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The Relationship and Its Change with Aging between ADL and Daily Life Satisfaction Characteristics in Independent Japanese Elderly Living at Home

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Abstract The purposes of this study were to examine the characteristics of the relationship between ADL ability and daily life satisfaction and the pattern change with aging in independent Japanese elderly, and to compare these tendencies between males and females. The characteristics of ADL ability and daily life satisfaction of 482 subjects (213 males, 269 females) were investigated in a self-response survey. Seventy-four ADL items, considered from previous studies, were selected from nine ADL domains of 1) movement, 2) going up and down stairs, 3) changing and holding posture, 4) bathing, 5) toileting, 6) dressing, 7) grooming, 8) eating, and 9) manual activities, and nine items of daily life satisfaction were selected from physical, psychological and sociological factors. Both ADL ability and life satisfaction of independent elderly tended to decline with aging. From correlation analysis, since life satisfaction of the elderly was higher with high ADL ability level, it was considered that ADL ability level is one of the important factors in providing for life satisfaction of independent elderly. The subjective symptoms of inconvenience in the lower extremity and lumbar region increased from the 70s in both genders, and the use of assisting devices for movement remarkably increased in the 80s in both genders. The use of assisting devices closely related to the activity area in daily life and influenced the characteristics of life satisfaction and its age-related change in the relationship between ADL ability and life satisfaction. The relationship between ADL ability and satisfaction with physical function was similar in both genders, while the relationship between ADL ability and satisfaction with sociological and psychological factors was different between males and females. Since the relationship between ADL ability and life satisfaction of independent elderly is influenced by a combination of personal, cultural, and environmental factors, additional study must investigate in detail the influence of these factors. *J Physiol Anthropol 21 (4): 195-204, 2002*
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Introduction

Assessing characteristics of the elderly from multiple aspects of physical, mental, sociological and environmental factors is important in the aging society (Tanaka & Okada, 2000; Lawton, 1975). Although physical function is one of the important factors for independent daily living, there are many elderly with higher physical function but not necessarily higher daily life satisfaction. Therefore, a comprehensive assessment including quality of life (QOL) should be conducted on the elderly.

In general, physical function of the elderly, especially of dependent people, is determined as the ability level of activities of daily living (ADL), and the ADL ability decreases with aging. However, ADL consists of various activities, such as walking, dressing, eating, bathing, etc., and the pattern change with aging in these ability levels is not consistent among activities (Sato et al., 2001). In addition, the contribution to independent living is also different in each activity. For example, the ability to walk influences on independency in daily life more than other activities.

Similarly, QOL characteristics of the elderly are also

Table 1 The usage of assisting device and the subjective symptom of inconvenient body sites in our sample

	Males			Females		
	60s	70s	80s	60s	70s	80s
Usage of assisting device						
Subjects with assisting devices (%)	5.1	18.2	44.8	3.8	24.1	57.4
The symptoms of inconvenient body sites (%)						
Upper extremity	2.4	9.4	8.8	1.8	6.3	10.0
Lower extremity	4.8	26.0	38.2	14.3	30.2	45.0
Lumbar	13.3	19.8	32.4	19.6	19.8	28.3
Back	0.0	1.0	5.9	4.5	5.2	6.7
Eyes	12.0	16.7	14.7	20.5	22.9	20.0
Ear	6.0	15.6	32.4	5.4	41.7	31.7

The above values are the proportions for a total sample.

assessed from multiple dimensions of satisfaction and happiness toward daily life, morale and depression. QOL characteristics are influenced by a combination of personal characteristics, health condition, mental, social and environmental factors in addition to physical functional level. Since QOL characteristics are also influenced by custom, culture, and natural features of one's own country, generalization of its characteristics is difficult.

In previous studies examining the relationship between ADL ability level and daily life satisfaction for disabled Japanese elderly, it was reported that the elderly with a lower ADL ability level felt uncomfortable in their daily life, and their life expectancy was also shorter (Imuta et al., 1998; Matsuda et al., 1996; Anme & Shimada, 2000; Mihara et al., 1996). However, studies examining this relationship for independent elderly are limited, and a general tendency is not clear. In the aging process where the physical functional level consistently declines, the situation around an elderly person remarkably changes through economic loss, one's own life expectancy, and separation from spouse and relatives. Although these changes are considered to influence QOL characteristics of the elderly, the age-dependent change of the relationships between physical functional level and QOL characteristics is sufficiently determined. Determining the relationship between ADL ability and daily life satisfaction for independent elderly in Japan, a country with the longest life expectancy, will give a foundation for investigating what ADL ability is more important in order to spend their remaining years comfortably while maintaining a high satisfaction level.

