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Original Article

Determinants of quality of life in elderly rehabilitation users at a day care service center

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Abstract. [Purpose] We investigated the relationship of quality of life (QOL) with cognitive function, physical function, and activity ability, and aimed to identify functions related to QOL improvement, among elderly people who use day-care rehabilitation. [Participants and Methods] The participants were 37 elderly rehabilitation users, whose QOL was assessed using the Health Organization QOL26 (WHOQOL26), which consists of a 26-item self-report questionnaire. Cognitive function was assessed using the Mini-Mental State Examination, while physical function was assessed with seated forward bending, knee extension, grip, 30-second chair stand test, timed up and go test, and gait speed. Activity ability was assessed using the Tokyo Metropolitan Institute of Gerontology Index of Competence (TMIG index). [Results] A positive correlation was found between five WHOQOL26 categories (psychological QOL, social QOL, environmental QOL, total QOL, and QOL average) and social role in the TMIG index. There was also a positive correlation between four WHOQOL26 categories (psychological QOL, social QOL, environmental QOL, and QOL average) and instrumental activity of daily living in the TMIG index. To identify factors influencing the QOL score, association with TMIG index was investigated. Social role in the TMIG index was a positive factor in psychological and social QOL. [Conclusion] Enhancing social role is important to improve QOL of elderly rehabilitation users.

Key words: World Health Organization quality of life 26 (WHOQOL26), Social role, Tokyo Metropolitan Institute of Gerontology Index of Competence (TMIG-IC)

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INTRODUCTION

Japan became a super-aging society in 2007, and according to the Ministry of Health, Labour, and Welfare, approximately 40% of the population will be 65 years or older by 2060. Quality of life (QOL) has been categorized by Lawton[1)] as Behavior Competence, Perceived QOL, Psychological Well-being, and Objective Environment. The World Health Organization (WHO) defines QOL as an abstract concept that can be improved, maintained, or diminished. The development of an international QOL scale began in 1992 with the creation of the 100-item WHOQOL assessment scale. This scale measures a broad range of QOL based on the WHO's definition of health. In addition, a shortened 26-item version, the WHOQOL26,

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was created to reduce the burden on the target population. This scale, also known internationally as the WHOQOL-BREF, is used worldwide[2, 3].

There are reports of a positive correlation between QOL and the ability to perform activities of daily living (ADL) among the elderly[4, 5], and decreased ADL ability not only affects social participation, but also decreases quality of life. In addition to ADL ability, instrumental ADL (IADL) is important for daily living, and a positive correlation between ADL and IADL has been shown[6, 7]. The Tokyo Metropolitan Institute of Gerontology Index of Competence (TMIG-IC) was developed for the Japanese elderly and can assess IADL, intellectual activity, and social role[8, 9].

As the elderly population increase in Japan, the number of people certified as requiring support and certification of necessary long-term care in the care insurance system has been increasing annually. In recent years, Japan's policy of curbing medical costs has promoted early return to home from hospitals. Therefore, follow-up using the long-term care insurance system after hospital discharge is important. However, elderly people certified as requiring long-term care have been reported to demonstrate a shorter decline in ADL ability than healthy elderly people[10]. Therefore, the current study aimed to elucidate the relationship between QOL and physical and cognitive functions, ADL abilities, and social roles by surveying those requiring assistance who attend daytime rehabilitation, and to determine what factors are important for improving the QOL of those requiring assistance.

PARTICIPANTS AND METHODS

This study included 37 participants [mean age 81.3 ± 5.7 years, 11 males, height 153.5 ± 7.8 cm, weight 57.5 ± 13.3 kg, body mass index (BMI) 24.1 ± 4.1 kg/m^2, history of support 21.5 ± 11.5 months, live together 2.5 ± 1.4 people] using the Day Care Service from August to September 2021. The participants used the day care center twice a week. Informed consent was obtained from all participants after verbally explaining that participation in the survey was not mandatory, the data obtained through the survey would not be used for any purpose other than research, and the data would be anonymized before use. The Ethical Review Committee of Kurume Rehabilitation Hospital of the Kabutoyama Medical Corporation approved this study (approval number: 21-001). Physical measurements were taken with care to avoid fatigue and pain, and it was confirmed that no pain occurred at the end of the measurements. Participant characteristics were collected regarding level of requiring support, education, current medical history, and smoking status. QOL was assessed using the WHOQOL26. Activity ability was assessed using the TMIG-IC[8]. Cognitive function was assessed using the Mini-Mental State Examination (MMSE)[11]. Physical function was assessed using seated forward bending, knee extension, grip, 30-second chair stand test (CS-30), timed up and go test (TUG), and gait speed (Supplementary Table 1).

