1. Introduction

A variety of activities and programs for older adults have been implemented by communities across Japan to help older adults stay healthy and active. Many club activities for older adults have been made available by both community organizations and private care providers. Physicians recommend that older patients adopt hobbies in order to maintain their vitality and prevent deterioration in their physical and mental health. In addition, adult day care centers provide recreational services for frail elderly people, which are funded by public long-term health care insurance in Japan. However, conflict between young recreational service providers and the older adults under their care sometimes occur largely, due to the fact that service providers do not always have a sufficient understanding of the preferences of older adults. Previous reports surveyed the frequency of participation in various leisure activities, which showed older adults were often participating in the activities such as watching TV or listening radio, traveling, or doing sports (Life Design White Paper, 1999; Annual Report on the Aging Society, 2002). But there are some gaps between the activities in which older adults are actually participating and those which they would like to participate even if they are not doing. Therefore, it is important to understand what activities older adults like to participate in. Furthermore, it is essential to understand which activities can help older adults maintain their quality of life (QOL). The authors worked under the assumption that some activities can help prevent the reduction of QOL of older adults, despite negative experiences they may have suffered, such as retirement, the onset of a disability, or the death of family members.

In this study, we surveyed the amount of pleasure when older adults participate in daily or recreational activities. The original list made by the authors based on the results, which is derived from the preliminary study that clarified rate of residents enjoying the activities and QOL in Japanese nursing home (Onishi et al., 2005), was used to evaluate the amount of pleasure. Also, we studied the relationship between how pleasant they perceive in the activities and their QOL.

2. Subjects and methods

2.1. Subjects and data collection

Nine hundred and sixty-four older adults aged 65 years and over living in a village, situated in the mountainous area of central Japan, were nominated from a health care register. A questionnaire was mailed, along with a letter inviting the adults to schedule their annual health checkup, to all of the nominated subjects. The completed questionnaire was then collected when the subjects came in for a subsequent health checkup. Written consent was obtained from all subjects. The data from the questionnaires and health checkups were combined for analysis.

2.2. Questionnaire

The questionnaire consisted of questions about the demographic and characteristic information, the amount of pleasure taken in activities, and QOL. Demographic and

Table 1
List of the activities

Items
Watching TV
Listening to music
Walking
Conversation with family
Conversation with neighbors
Eating meals
Reading books
Playing with animals
Singing songs
Relaxing at home
Gardening
Working
Traveling
Fishing
Bathing
Gambling
Physical exercise
Joining club activities for older adults

characteristic information included age, gender, basic activities of daily living (ADL), family structure, former and present occupation, the presence of chronic physical pain, hobbies, human relationships, and the frequency with which the respondents went out. Subjects rated difficulty in managing finances on a 5-point scale from extremely high to extremely low.

The amount of pleasure experienced by the participants when participating in 18 daily and recreational activities was examined using the original list shown in Table 1. The amount of pleasure was described by three alternatives: "very pleasant" (2 points), "moderately pleasant" (1 point), or "not pleasant" (0 point) for each activity. The participants were asked to select one among the three alternatives, even if they did not actually participate in the activity listed, unless they had never actually engaged in the activity during their life.

The QOL was evaluated by the revised Philadelphia Geriatric Center (PGC) morale scale (Lawton, 1975). The happiness score was subjectively scored by the participants between 0 for extremely unhappy, and 100 for extremely happy.

2.3. Statistical analyses

The internal consistency of the revised PGC morale scale was calculated by Cronbach's method. The correlations between age, the total score of the amount of pleasure experienced in daily and recreational activities, the revised PGC morale scale, and the happiness score were examined, and Pearson's correlation coefficients were calculated. Spearman's rank correlation analyses were applied for the correlation between the amount of pleasure given for each activity, the revised PGC morale scale, and the happiness score. Differences in the revised PGC morale scale and the happiness score between two groups

divided by the response to each question were tested using the Student's t-test. Differences in the revised PGC morale scale and happiness score between more than two groups were determined by one-way analysis of variance (ANOVA). Tukey's test was used for multiple comparisons after ANOVA. Univariate and multiple linear regression analyses were carried out to evaluate the influence of the amount of pleasure for the recreational activities on the revised PGC morale scale and the happiness score. The step-wise method was used for the multiple regression analyses, controlling for age and gender. All tests were two-tailed, and scores of $P < 0.05$ were considered statistically significant. All statistical analyses were performed on a personal computer with the statistical package SPSS for Windows (Version 11.0 SPSS Inc., Chicago, IL).