The purposes of this study were to examine the characteristics of the relationship between ADL ability and daily life satisfaction and their pattern changes with aging, and to compare these tendencies between male and female Japanese elderly.

Methods

Subjects

Subjects were 482 independent Japanese elderly aged 60 and over (213 males, mean age 72.5 ± 6.8 years; 269 females, mean age 73.2 ± 7.8 years), living in Ishikawa, Fukui, Akita and Gifu prefectures. About 80% of the subjects were recruited from health or culture education classes for the elderly offered by each municipality, and the others were community-dwelling elderly without these classes. They independently agreed to participate in this study after an explanation of the procedures. About a half of the subjects from these municipal classes participated in health education classes which provided healthy exercise programs and recreational sports, and the other half of them participated in culture education classes which included traditional culture programs such as flower arrangement, calligraphy, "go" games and "haiku" poems. The independent levels of the subjects were "independent living (rank J)" according to the standard of independence level for dependent elderly approved by the Japan Ministry of Health and Welfare in 1991. In investigating assistance devices for movement, 72.4% of the subjects were without assistance, 18.5% used some of assisting devices, and 9.1% had no response. Of the total, 8.1% used a stick, 1.5% used a walker, 1.2% used a wheelchair and 2.9% used other. The proportions of subjects using assisting devices for each age group were 5.1% in the 60s, 18.2% in the 70s, 44.8% in the 80s for males, and 3.8% in the 60s, 24.1% in the 70s, 57.4% in the 80s for females (Table 1).

Survey

This study investigated ADL, life satisfaction, use of assisting devices and the body sites having problems. The survey was conducted in health or culture education classes setting. For the elderly without these classes, a general delivery survey was conducted. The subjects provided their own information, but in accordance with a

Table 2 ADL items selected in this study

	Domain	Content
1	I	Crawling.
2	I	Walking in the room.
3	I	Walking to an adjoining room.
4	I	Going up slope.
5	I	Going down slope.
6	I	Crossing the doorsill.
7	II	Going up stairs.
8	II	Going down stairs.
9	II	Getting in and out of an automobile.
10	III	Shifting the body while lying on one's back.
11	III	Sitting up from the lying posture.
12	III	Moving the face of the body in a different direction at the sitting posture.
13	III	Getting off the bed.
14	III	Getting on the bed.
15	III	Sitting on a chair from the standing posture.
16	III	Sitting cross legged from the standing posture.
17	III	Sitting upright from the standing posture.
18	III	Squatting down from the standing posture.
19	III	Standing up from the sitting posture.
20	III	Standing up from the squatting posture.
21	III	Walking on the knees.
22	III	Tossing about in bed.
23	III	Maintaining the sitting posture.
24	III	Maintaining the knee-standing posture.
25	III	Keeping the standing posture.
26	IV	Entering the bathtub.
27	IV	Exiting the bathtub.
28	IV	Washing the hair in the bath.
29	IV	Washing the back in the bath.
30	IV	Washing the extremities in the bath.
31	IV	Scooping water in the bathtub.
32	IV	Rinsing the body with the shower.
33	IV	Drying the body with a towel after bathing.
34	V	Squeezing a wet towel.
35	V	Using a Western-style lavatory.
36	V	Using a Japanese-style lavatory.
37	V	Pulling up and down the underwear when excreting.
38	V	Wiping off and flushing after excretion.
39	V	Controlling urination.
40	V	Controlling defecation.
41	VI	Putting on pants or skirt in the standing posture.
42	VI	Putting on socks or stockings in the standing posture.
43	VI	Putting on pants or skirt in the sitting posture.
44	VI	Putting on socks or stockings in the sitting posture.
45	VI	Putting on mules.
46	VI	Putting on wooden clogs.
47	VI	Putting on shoes without laces.
48	VI	Putting on shoes.
49	VI	Putting on a short-sleeved shirt with buttons.
50	VI	Putting on a long-sleeved shirt with buttons.
51	VI	Pulling a zipper closed.
52	VI	Clasping buttons.
53	VI	Putting the hem of the jacket into pants or a skirt.
54	VII	Washing the face.
55	VII	Wiping the body with a towel.
56	VII	Washing hands.
57	VII	Taking care of dentures. (Brushing the teeth.)
58	VII	Cutting the nails.
59	VII	Shaving (males). Combing (females).
60	VIII	Eating with a spoon and a fork.
61	VIII	Eating with chopsticks.
62	VIII	Eating while holding the tableware on the table.
63	VIII	Eating while holding the tableware up towards the mouth.
64	VIII	Biting food.
65	VIII	Peeling a mandarin orange.
66	VIII	Cutting fruit and vegetables with a knife. Peeling fruit and vegetables with a knife.
67	VIII	Pouring hot water from a kettle into another vessel.
68	VIII	Opening and closing the faucet.
69	IX	Tying a string.
70	IX	Writing characters.
71	IX	Cutting paper with scissors.
72	IX	Opening and closing a sliding door.
73	IX	Undoing a package wrapped in cloth.
74	IX	Opening and closing a drawer.