The QOL was assessed using the WHOQOL26 which is widely used globally and has excellent reliability and validity[2, 12]. The WHOQOL26 comprises 24 items in four domains and 2 items regarding overall QOL as follows: Physical QOL (7 items: ADL, medical supplies and dependence on medical care, vitality and fatigue, mobility, pain and discomfort, sleep and rest, and work capacity); Psychological QOL (6 items: body image, negative effect, positive effect, self-evaluation, spirituality, religion, beliefs, thinking, learning, memory, and concentration); Social QOL (3 items: relationships, social support, and sexual activity); Environmental QOL (8 items: financial relationships, freedom and safety and security, accessibility and quality of health and social care, dwelling environment, opportunities to acquire new information and skills, participation and opportunities for leisure activities, living environment, and transportation.); and overall QOL (2 items: subjective QOL and sense of wellbeing). Up to 5 points were assigned for each item of the four domains, and up to 10 points were assigned for the two items of overall QOL. The QOL survey involved a self-evaluation questionnaire. Respondents were required to indicate "how they felt during the past two weeks", "how satisfied they were during the past two weeks", and "how often they experienced this during the past two weeks", by choosing either "not at all (not good, not satisfied)", "a little (bad, not satisfied)", "somewhat (fair, neither good nor bad)", "a lot (good, satisfied, not satisfied)", and "a little (good, satisfied, not satisfied)".

The TMIG-IC consists of 13 items and is classified into 3 categories: IADL (5 items), intellectual activity (4 items), and social role (4 items)[13]. The TMIG-IC is answered on a "yes" or "no" scale, with higher TMIG-IC scores indicating a greater ability to perform the activity. IADL refers to the basic skills needed to live independently in the community, such as managing transportation, shopping for daily necessities, cooking, and money management. Intellectual activity refers to the ability to engage in activities such as leisure, learning, and creativity, while social role refers to the ability to interact closely with people and society.

Seated forward bending was performed using a digital longitudinal body forward bending measuring device (Takei Kiki Kogyo Co., Ltd., Niigata, Japan). The starting limb position was the long sitting posture with the back and occiput touching the wall, elbows shoulder-width apart, and the center of the palms placed at the front edge of the measuring device. The trunk was bent forward slowly while both hands were on the measuring device, and the distance of maximum forward flexion was measured twice with the knees extended.

A hand-held dynamometer (HHD) (OG Giken Co., Ltd., Okayama, Japan) was used to measure the knee extension force of the quadriceps muscle. The maximum isometric muscle force was measured twice on each side by applying force in the direction of the extended knee joint while the participant was in a sitting position, knee joint in 90-degree flexion, and sensor part of the HHD placed on the distal leg.

The grip strength was measured using a digital grip strength meter (OG Giken Co., Ltd.), and the grip width was adjusted so that the PIP joint of the second finger was almost at a right angle. The maximum grip strength was measured twice alternately on the left and right sides, without swinging the grip strength meter, and the maximum value was set as the representative value.

For the CS-30, a 40-cm-high chair without armrests was used. The examiner eliminated any risk of falling. At the beginning of the test, the participants were seated with their backs to the chair and their arms crossed in front of their chests in a uniform posture. After several practice sessions, the participants were asked, on cue, to move from a sitting position to a standing position, extending their hip and knee joints fully, and then back to a seated position; the number of standing–sitting cycles during a 30-second period was counted.

TUG measurements were taken by measuring the time taken to rise from a chair-sitting posture, walk to a target 3 m away, change direction, return to the chair, and sit down. The measurement started immediately after the participants rose from the chair and stopped immediately after they sat back down. Measurements were taken twice, with the fastest value (in seconds) being representative.

Gait speed was measured by walking at a normal speed along a 5-m measurement section with 3 m each in the front and behind, and the time required to walk along the 5-m section was measured. Measurements were taken twice, with the fastest value (in seconds) being the representative value.

IBM SPSS Statistics version 26.0 (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis. In this study, all continuous variables are presented as the mean ± standard deviation (SD) and categorical data are presented as numbers (percentages). Correlations were analyzed by Pearson's correlation coefficient among continuous variables. The level of significance was set as $p<0.05$.

RESULTS

The participants were elder rehabilitation users using day care rehabilitation (29.7% male and 70.3% female) in Table 1. A total of 83.8% of the participants required assistance under Japan's long-term care insurance system. Regarding education, all participants had completed at least junior high school. For the participants' current medical history, cerebrovascular disease was the most common (21.6%), followed by spinal disease (16.2%), hypertension (13.5%), and surgery of the lower extremities (13.5%), including after femoral neck fracture surgery. More than half of the patients were smokers.