3. Results

In total, 420 older adults (189 males and 231 females, 46.1% of the nominated subjects) were examined. The mean age was 72.3 ± 5.1 (S.D.), and mean basic ADL was 19.8 ± 0.5 (S.D.)/20. The former occupations of the subjects were: agriculture, fishery, or forestry: 37.1%; office worker: 32.3%; undefined including housewife: 14.1%; self-employment and others: 16.6%. The present occupations were: agriculture, fishing, or forestry: 37.2%; office worker: 4.5%; no occupation including housewife: 49.9%; self-employment and others: 8.3%.

The mean of the total score of pleasant recreational activities was 14.1 ± 4.9 (S.D.)/36. The revised PGC morale scale indicated the high reliability of Cronbach's $\alpha = 0.814$. The mean of the revised PGC morale scale and happiness score were 10.6 ± 3.8 (S.D.)/17 and 72.0 ± 19.0 (S.D.)/100, respectively. Pearson's correlation coefficients between age, the total score of pleasant recreational activities, the revised PGC morale scale, and the happiness score are shown in Table 2. There was a strong relationship among the total score of the pleasant recreational activities, the revised PGC morale scale and the happiness score. Age showed a significant correlation with the happiness score. As for age-dependency of the recreational activities examined, age showed significant negative relationships with physical exercise ($\rho = -0.187$, $P = 0.004$) and joining club activities for older adults ($\rho = -0.129$, $P = 0.047$). An increase of difficulty in managing finances showed a negative relationship with the revised PGC morale scale ($\rho = -0.244$, $P < 0.001$) and the happiness score ($\rho = -0.277$, $P < 0.001$) by Spearman's rank correlation coefficients.

Table 2
Pearson's correlation coefficients among age, total score of pleasant activities, PGC morale scale and happiness score

	Age	Total score of pleasant activities	PGC morale scale	Happiness score
Age	1	0.016 ($P = 0.746$)	0.033 ($P = 0.497$)	0.140 ($P = 0.004$)
Total score of pleasant activities	–	1	0.226 ($P < 0.001$)	0.311 ($P < 0.001$)
PGC morale scale	–	–	1	0.402 ($P < 0.001$)
Happiness score	–	–	–	1

Table 3 presents a comparison of the mean of the revised PGC morale scale and the happiness score by gender, living status, frequency with which the subject went out, and the presence of a hobby or hobbies. The mean of the revised PGC morale scale was significantly higher when the participants were living with a spouse, and when they had some hobbies. The mean of the happiness score was significantly higher when the participants were female, living with grandchildren, or living with parents. The results of the ANOVA conducted to compare the mean of the revised PGC morale scale and the happiness score by the social and demographic variables are shown in Table 4. The revised PGC morale scale was significantly lower when the older adults had experienced distress in their human relationships or had the physical pain. The happiness score was also significantly higher when they had a better economic status.

The rates of amount of pleasure taken in the activities and their association with the revised PGC morale scale and the happiness score are shown in Table 5. The activities are listed in order of the mean score of amount of pleasure in the table. Only three activities, including conversing with family, eating meals and traveling, showed a significant relationship with the revised PGC morale scale by Spearman's rank correlation analyses, but many activities showed a significant relationship with the happiness score. A single

Table 3
Comparison of mean PGC morale scale and happiness score by gender and living status