I: Movement, II: Going up and down stairs, III: Changing and holding the postures, IV: Bathing, V: Using the toilet, VI: dressing, VII: Grooming, VIII: Eating, IX: Manual activities.

subject's request, the survey staff interviewed. The content on ADL and the satisfaction survey are described in the following sections.

ADL items

In this study, it was assumed that ADLs are constructed with the following nine domains; 1) movement, 2) going up and down stairs, 3) changing and holding posture, 4) bathing, 5) using the toilet, 6) dressing, 7) grooming, 8) eating and 9) manual activities. Considering previous studies (Demura et al., 2000; Kempen & Suurmaijer, 1990; Lawton and Brody, 1969; Sato et al., 1999; Shoening and Iversen, 1968; Mahoney & Barthel, 1965), seventy-four items needed to comprehensively assess basic ADL ability were selected from the above stated ADL domains (Table 2). These items were assessed with a dichotomous rating scale.

Daily life satisfaction items

In this study, it was assumed, considering previous

Table 3 Daily life satisfaction items in this study

Contents	Category			
Q1. How do you feel about your health?	1. Very good	2. Good	3. Not very good	4. Poor
Q2. How do you feel about your physical fitness?	1. Good	2. Normal	3. Poor	
Q3. Do you see enough of your family and/or relatives?	1. Very satisfied	2. Satisfied	3. Cannot say	4. Not very satisfied
	5. Dissatisfied			
Q4. Do you have close friends?	1. Have a lot	2. Have some	3. Have at least one	4. None
Q5. Do you have a lot of conversations with others?	1. Very often	2. Often	3. Not very often	4. None
Q6. Do you feel life is wonderful?	1. Yes	2. No		
Q7. Recently, are you doing any interesting things?	1. Yes	2. No		
Q8. Do you feel lonely?	1. Do not feel lonely	2. Not very lonely	3. Sometimes	4. Feel lonely
Q9. Do you have any things that you want to do?	1. Yes	2. No		

studies (Lawton, 1975; Larson, 1978; Neugarten et al., 1961), that daily life satisfaction of the elderly is made up of physical, psychological and sociological factors. Nine items were selected to investigate the subjective satisfaction of each satisfaction factor (Table 3). Two items of "subjective evaluation of health status" and "subjective evaluation of physical fitness level" were selected for physical factors. Four items of "feeling of wonderfulness toward life", "existence of interesting things", "existence of loneliness" and "existence of what you want" were selected for psychological factors. Three items of "association with families and relatives", "existence of close friends" and "conversation with others" were selected for sociological factors. These satisfaction items used a polychotomous rating scale as shown in Table 3. The satisfaction item score was the category number for each question, and the satisfaction total score was calculated by summing the item scores.