The MMSE cutoff was 26 points, with 45.9% of participants scoring below 26 points and 54.1% scoring above 27 points. Table 2 presents the range of values, mean, and SD for each measurement item.

Table 1. Demographic characteristics of the participants

Demographic characteristics (n=37)	Numbers (%)
Determination of the level of care needed	
Requiring support level 1	22 (59.5)
Requiring support level 2	9 (24.3)
Not eligible	6 (16.2)
Educational qualification	
Junior school	17 (45.9)
High school	19 (51.4)
College	1 (2.7)
Type of disease	
Cerebrovascular disease	8 (21.6)
Spinal disease	6 (16.2)
Hypertension	5 (13.5)
Surgery of the lower extremities	5 (13.5)
Heart disease	2 (5.4)
Diabetes	2 (5.4)
Osteoarthritis	2 (5.4)
Other diseases	7 (18.9)
To smoke or not to smoke	
Smokers	25 (67.6)

Other diseases: Respiratory disease, Rheumatoid arthritis, Cancer, Ganglion, Hepatitis C, Cataract, Ischemic colitis.

Table 2. Demographics of the study population at the value range and average

	Minimum	Maximum	Mean ± SD
WHOQOL26			
Physical QOL (points)	2	5	3.18 ± 0.53
Psychological QOL (points)	2	4	3.09 ± 0.58
Social QOL (points)	2	5	3.41 ± 0.59
Environmental QOL (points)	2	5	3.32 ± 0.51
Total QOL (points)	1	5	2.82 ± 0.73
QOL Average (points)	2	4	3.20 ± 0.46
TMIG-IC			
IADL (points)	0	5	3.51 ± 1.48
Intellectual Activity (points)	1	4	2.86 ± 0.98
Social Role (points)	0	4	2.59 ± 1.34
Total TMIG-IC scores (points)	3	13	8.97 ± 3.00
Cognitive function			
MMSE score (points)	17	30	26.62 ± 3.19
Physical function			
Seated forward bending (m)	0.05	0.56	31.23 ± 9.24
Knee extension (kgf)	10.9	41.6	22.78 ± 7.98
Grip Right (kg)	8.0	39.3	23.85 ± 7.65
Grip Left (kg)	0.0	37.9	22.01 ± 7.54
CS-30 (s)	7.0	34.0	18.51 ± 5.09
TUG (s)	5.2	32.6	9.09 ± 5.78
Gait speed (m/s)	0.3	1.7	1.08 ± 0.32

SD: Standard deviation; WHOQOL26: World Health Organization quality of life 26; IADL: Instrumental activity of daily living; TMIG-IC: Tokyo Metropolitan Institute of Gerontology index of competence; MMSE: Mini Mental State Examination; CS-30: 30-second chair stand test; TUG: Timed up and go test.

Table 3 shows the relationship between QOL and each of the measures in Table 2. There was no significant correlation between Physical QOL and any of the items. There was a significant negative correlation between Psychological QOL and history of support and a positive correlation between Psychological QOL and IADL, social role in the TMIG-IC, and gait speed. There was a significant negative correlation between Social QOL and history of support, a positive correlation between Social QOL and IADL, and social role in the TMIG-IC. There was a significant positive correlation between Environmental QOL and IADL, intellectual activity, and social role in the TMIG-IC. There was a significant positive correlation between Total QOL and social role in the TMIG-IC, and gait speed. There was a significant positive correlation between QOL Average and IADL, and social role in the TMIG-IC.

Table 4 shows the associations between the TMIG-IC items (IADL, intellectual activity, and social role) and each of the QOL domains that showed significant correlations in many of the measured items (Table 3). Some items that were associated in Table 3 were found to be unrelated after multiple regression analysis was conducted. In particular, only Psychological QOL and Social QOL were significantly related to Social Role.

DISCUSSION

This study aimed to determine what cognitive function, physical function, and activity ability are related to QOL improvement, to help achieve effective rehabilitation for elderly people using day care rehabilitation. The study revealed that social role—that is, relationships with friends and family—was significantly related to Psychological QOL and Social QOL.