Items	n (%)	PGC morale scale (/17)			Happiness score (/100)		
		Mean ± S.D.	T-value	P-value	Mean ± S.D.	T-value	P-value
Gender							
Women	189 (45.0)	11.0 ± 3.8	1.91	0.057	74.0 ± 19.0	−2.34	0.020
Men	231 (55.0)	10.3 ± 3.8			69.6 ± 18.9		
Cohabitual status							
Living with somebody	26 (6.2)	9.2 ± 4.3	1.95	0.052	72.1 ± 19.2	0.46	0.648
Living alone	393 (93.8)	10.7 ± 3.7			70.3 ± 17.1		
Living with a spouse	321 (76.6)	10.8 ± 3.7	−2.04	0.042	71.6 ± 18.8	0.78	0.434
Living without a spouse	98 (23.3)	9.9 ± 3.8			73.3 ± 19.9		
Living with children	210 (50.1)	10.5 ± 3.7	0.54	0.567	73.2 ± 19.9	−1.32	0.189
Living without children	209 (49.9)	10.7 ± 3.9			70.8 ± 18.1		
Living with grandchildren	159 (37.9)	10.5 ± 3.6	0.37	0.714	75.3 ± 18.7	−2.83	0.005
Living without grandchildren	259 (62.0)	10.7 ± 3.9			69.9 ± 19.0		
Living with parents	25 (6.0)	10.9 ± 4.6	−1.03	0.302	76.9 ± 20.0	−4.40	<0.001
Living without parents	394 (94.0)	10.5 ± 3.7			68.7 ± 16.4		
Frequency of going out							
<Once a week	288 (69.6)	10.4 ± 3.7	0.92	0.360	70.7 ± 19.5	1.03	0.305
≥Once a week	126 (30.4)	10.8 ± 3.7			72.8 ± 18.5		
Presence of hobby							
Yes	197 (47.1)	11.2 ± 3.7	−3.17	0.002	74.4 ± 17.4	−2.74	0.006
No	221 (52.9)	10.0 ± 3.7			69.3 ± 20.4		
Total		10.6 ± 3.8			72.0 ± 19.0		

Table 4
Influence of social and demographic variables on PGC morale scale and happiness score

	n (%)	PGC morale scale	Happiness Score
Presence of physical pain			
None	149 (35.6)	12.0 ⎤ ⎤ P = 0.001	74.7
Sometimes	129 (30.9)	10.4 ⎦	70.4
Always	140 (33.5)	9.5 ⎦ P < 0.001	70.5
Distress in human relationship			
No	311 (74.4)	11.0 ⎤ P < 0.001	72.9
Sometimes yes	73 (17.5)	10.4 ⎤ ⎤	70.4
Yes	34 (8.1)	8.0 ⎦ ⎦ P = 0.007	67.7
Former occupation			
Agriculture, fishing, or forestry	156 (37.1)	10.3	71.3
Office worker	135 (32.3)	11.1	72.5
No occupation (including house wife)	59 (14.1)	9.9	70.2
Self-employed, or others	69 (16.5)	11.0	74.3
Present occupation			
Agriculture, fishing, or forestry	156 (37.2)	10.6	70.9
Office worker	19 (4.5)	10.8	66.8
No occupation (including house wife)	209 (49.9)	10.6	74.0
Self-employed, or others	35(8.4)	11.1	67.5

regression model extracted many activities as significant variables for predicting the happiness score, whereas it did not indicate any activities as being a significant variable for predicting the revised PGC morale scale.

Multiple linear regression analyses indicated that the amount of pleasure for exercise (standardized $\beta = 0.426$), the difficulty in managing finances (standardized $\beta = -0.256$), and the amount of pleasure taken in watching TV (standardized $\beta = 0.242$) were significant variables for predicting the happiness score with an adjusted R^2 of 0.357 ($P < 0.001$).

4. Discussion

As the present study was carried out in a rural area, some idiosyncratic results were obtained. Many older adults in this area have continued to work, and most of them work for a primary resource industry such as farming or forestry. The happiness score showed a significantly high correlation with the revised PGC morale scale, reflecting its validity as a QOL indicator. The mean of the revised PGC morale scale was similar to the ones obtained in previous Japanese studies (Koyano, 1981; Maeda et al., 1989; Yasunaga and Tokunaga, 2001). Additionally, as shown in Maeda's study, the difficulties in managing finances showed a high negative correlation with both the revised PGC morale scale and the happiness score. Furthermore, the importance of having a hobby and the presence of cohabitants was suggested by the significant association of these two variables with both the revised PGC morale scale and the happiness score.

Table 5
The relationship of pleasant degrees for the activities with PGC morale scale and happiness score