Statistic analyses

Calculation of ADL and satisfaction scores: The proportion of a "possible" response for each ADL item was calculated for the 60s, 70s and 80s age groups to examine ADL difficulty. Then, ADL scores were calculated. If the subject could achieve an item, one point was given as an ADL item score. ADL domain score was calculated by summing the item scores consisting of the ADL domain divided by the number of items. ADL total score was calculated by summing the item scores. In the present study, the following analyses were conducted using ADL domain scores as ADL scores. Satisfaction score was the category number of each question, and the total score was calculated by summing the item scores. For ADL scores and the satisfaction scores, gender and age differences were examined using two-way ANOVA. If a main effect was found in the analysis of variance, multiple comparisons were conducted using Tukey's HSD test.

Correlation between ADL ability and daily life satisfaction: Differences in ADL scores among satisfaction item categories were examined with an analysis of covariance (ANCOVA) controlled effect of age. To determine the relationship between ADL and daily life satisfaction, and its change with aging, Pearson product moment correlations were calculated for each age group.

Results

Gender and age differences in ADL ability

In calculating achievement proportions for each age group, the ranges of proportions were 91.6% to 100% in the 60s, 77.8% to 100% in the 70s and 47.7% to 100% in the 80s (Table 4). The proportion of only "biting food" was 100% in all age groups. In an examination of gender and age differences in ADL domain and total scores, significant interaction effects were found for bathing, grooming and total score. From the results of multiple comparisons of age level by gender, bathing and total scores of males in the 80s group were significantly superior to those of females. By age group, in females, bathing, grooming and total scores in the 80s group were significantly less than those in other age groups. For males, total score in the 80s group was significantly less than that in the 60s group. The significant main effects for gender were found in "going up and down stairs" and "changing and holding posture" scores, and males were significantly superior to females in these scores. Significant age differences were found in all domain scores excepting the domain showing a significant interaction effect, and all scores in the 80s were significantly less than those of other age groups.

Gender and age differences of life satisfaction of daily life

In two-way ANOVA for life satisfaction scores, significant gender differences were found in three items of "Q2. Satisfaction with physical fitness level", "Q3. Existence of conversation with others" and "Q8. Existence of loneliness". Males were superior to females in these scores. Significant age differences were found in all satisfaction items and total scores, and these scores tended to decrease with aging (Table 5).

Table 4 Range of achievement proportions for each ADL domain and gender and age differences in ADL scores

	ADL domains	Range of achievement proportions (%) 60s group	70s group	80s group	Two-way ANOVA for ADL scores Gender	Age	Inter.	Multiple comparisons
AD1	Movement	98.4-99.5	90.6-97.4	67.8-86.5		**		60, 70>80
AD2	Going up stairs	96.9-97.4	89.5-91.6	63.6-68.5	**	**		M>F 60, 70>80
AD3	Changing and holding posture	91.6-99.0	84.6-99.5	60.2-92.1	**	**		M>F 60, 70>80
AD4	Bathing	98.4-99.5	91.6-94.8	72.2-85.6			**	80: M>F F: 60, 70>80
AD5	Using the toilet	94.8-99.5	85.2-97.9	65.6-92.0		**		60, 70>80
AD6	Dressing	93.6-99.5	77.8-95.8	47.7-87.6		**		60, 70>80
AD7	Grooming	98.4-100	90.1-100	65.9-95.5			**	F: 60, 70>80
AD8	Eating	97.9-100	91.6-100	77.3-100		**		60, 70>80
AD9	Manual activity	98.4-100	93.2-99.5	85.4-87.6		**		60, 70>80
AT	ADL total score						**	80: M>F M: 60>80/F: 60, 70>80

60, 70 and 80 are the 60s, 70s and 80s age groups. Inter. is interaction effect. M: male, F: female. Two-way ANOVA conducted for each ADL domain score and ADL total score.

Table 5 Gender and age differences in daily life satisfaction score

	Two-way ANOVA Gender	Age	Inter.	Multiple comparisons
Q1 Subjective health evaluation		**		60>70, 80
Q2 Subjective physical fitness evaluation	**	**		F>M 60>70, 80
Q3 Association with relatives		**		60, 70>80
Q4 Existence of friends		**		60, 70>80
Q5 Conversation	**	**		F>M 60, 70>80
Q6 Wonderfulness of life		**		60, 70>80
Q7 Interesting things		**		60, 70>80
Q8 loneliness	**	**		F>M 60>80
Q9 Existence of worth living		**		60>80
QT Satisfaction total score		**		60, 70>80

60, 70 and 80 are the 60s, 70s and 80s age groups. Inter. is interaction effect. M: males, F: females. Question numbers correspond to Table 2.