Social roles in the TMIG-IC are related to interpersonal relationships and activities, consisting of items such as “visiting friends”, “consulting family and friends”, “visiting the sick”, and “talking to young people”. Koyano et al.[14] reported that the average total score of the TMIG-IC for persons aged over 80 was 8.0 ± 4.2 points for mixed gender, and the score tends to decrease with age. Although the participants in this study had an average age of over 80 years, their mean TMIG-IC score was 9.0 ± 3.0, indicating a high level of IADL activity. The participants also attended the facility twice a week, suggesting that they were a sociable group. Previously, we have reported an association between life-space assessment and WHOQOL26 in day care rehabilitation, finding that the greater the life space, the more fulfilling the QOL[15]. Shimanuki et al.[16] also showed that compared to the general elderly population, the elderly who participate in volunteer activities had significantly

higher scores on the social roles in TMIG-IC, as well as higher values for QOL, including ADL ability and health satisfaction. Similar to previous studies, we suggest that QOL and social roles are significantly related in this study. Many papers have reported a correlation between cognitive functions assessed by MMSE and QOL in the Physical, Psychological, and Environmental domains of QOL for diseases related to cognitive dysfunction, such as stroke[17, 18]. However, some reports show no association in diseases not related to cognitive function, such as rheumatism[19]. Cerebrovascular disease accounted for about 20% of the participants in this study, and there was no significant difference in the correlation between QOL and cognitive function.

Table 3. Association of characteristics with the domains of QOL

	Physical QOL	Psychological QOL	Social QOL	Environmental QOL	Total QOL	QOL Average
	r-value	r-value	r-value	r-value	r-value	r-value
Characteristics of participants						
Age	0.052	0.035	0.163	0.179	0.120	0.126
History of support	−0.033	−0.363*	−0.367*	−0.307	−0.199	−0.297
BMI	0.113	0.317	0.138	0.100	0.274	0.213
Live together	0.052	−0.060	0.021	−0.139	0.022	−0.043
TMIG-IC						
IADL	0.213	0.487**	0.391*	0.405*	0.317	0.439**
Intellectual Activity	0.157	0.193	0.195	0.402*	0.122	0.284
Social Role	0.258	0.565**	0.589**	0.358*	0.394*	0.497**
Cognitive function						
MMSE	−0.300	−0.085	0.040	0.073	0.096	−0.074
Physical function						
Seated forward bending	−0.075	0.027	0.225	0.116	0.308	0.097
Knee extension	−0.094	0.043	−0.078	−0.107	0.054	−0.059
Grip Right	0.011	0.050	−0.016	−0.063	−0.082	−0.016
Grip Left	0.105	0.196	−0.099	−0.020	0.038	0.072
CS-30	−0.033	0.177	0.095	0.074	0.175	0.101
TUG	0.116	−0.114	−0.087	−0.128	−0.063	−0.061
Gait speed	0.111	0.345*	0.155	0.306	0.330*	0.300

QOL: quality of life; BMI: Body mass index; TMIG-IC: Tokyo Metropolitan Institute of Gerontology index of competence; IADL: Instrumental activity of daily living; MMSE: Mini Mental State Examination; CS-30: 30-second chair stand test; TUG: Timed up and go test.
*p<0.05, **p<0.01.

Table 4. Bivariate linear regression for prediction of quality of life

Dependent variable	Predictors	Unstandardized beta (B)	95% CI		VIF
			Lower	Upper	
Physical QOL	IADL	0.031	−0.119	0.181	1.530
	Intellectual Activity	0.029	−0.172	0.231	1.208
	Social Role	0.073	−0.098	0.244	1.641
Psychological QOL	IADL	0.097	−0.040	0.233	1.530
	Intellectual Activity	−0.039	−0.223	0.146	1.208
	Social Role	0.192*	0.036	0.349	1.641
Social QOL	IADL	0.032	−0.108	0.172	1.530
	Intellectual Activity	−0.035	−0.224	0.154	1.208
	Social Role	0.247**	0.088	0.407	1.641
Environmental QOL	IADL	0.090	−0.040	0.221	1.530
	Intellectual Activity	0.148	−0.029	0.325	1.208
	Social Role	0.035	−0.114	0.185	1.641

CI: confidence interval; QOL: quality of life; IADL: Instrumental activity of daily living; VIF: variance inflation factor. *p<0.05, **p<0.01.

Another noteworthy finding is the negative correlation between the history of support and Psychological and Social QOL. In this study, there was no significant correlation found between QOL and age. It is generally believed that QOL declines with age and physical disability due to illness or postoperative period. This suggests that the decline in QOL in this study is not due to general aging, but due to the length of time required for obtaining support. We suggest that psychological and social support are important for the participants in day care rehabilitation.

As found in this study, psychological and social QOL are related to Social Role as an activity ability involving intimate relationships with people and society. This suggests that maintaining or improving Social Role is important for improving the QOL of older adults. We believe that the results of this study can be utilized in the future management of day care rehabilitation facilities to improve QOL by incorporating programs that not only enhance physical function but also allow people to find their social roles, such as personal interaction. We will continue to provide appropriate programs for older adults and conduct longitudinal surveys for further research.

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The authors have no conflicts of interest directly relevant to the content of this article.

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