Items	Rate				Standardized β coefficient by a single regression model			
	n^a	Very pleasant (%)	Moderately pleasant (%)	Not pleasant (%)	PGC morale scale	P-value	Happiness score	P-value
Bathing	408	24.6	73.9	1.5	0.039		0.139	0.005
Traveling	314	24.8	72.4	2.9	0.141	0.012	0.231	<0.001
Singing	218	20.6	75.2	4.1	0.083		0.227	0.001
Gardening	385	19.1	76.0	4.9	0.028		0.184	<0.001
Watching TV	410	14.8	83.7	1.5	−0.001		0.189	<0.001
Eating meals	411	16.0	81.4	2.7	0.126	0.010	0.179	<0.001
Playing with animals	179	17.2	77.2	5.6	0.066		0.145	
Relaxing at home	376	13.8	83.9	2.4	0.031		0.125	0.015
Working	390	16.3	78.6	5.1	0.039		0.194	<0.001
Conversation with neighbors	298	13.3	84.0	2.8	0.083		0.242	<0.001
Fishing	93	16.0	77.7	6.4	0.058		0.053	
Listening to music	272	11.3	85.8	2.9	0.033		0.081	
Joining club activities for older adults	237	15.5	76.6	7.9	0.079	0.004	0.273	<0.001
Conversation with family	485	12.7	81.9	5.4	0.147		0.274	<0.001
Reading	214	11.7	83.6	4.7	0.063		0.059	
Walking	254	12.2	82.4	5.5	0.106		0.172	0.006
Exercise	235	9.7	84.7	5.5	−0.042		0.150	0.022
Gambling	66	18.2	66.7	15.2	−0.147		−0.147	<0.001

[a] Number of participants excluding those who have never done the activities or those with no answer.

Some of the amount of pleasure for the activity such as conversation with family or neighbors showed significant correlations with the happiness score but not the revised PGC morale scale. This may give a rationale to believe that the happiness score is a more subjective measurement than the revised PGC morale scale, which can be influenced by the relative circumstances of their living environment. Thus, we presumed that a subjective measurement can sometimes better reflect the QOL of older adults than a structurally fixed scale. It is important for recreational service providers to support older adults in increasing the pleasure they take in activities, and in developing a hobby, in order to increase their happiness, which will eventually help increase their QOL.

Previously, De Gracia and Marco (2000) reported a significant relationship between the physical activity enjoyment scale developed by Kendzierski and DeCarlo (1991), and psychological well-being. However, it is irrelevant to use the scale for older adults, given that the scale was developed for healthy young population. The scale rating the amount of pleasure experienced when participating in the activities listed in the present study is more suitable for an elderly population.

Furthermore, Nakanishi and Tatara (2000) reported that mortality was lower among people who took part in social activities than those who did not. As Bozzola et al. (1992) have reported on the personality change occurring in patients in the early stage of dementia of Alzheimer's type, assessment of amount of pleasure for activities can be a useful indicator of the progress of the dementia. These results also suggest the importance of giving older adults the opportunity to participate in various activities.

In conclusion, the results indicate that the amount of pleasure older adults experienced when participating in daily and recreational activities, such as conversing with family or neighbors, showed a significant association with the older adults' happiness. The present results also suggest that the presence of cohabitants and a hobby play an important role in the QOL. These results may be helpful in understanding contributions of various activities to the perception of pleasure in older adults, therefore, can be useful when care providers consider supplying adequate recreational services.

Acknowledgement

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A Comparison of Depressive Mood of Older Adults in a Community, Nursing Homes, and a Geriatric Hospital: Factor Analysis of Geriatric Depression Scale

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ABSTRACT

The Geriatric Depression Scale (GDS)–15 was used in 607 adults aged 65+ years living in a community, nursing homes, and a general hospital to explore characteristics of depressive mood in different care settings. Factor analysis of GDS-15 extracted 4 factors labeled unhappiness, apathy and anxiety, loss of hope and morale, and energy loss. The scale scores labeled unhappiness, apathy and anxiety, and loss of hope and morale were negatively correlated with the Barthel Index and the Mini-Mental State Examination scores. The results classified the depressive patterns into 2 types, one fitting the nursing home residents and the other fitting the hospital patients. The dominant factors of the nursing-home type were unhappiness and loss of hope and morale, and the hospital type was highly related with apathy and anxiety. The results indicate an extended utility of the GDS-15 for a deeper understanding of depressive mood in various care settings. (*J Geriatr Psychiatry Neurol* 2006;19:26-31).

Keywords: depressive mood; Geriatric Depression Scale; factor analysis

Depression is one of the most common and insidious problems for older adults, including those in long-term care settings. Although nursing home residents and geriatric hospital patients often receive comprehensive assessments involving instruments programmed to evaluate depression, it has been suggested that clinicians tend to underestimate the presence of depression, possibly because depressive symptoms may be assumed to be a

part of normal aging, not related to the disease of depression, and therefore are sometimes overlooked.[1] We previously reported on the relationship between functional disabilities and depressive mood in older patients admitted to the geriatric ward of a general hospital using factorial analysis.[2] The results clarified factorial components of the Geriatric Depression Scale (GDS)–15,[3] which consists of 4 major factors. Two of those factors, "loss of morale and hope" and "memory loss and reduction of social activity," were significantly correlated with the presence of functional disabilities; thus, we concluded that depression associated with physical and/or cognitive handicaps could be reflected in patterns of GDS scores. However, as suggested in our report, the features of depression affected by acute medical conditions in hospitalized elderly patients may not always be generalized to older adults living in a community or other long-term care settings.