Relationship between ADL and satisfaction

In an examination of satisfaction categorical differences between ADL domain scores, significant differences were found in all satisfaction items excepting "Q9. Existence of what you want". For this item, there were significant differences only in changing and holding posture, bathing, dressing, eating and total ADL scores. In the multiple comparisons, the tendency was the higher the ADL score, the more daily life satisfaction is desirable (Table 6).

The relationship between ADL domain scores and satisfaction item scores were examined (Table 7). In males, satisfaction items of "Q1. Satisfaction with health status", "Q3. Association with family and relatives", "Q6. Feeling of wonderfulness of life" and "Q8. Existence of loneliness" were significantly related to all ADL domain scores in the 60s group. The only satisfaction items related to all ADL domain scores were "Q1. Satisfaction with health status" and "Q7. Existence of interesting things" in the 70s group, and "Q1. Satisfaction with health status" in the 80s group. In females, no satisfaction item relating to all ADL domain scores was found in the 60s group. "Q1. Satisfaction with health status" and "Q2. Satisfaction with physical fitness" in the 70s group, and "Q1. Satisfaction with health status", "Q3. Association with family and relatives" and "Q5. Existence of conversation with others" in the 80s group were significantly related to all ADL domain scores. "Q9. Existence of what you want" in the 70s group and "Q4. Existence of close friends" in the 80s group were significantly related to many ADL domain scores.

Discussion

Declining ADL ability causes a reduction of not only the range of movement but also the chance to participate in social activities and social contact, and finally causes a reduction in the scope of daily life activity. These reductions result in a decline of satisfaction and worth in daily life. In contrast, decline of satisfaction and worth in daily life are a cause for keeping indoors, and finally results in a reduction in the activity. Namely, the ADL

Table 6 The differences in ADL scores among daily life satisfaction item categgories

	Q1		Q2		Q3	
	ANCOVA	Multiple	ANCOVA	Multiple	ANCOVA	Multiple
AD1 Movement	**	1,2>3>4	**	1,2>3	**	1,2,3,4>5
AD2 Going up stairs	**	1,2>3>4	**	1,2>3	**	1>3,4>5/2>5
AD3 Changing and holding posture	**	1>3>4/2>4	**	1,2>3	**	1,2>3,4>5
AD4 Bathing	**	1,2>3>4	**	1,2>3	**	1,2>3,4>5
AD5 Using the toilet	**	1,2>3>4	**	1,2>3	**	1,2>3,4>5
AD6 Dressing	**	1>3>4/2>4	**	1,2>3	**	1>4>5/2>3,4>5
AD7 Grooming	**	1,2>3>4	**	1,2>3	**	1,2>3,4>5
AD8 Eating	**	1,2>3>4	**	1,2>3	**	1,2>3,4>5
AD9 Manual activity	**	1,2>3>4	**	1,2>3	**	1,3,4>5/2>3,5
AT ADL total score	**	1,2>3>4	**	1,2>3	**	1,2>3,4>5

	Q4		Q5		Q6	
	ANCOVA	Multiple	ANCOVA	Multiple	ANCOVA	Multiple
AD1 Movement	**	1,2>3,4	**	1>3>4/2>4	**	1>2
AD2 Going up stairs	**	1>2>3,4	**	1,2>3,4	**	1>2
AD3 Changing and holding posture	**	1>3,4/2>3	**	1>3>4/2>4	**	1>2
AD4 Bathing	**	1,2>3,4	**	1,2>3>4	**	1>2
AD5 Using the toilet	**	1,2>3,4	**	1,2>3>4	**	1>2
AD6 Dressing	**	1,2>3,4	**	1,2>3>4	**	1>2
AD7 Grooming	**	1>3,4/2>3	**	1,2>3>4	**	1>2
AD8 Eating	**	1,2>3,4	**	1,2>3>4	**	1>2
AD9 Manual activity	**	1>3,4/2>3	**	1,2>3>4	**	1>2
AT ADL total score	**	1,2>3,4	**	1,2>3>4	**	1>2