In this study, we extended this line of research to include a community and several nursing homes, both to apply this new and easy method using factorial analysis and to clarify the differences in patterns of depressive mood among these 3 settings.

	N	Age	Basic ADL	MMSE	GDS-15
Community	184	71.5 ± 7.5	19.7 ± 0.8]**	27.9 ± 0.4[a]	5.1 ± 3.5]**
Nursing homes	178	82.4 ± 6.1	13.8 ± 4.6]**]**	21.0 ± 4.5]**	8.6 ± 2.1]**
General hospital	245	77.4 ± 6.6	17.7 ± 4.0	25.7 ± 4.2	5.7 ± 3.8
Total	607	79.4 ± 9.6	17.2 ± 4.2	24.7 ± 4.4	6.4 ± 3.6

Note: ADL = activities of daily living; MMSE = Mini-Mental State Examination; GDS = Geriatric Depression Scale.

a, MMSE was measured in 22 randomly sampled older adults in the community. The comparative analysis including residents in the community was not performed.

**$P < .01$

METHODS

Participants and Measurements

We sampled 928 adults aged 65 years or over. Among these, we consecutively enrolled 184 community-dwelling residents in Tsukude village, a rural village in central Japan, 389 residents in 4 nursing homes (mean length of stay, 409 ± 313 days at the survey), and 355 patients admitted to the geriatric ward of a teaching general hospital. In the community, data were collected from physically and cognitively independent volunteers visiting a health care center for an annual health check. All participants were asked to complete the Japanese version of short form GDS-15[4] and the Barthel Index[5] to assess their basic activities of daily living (ADL), with the assistance of attending staff if necessary. The GDS-15 is a well-established assessment scale for depressive mood, consisting of 15 self-administered alternative (yes/no) questions. A higher score indicates a greater degree of depressive mood with a cutoff score set at 6/6+.[6] All nursing home residents and all hospital patients underwent the Mini-Mental State Examination (MMSE),[7] administered by the attending doctors for hospital patients and by nurses for nursing home residents. In the community, because of availability of staff, MMSE was measured in 22 randomly sampled older adults to represent their cognitive status. Participants who were unable to answer the questionnaires because of acute illness and those who declined to cooperate with the study were excluded. Also in accordance with previous reports[8,9] regarding the validity of the GDS, participants who scored below 15 on the MMSE were excluded. As a result, 211 nursing home residents and 110 hospital patients were not included, and the data of remaining 607 participants (female 56.7%; mean age 77.1 ± 8.0 SD) were used for analysis.

Statistical Analysis

Correlation coefficients were calculated by Pearson's method for parametric data and by Spearman's method for nonparametric data. Differences in continuous variables among more than 2 groups were determined by a one-way analysis of variance, and Tukey's test was used for subsequent multiple comparisons. Kruskal–Wallis test was used for categorical comparisons of the nonparametric

data. The internal consistency of the GDS-15 was calculated with Cronbach's α. The principal factor analysis for the GDS-15 was performed with an eigenvalue of 1.0 or more as the extraction criterion, and factors were identified after varimax rotation. Scale scores were calculated by counting the number of scored items belonging to the factors extracted from the GDS-15. Values of $P < .05$ were considered to indicate statistical significance, and all tests were 2-tailed. All statistical analyses were performed on a personal computer with the statistical software package SPSS for Windows version 11.0 (SPSS Inc, Chicago, IL).

RESULTS

Table 1 shows the mean age, basic ADL, MMSE, and GDS-15 scores for each group of participants. Basic ADL and MMSE scores were highest in the community and lowest in the nursing homes. The mean GDS-15 score of all the participants was 6.4 ± 3.6 SD, and 49.7% of them scored above 6. The GDS-15 score was significantly higher in the nursing homes than in the other settings, and no fewer than 87.6% of the nursing home residents had a GDS-15 score above 6.