	Q7		Q8		Q9	
	ANCOVA	Multiple	ANCOVA	Multiple	ANCOVA	Multiple
AD1 Movement	**	1>2	**	1>3>4/2>4	ns	
AD2 Going up stairs	**	1>2	**	1,2>3>4	ns	
AD3 Changing and holding posture	**	1>2	**	1>3>4/2>4	**	1>2
AD4 Bathing	**	1>2	**	1,2>3>4	**	1>2
AD5 Using the toilet	**	1>2	**	1>3>4/2>4	ns	
AD6 Dressing	**	1>2	**	1>3>4/2>4	**	1>2
AD7 Grooming	**	1>2	**	1>3>4/2>4	ns	
AD8 Eating	**	1>2	**	1>3>4/2>4	**	1>2
AD9 Manual activity	**	1>2	**	1>3>4/2>4	ns	
AT ADL total score	**	1>2	**	1,2>3>4	**	1>2

Differences in ADL scores among satisfaction item categories were examined with an analysis of covariance (ANCOVA) controlled effect of age. Q1 to Q9 are the question numbers of satisfaction items. Numbers 1 to 5 are the categorical numbers for each satisfaction item. Question number and categorical number for each satisfaction item correspond to Table 2. "Multiple" means the results of multiple comparisons. **: $p<0.01$, *: $p<0.05$, ns: not significant.

ability level and life satisfaction are suggested to be factors that bring about the decline in each other.

In previous studies (Demura et al., 2000; Sato et al., 1999, 2001), the ADL ability of independent elderly was reported to decrease with aging. This tendency was also found in this study, and the decrease in the 80s group was extreme. The amount of decline in ADL ability was different among activities, and lower extremity activities, such as movement, going up and down stairs, changing and holding posture in standing position, and dressing while standing, significantly decreased from the 70s group. In contrast, upper extremity activities, such as eating and grooming, were easy to achieve until the 80s group, and the decline was less than lower extremity activities. The subjective symptoms of inconvenience in the lower extremity and lumbar region increased in 70s and 80s in both genders (Table 1), and it reflects the above findings.

Daily life satisfaction of independent elderly also tended to decline with aging. The satisfaction with health status in independent Japanese elderly aged more than 75 years was reported to be lower than that in those aged under 75 years (Kishi et al., 1996). Another study using independent Japanese elderly reported that elderly replying "own health status is very good" increased with advancing age (Imuta et al., 1998). Thus, the aging

Table 7 Relationship between ADL and daily life satisfaction for gender and age groups