Table 2 shows depressive response rate (the rate of respondents who had an alternative choice representing depressive mood) for each GDS-15 item in the 3 groups. Nursing home residents scored significantly higher than the other 2 participant groups on the following 10 of the 15 items: satisfied, dropped activities, emptiness, often bored, in good spirits, feels happy, prefers to stay in, wonderful to be alive, feels worthless, and feels situation is hopeless. "Full of energy" was the only item in which the hospital patients scored highest. The internal consistency of the GDS-15 was high, with Cronbach's α being .778. The factor analysis of GDS-15 extracted 4 factors, whose loading values are shown in Table 3. Factor I represented "unhappiness," which included the items 1, satisfied; 5, in good spirits; 7, feels happy; and 11, wonderful to be alive. Factor II, labeled "apathy and anxiety," was made up of 6 items: 2, dropped activities and interest; 3, emptiness; 4, often bored; 6, afraid something bad will happen; 8, often feels helpless; and 15, most people better off than self. Factor III, labeled "loss of hope and morale," included 4 items: 9, prefers to stay in; 10, more problems with memory than most; 12, feels worthless; and 14, feels situation is

Table 2. Depressive Response per Group to Each Geriatric Depression Scale–15 Item

	Community	Nursing Homes	General Hospital	Kruskal–Wallis Test (P)
1. Satisfied	26.0	**75.1**	*19.8*	<.001
2. Dropped activities and interest	*40.0*	**55.9**	51.3	<.001
3. Emptiness	*18.9*	**41.7**	33.9	<.001
4. Often bored	*15.4*	**46.0**	28.9	<.001
5. In good spirits	33.4	**88.1**	*21.8*	<.001
6. Afraid something bad will happen	*40.2*	50.3	**50.6**	.076
7. Feels happy	28.7	**81.8**	*21.9*	<.001
8. Often feels helpless	*52.6*	**68.6**	63.0	.007
9. Prefers to stay in	43.4	**60.8**	*43.0*	<.001
10. More problems with memory than most	**66.3**	64.4	*54.0*	.021
11. Wonderful to be alive	27.0	**65.9**	*22.2*	<.001
12. Feels worthless	*17.2*	**41.8**	28.9	<.001
13. Full of energy	46.0	*33.5*	**63.1**	<.001
14. Feels situation is hopeless	*30.9*	**52.5**	43.2	<.001
15. Most people better off than self	*29.7*	**33.0**	30.8	.795

Note: Bold indicates highest; italic indicates lowest.

Table 3. Principal Factor Analysis (Varimax) of the Geriatric Depression Scale–15

Item	Factor I Unhappiness	Factor II Apathy and Anxiety	Factor III Loss of Hope and Morale	Factor IV Energy Loss
1. Satisfied	0.776			
2. Dropped activities and interest		0.413		
3. Emptiness		0.756		
4. Often bored		0.532		
5. In good spirits	0.746			
6. Afraid something bad will happen		0.421		
7. Feels happy	0.771			
8. Often feels helpless		0.385		
9. Prefers to stay in			0.280	
10. More problems with memory than most			0.247	
11. Wonderful to be alive	0.684			
12. Feels worthless			0.567	
13. Full of energy				0.475
14. Feels situation is hopeless			0.690	
15. Most people better off than self		0.418		
Explained variance	2.3	1.8	1.4	0.5
Cumulative percentage of variance explained	15.3	27.5	36.8	40.3

Note: The factor score was calculated by a regression method, which cumulated factor loadings of all items of Geriatric Depression Scale–15.

hopeless. Factor IV, labeled "energy loss," included the item 13, full of energy. The cumulative percentage of variance explained was 40.3%.

The GDS-15 score had a significant negative correlation with basic ADLs (Pearson's $r = -.304$, $P < .001$) and with MMSE score ($r = -.220$, $P < .001$), but not with age. Table 4 shows the correlations between the scale score of each factor extracted from GDS-15 and age, basic ADL, and MMSE score. The scale scores of factors I, II, and III were negatively correlated with basic ADL and MMSE scores, whereas that of factor IV showed significant positive correlations with basic ADL and MMSE scores.

Based on the results of the scale-score calculations, a radar chart was created to analyze patterns in the GDS-15 scores. Figure 1 illustrates the patterns of 3 care settings. The pattern in nursing homes was wide above and below, indicating large contributions of Factors I (unhappiness) and III (loss of hope and morale) to the participants'

depressive mood. On the other hand, the pattern in the general hospital had a sharply pointed shape, which suggested the large contribution of factor II (apathy and anxiety).

DISCUSSION

In the present study, most of the nursing home residents were in a depressive mood. Their average GDS-15 score was 8.6 ± 2.1 SD, higher than in the studies of nursing home residents by Sutcliffe et al,[10] Casarett et al,[11] and Rinaldi et al,[12] which showed averages of 5.4 ± 3.2 SD, 5.6 ± 4.4 SD, and 6.7 ± 3.8 SD, respectively. With an intent to secure the validity of the GDS-15, we excluded participants with moderate and severe cognitive impairment. Rinaldi et al included participants with MMSE scores of 5 or higher (mean MMSE score 20.0 ± 6.1 SD), and Sutcliffe et al had no exclusion criteria based on MMSE score.

Table 4. Correlation Coefficients Between the Scale Scores of the Factors Extracted From
GDS-15 and Age, Basic ADL, and MMSE Score

Item	Factor I Unhappiness	Factor II Apathy and Anxiety	Factor III Loss of Hope and Morale	Factor IV Energy Loss
Age	.065 $P = .131$	.273* $P < .001$*	.043 $P = .322$	-.095* $P = .027$*
Basic ADL	-.374* $P < .001$*	-.167* $P < .001$*	-.169* $P < .001$*	.108* $P = .010$*
MMSE	-.263* $P < 0.001$*	-.098* $P = .017$*	-.164* $P < .001$*	.083* $P = .043$*

Note: GDS = Geriatric Depression Scale; ADL = activities of daily living; MMSE = Mini-Mental State Examination. Correlation coefficients between age and the factors were calculated by Spearman's method, and those between basic ADL, MMSE and the factors were calculated by Pearson's method.

*$P < .05$.

Factor I: Unhappiness
(Item No. 1, 5, 7, 11)

Factor II: Apathy and anxiety
(Item No. 2, 3, 4, 8, 15)

Factor IV: Energy loss
(Item No. 13)

Factor III: Loss of hope and morale
(Item No. 9, 10, 12, 14)

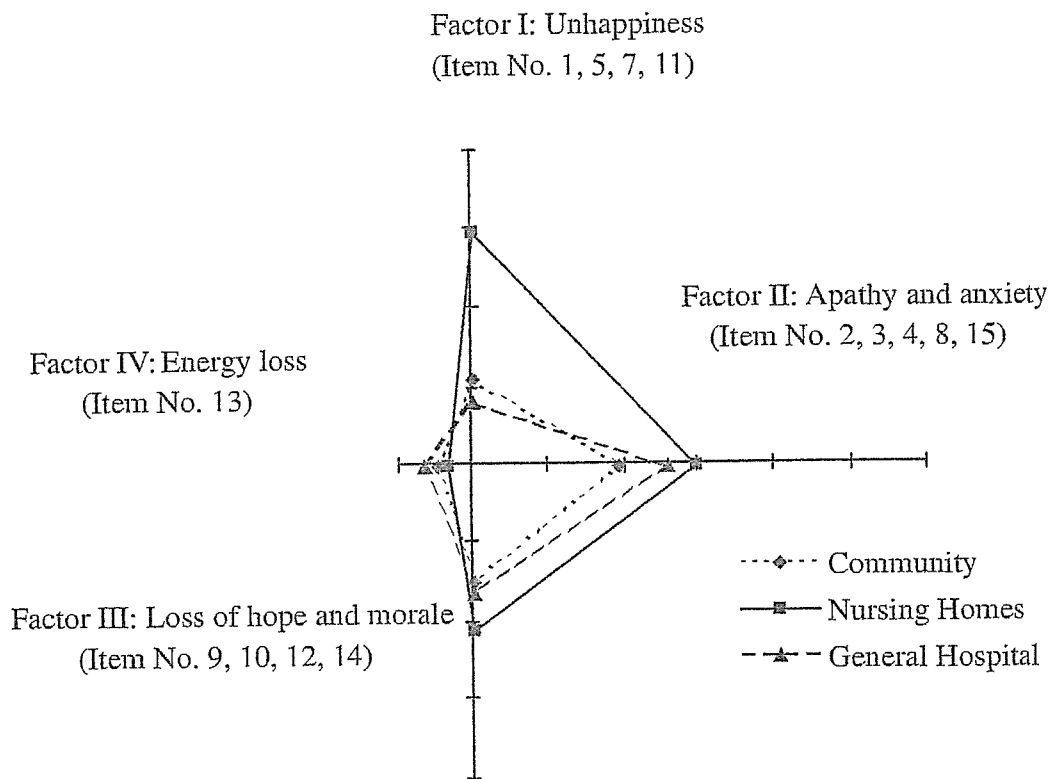---◆--- Community
——■—— Nursing Homes
– –▲– – General Hospital

Figure 1.The factorial pattern on a Geriatric Depression Scale (GDS)–15 radar chart for the participants in a community, nursing homes, and a general hospital.