		males									
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	QT
60s group	AD1	−0.47	−0.27	−0.38			−0.49		−0.31		−0.40
	AD2	−0.44	−0.26	−0.31		−0.24	−0.46		−0.30		−0.41
	AD3	−0.38		−0.24		−0.28	−0.38	−0.28	−0.30	−0.28	−0.41
	AD4	−0.47	−0.27	−0.38			−0.49		−0.31		−0.40
	AD5	−0.35	−0.32	−0.32		−0.24	−0.34	−0.34	−0.31	−0.34	−0.44
	AD6	−0.47	−0.27	−0.38			−0.49		−0.31		−0.40
	AD7	−0.47	−0.27	−0.38			−0.49		−0.31		−0.40
	AD8	−0.42		−0.41		−0.28	−0.42		−0.33		−0.43
	AD9	−0.47	−0.27	−0.38			−0.49		−0.31		−0.40
	AT	−0.46	−0.27	−0.35		−0.22	−0.47		−0.33		−0.43
70s group	AD1	−0.41	−0.33					−0.27			
	AD2	−0.38	−0.30					−0.33			−0.28
	AD3	−0.37	−0.31					−0.33			−0.27
	AD4	−0.39	−0.32					−0.30			−0.26
	AD5	−0.39	−0.29		−0.33			−0.36	−0.27		−0.33
	AD6	−0.37			−0.29			−0.42	−0.34		−0.34
	AD7	−0.32						−0.37			−0.29
	AD8	−0.42	−0.33					−0.31		−0.26	−0.28
	AD9	−0.39						−0.38	−0.34		−0.31
	AT	−0.41	−0.31					−0.37	−0.26		−0.31
80s group	AD1	−0.67	−0.56				−0.43				−0.50
	AD2	−0.61	−0.50								
	AD3	−0.65		−0.42							−0.41
	AD4	−0.56		−0.53					−0.46		−0.55
	AD5	−0.51		−0.52	−0.49		−0.47				−0.58
	AD6	−0.68	−0.40	−0.55					−0.44		−0.61
	AD7	−0.37		−0.50	−0.43		−0.53		−0.50		−0.53
	AD8	−0.46		−0.50	−0.41		−0.48		−0.55		−0.58
	AD9	−0.26					−0.66	−0.43	−0.47		−0.49
	AT	−0.63		−0.52					−0.47		−0.58
		females									
		Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	QT
60s group	AD1	−0.27	−0.29				−0.24		−0.36		−0.23
	AD2	−0.22	−0.23						−0.41		−0.24
	AD3		−0.27					−0.22			
	AD4				−0.21		−0.37		−0.25		−0.22
	AD5										
	AD6		−0.30				−0.27				
	AD7				−0.21		−0.37		−0.25		−0.22
	AD8		−0.24				−0.31		−0.31		−0.26
	AD9				−0.21		−0.37		−0.25		−0.22
	AT		−0.30				−0.25	−0.22	−0.29		−0.24
70s group	AD1	−0.35	−0.34						−0.25	−0.29	−0.33
	AD2	−0.48	−0.56	−0.25	−0.26	−0.25				−0.27	−0.45
	AD3	−0.37	−0.37				−0.26		−0.36	−0.34	−0.42
	AD4	−0.35	−0.30							−0.26	−0.33
	AD5	−0.33	−0.35						−0.31	−0.25	−0.33
	AD6	−0.38	−0.42		−0.27	−0.24		−0.25	−0.28	−0.29	−0.43
	AD7	−0.32	−0.28								−0.28
	AD8	−0.41	−0.30			−0.30		−0.25	−0.27	−0.28	−0.41
	AD9	−0.37	−0.28			−0.25					−0.34
	AT	−0.42	−0.41						−0.30	−0.32	−0.43
80s group	AD1	−0.43		−0.32	−0.38	−0.42					−0.42
	AD2	−0.54	−0.33	−0.33	−0.44	−0.39			−0.33		−0.47
	AD3	−0.38		−0.32		−0.43			−0.31		−0.40
	AD4	−0.52	−0.32	−0.37	−0.38	−0.45					−0.49
	AD5	−0.45		−0.37	−0.35	−0.49					−0.44
	AD6	−0.47		−0.34	−0.41	−0.50					−0.48
	AD7	−0.53	−0.36	−0.42	−0.37	−0.43			−0.33		−0.50
	AD8	−0.56	−0.36	−0.54	−0.54	−0.61			−0.42		−0.64
	AD9	−0.40		−0.33	−0.35	−0.47					−0.44
	AT	−0.50		−0.40	−0.40	−0.51			−0.34		−0.51

ADL and satisfaction variables correspond to Table 2 and Table 3. Only significant values are indicated.

pattern in satisfaction with physical condition of independent Japanese elderly was not sufficiently determined in previous studies (Kishi et al., 1996; Imuta et al., 1998; Larson, 1978). In this study, the decline of the satisfaction with health and physical fitness condition began in the 70s group and that of the satisfaction with psychological and sociological factors began in the 80s group. The subjective symptoms of inconveniences in the lower extremity and lumbar region increased from the 70s in both genders, and the use of assisting devices for movement remarkably increased in the 80s in both genders. The use of assisting device closely related to the activity area in daily life and it influences symptom of life satisfaction and its age-related change. This means that physical function in the lower body begins to decline in the 70s, and the scope of daily life activity begins to change in the 80s. The age-stages of the 70s and the 80s may be the period when bad influences on the satisfaction characteristics in older people appear, such as the decline of ADL ability, morbidity, and separation from spouse and relatives. The results in this study are considered to be influenced by these factors.