On the other hand, Casarett's samples had higher cognitive abilities (mean MMSE score 27.4 ± 1.7 SD) than our participants. Thus, higher average GDS-15 score in the present study relative to the above reports may be attributable to variability of participants' cognitive status. Another explanation for the discrepant results may be that because there was a wide range in the residents' length of stay, our study may have included participants who were still in their transitional period trying to adjust to the nursing home environment. Therefore, our results may not necessarily reflect persistent psychological status of nursing home residents. On the other hand, hospital patients showed significantly higher GDS-15 scores than the community residents, which is consistent with the

previous findings suggesting that acute medical conditions or exacerbations of chronic illnesses may be associated with depressive mood.[13-15]

The present study revealed that depressive symptoms in older adults are common in long-term care settings. The factorial analysis demonstrated clear associations of physical/cognitive status with depressive mood. The results of this study showed a similar factorial structure of GDS-15, which is comparable to the results of a previous Japanese study[6,16] as well as those reported from countries with different ethnicities.[17-19] All of the factors extracted from GDS-15 had rather weak but significant correlations with basic ADL and MMSE scores. In particular, Factors I (unhappiness) and III (loss of hope and morale) showed

stronger negative correlations with basic ADL and MMSE scores than the other factors. These findings indicate that Factors I and III can be especially enhanced by physical and/or mental disabilities; thus, these factors may be associated with secondary depression.

As shown in the radar chart, it is interesting that the pattern of GDS-15 scores in the nursing homes was vertically wide, indicating strong contributions by Factors I (unhappiness) and III (loss of hope and morale) to depressive moods, whereas the pattern in the hospital was extended far out to the right relative to other factors, indicating a relatively strong contribution by Factor II (apathy and anxiety). Thus, when older adults show the nursing-home type depressive pattern with dominant factors influenced highly by functional handicaps, clinicians should endeavor to alleviate the handicaps—for example, by improving the care environment through more adequate care services or extending the patient's remaining functional abilities. On the other hand, when older adults show the hospital-type depressive pattern, clinicians should pay attention to the temporary nature of depressive moods derived from acute physical or mental deterioration. An understanding of the differences in depressive patterns can be useful in formulating clinical interventions. However, a limitation of this study is that it did not take the time course of functional disabilities of the study sample into consideration. Ormel et al[20] clarified that basic ADL/instrumental ADL disability and depression are mutually reinforcing over time in a community-based cohort study. Therefore, a speculation arises, regarding the structural difference of depressive mood in different care settings, that it may be the length of time participants have been suffering from functional disabilities, not their environment of care, that explains the difference we observed in this study. Longitudinal studies tracking hospital inpatients who move into nursing homes for the assessment of changes in their depressive mood would be necessary to address this issue. The other limitation is that the findings do not address the influence of quality of care or treatment on depressive mood of the study participants. An interventional approach may clarify whether the environment of care can affect depressive mood of older adults with functional disabilities.

In summary, we carried out a factorial analysis of GDS-15 in older adults in a community, nursing homes, and a geriatric ward of a general hospital and extracted 4 factors, labeled unhappiness, apathy and anxiety, loss of hope and morale, and energy loss. Among the 3 settings, depressive mood was observed most frequently in the nursing homes. The depressive patterns of GDS-15 scores were classified into 2 types, 1 fitting the nursing home residents and the other fitting the hospital patients. The dominant factors of the nursing-home type depressive pattern were unhappiness and loss of hope and morale, which were influenced highly by the participants' func-

tional handicaps, and the hospital-type depressive pattern was highly related to apathy and anxiety. The results indicate an extended utility of the GDS-15 for a deeper understanding of depressive mood in different care settings; this instrument may help staff and clinicians to more accurately identify those who are depressed and initiate an appropriate treatment intervention.

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