With the controlling effect of age, the elderly superior in ADL ability were more comfortable in daily life satisfaction. This result agrees with previous studies examining the relationship between ADL and QOL for independent Japanese elderly (Anme & Shimada, 2000; Matsuda et al., 1998; Honma et al., 1999). The results in the present study suggest that both of ADL ability and life satisfaction decline with aging, and that subjects with higher ADL ability have a higher life satisfaction when controlling the age effect, indicate that these ADL ability levels and life satisfaction of independent elderly are closely related to each other.

In the aging pattern in the relationship between ADL ability and life satisfaction, satisfaction with physical condition (Q1 and Q2) and loneliness (Q8) were significantly related to many ADL domain scores, and this tendency was similar in both genders. The ADL ability of elderly with high satisfaction regarding physical condition and without loneliness tended to become high. In contrast, the aging pattern in the relationship between ADL ability and satisfaction with sociological and psychological factors were different between males and females. In satisfaction with sociological factors (Q3, Q4 and Q5), the subjects with high physical function tended to be satisfied with human support such as from family, relatives and friends, and this tendency was clearly found in the 80s female group. In satisfaction with psychological factors (Q6, Q7, Q8 and Q9), although many ADL domain scores significantly related to "Q7. Existence of interesting things recently" in the 70s males, and related to "Q6. Feeling of wonderfulness of life" in the 80s male group. On the other hand, many ADL scores significantly related to "Q9. Existence of what you want in the future" in the 70s female group.

Physical functional level closely related to the satisfaction with present occurrences in the 70s or 80s males, but related to the satisfaction with future occurrences in the 70s females. We considered that this gender difference in the relationship between ADL ability and satisfaction with psychological and sociological factors is influenced by the difference of life expectancy. Presumably the feeling about remaining days for the 70s is different between males and females, and this is one of the reasons for the gender difference in the relationship between ADL ability and life satisfaction. Furthermore, in the case of the elderly, social human networks closely relate to daily activity and physical functional level, and this tendency is considered to become remarkable after the separation from spouse and relatives. In general, life expectancy is longer in females than males, and the possibility of the female being separated from the spouse is higher compared to males. Thus, we inferred that this is one of the influences on the gender difference in pattern changes with aging in the relationship between ADL ability and life satisfaction.

As mentioned above, the relationship between ADL ability and life satisfaction changes with aging, and its aging pattern is also different between males and females. ADL ability is considered to be one of the important factors providing for life satisfaction of the elderly, and it declines with aging in the same way. The psychological, sociological, environmental factors, except physical function, also change with aging, but these conditions are considered to vary between individuals and genders. As a result, the characteristics of the conditions are reflected in the change of the relationship between ADL ability and life satisfaction. Ueno et al. (1997) reported that when Japanese elderly cannot adapt to a change in their surroundings, such as a change in human relationships after retirement, loss of economic base, separation from spouse, and independence of children, mental symptoms including depression appear. Furthermore, the lack of a social network, such as social contact, influences physical and mental impairments (Kishi et al., 1996).

The investigation of the relationship between ADL ability and life satisfaction on independent elderly in the present study was exploratory in nature, and the results cannot conclude a causal relationship between them. Furthermore, in drawing conclusions, researchers must resist tendencies to universalize the results of this study as a way to explain the relationship between ADL ability and life satisfaction in independent elderly. The results, however, support additional study that might empirically investigate considering the influences of life situations and personal, cultural, and environmental factors.

In conclusion, both ADL ability and life satisfaction of independent elderly tend to decline with aging. Since the life satisfaction of the elderly with high ADL ability level

is higher, ADL ability level is one of the important factors in providing for life satisfaction of independent elderly. The lower body function begins to decline from the 70s. The scope of daily life activity may begin to change in the 80s, and it influences the decline of life satisfactions and age-related change in the relationship between ADL ability and life satisfaction. The relationship between ADL ability and satisfaction with physical function is similar in both genders, while the relationship between ADL ability and satisfaction with sociological and psychological factors is different between males and females. Since the relationship between ADL ability and life satisfaction of independent elderly is influenced by a combination of personal, cultural, and environmental factors, additional study must investigate in detail the influence of these factors on the relationship between ADL ability and life satisfaction.

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