

# Factors Affecting the Health-Related Quality of Life of Community-Dwelling Elderly in Japan: A Focus on Spirituality

Minako Kobayashi<sup>1,2\*</sup>, Eiji Marui<sup>2</sup>

<sup>1</sup>Department of Nursing, Yokkaichi Nursing and Medical Care University, Mie, Japan

<sup>2</sup>Department of Health Sciences of Mind and Body, Graduate School of University of Human Arts and Sciences, Saitama, Japan

Email: \*m-kobayashi@y-nm.ac.jp

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## Abstract

This study aimed to explain factors affecting health-related quality of life among community-dwelling elderly individuals living in Japan. We conducted a questionnaire survey of 898 individuals at senior citizens clubs in a rural area near the Tokyo metropolitan area in 2015, and analyzed the responses of 715 who provided valid responses. The survey questions included basic attributes (e.g., age, economic affluence), state of health (e.g., whether s/he has heart disease or not), the Spirituality Rating Scale Related to Health in the Elderly (SP Health Scale, composed of, e.g., meaning and purpose of living, self-transcendence), the Abbreviated Lubben Social Network Scale, and the MOS 8-Item Short Form Health Survey (SF-8). Multiple regression analyses were performed using the physical component summary (PCS) and mental component summary (MCS) of the SF-8 as dependent variables and all others as independent variables. Factors associated with improved PCS were economic affluence and SP Health Scale (meaning and purpose of living), while the factors associated with reduced PCS were age and state of health (heart disease, gastrointestinal disease, osteoarthritis, lower back pain, knee pain, and eligible for long-term care). Meanwhile, factors associated with improved MCS were economic affluence, while those that were associated with reduced MCS were state of health (cancer and headache) and SP Health Scale (self-transcendence). These results suggest the need to understand spirituality in addition to the subjective economic situation, age, and medical condition of elderly individuals in order to improve their physical and mental health.

## Keywords

Health-Related QOL, Spirituality, Physical and Mental Health, Community Dwelling Elderly

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## 1. Introduction

Japan's rate of aging has reached a record high of 24.1%, establishing it as a super-aged society [1]. The average life expectancy at birth, which is 80.79 years for men and 87.05 years for women, also continues to break previous records [2]. People are increasingly paying attention to healthy life expectancy, aiming for successful aging characterized by a fulfilling, independent life while maintaining physical and mental health during this extended period of old age.

The notion of "health of the elderly" used to be considered in terms of physical health based on the prolongation of life expectancy through disease prevention. However, as we gain a deeper understanding of the importance of independence in vital functions, the focus is shifting to health-related quality of life (HRQOL). HRQOL is a multi-dimensional conception of QOL based on not only physical health but also mental health, the state of daily role functions and social functions, and so on. Moreover, as HRQOL allows us to continuously evaluate everyone ranging from diseased to healthy, it is suitable for evaluating community-dwelling elderly, a population characterized by a mix of diseased and healthy individuals [3].

In previous studies, basic attributes (e.g., economic factors), social interaction, and state of health have been found to affect HRQOL. For example, it has been reported that income [4] [5] and life circumstances [6] [7] have positive relationships with HRQOL. Regarding social interaction, it has been reported that social network [8] and social support [7] [9] have positive relationships with HRQOL. Regarding the state of health, it has been noted that heart disease [7], cancer [10], arthrosis [7] [11], headache [11], and lower back and knee pain [12] [13] have negative relationships with HRQOL.

However, these factors all address the apparent aspects of body and mind that elderly people can notice on their own relatively easily; they do not require understanding fundamental human nature in the deepest part of the mind, which is necessary for elderly people to look back on their lives and reconfirm the meaning of life when facing death. A factor to describe this deeper aspect of human life is spirituality, which the World Health Organization noted in their proposed revision to the definition of health [14] as being closely related to health. Defined as a "relationship with transcendental existence" and "the inner nature of humans themselves that is related to the essence of human existence, such as the meaning of life, fear of death, and pursuit of the existence of God," spirituality supports individuals' lives as "a belief system or value system that provides the strength, hope, and meaning for life" [15].

In fact, several studies have suggested that spirituality affects HRQOL in elderly individuals [16]. For example, Konopack and McAuley [17] found, in a cross-sectional survey on elderly individuals in the US, that spirituality had a positive effect on HRQOL. Yoon and Lee [18] also reported, based on a survey of elderly people living in rural areas of the US, that spirituality had a negative effect on depression.

While these kinds of reports are seen in several countries, there is still no re-

port focusing on spirituality in Japan. Thus, this study aimed to examine the effect of various factors identified in previous studies, such as basic attributes, state of health, social network, and the spirituality scale developed for Japanese individuals, on HRQOL of community-dwelling elderly people in Japan using a quantitative method.

## 2. Materials and Methods

### 2.1. Survey Population

Participants were elderly individuals aged 65 or older who lived in Chiba Prefecture adjacent to Tokyo.

### 2.2. Survey Period

The survey was conducted from October to December 2015.

### 2.3. Survey Method

The questionnaire was distributed to participants via presidents of district senior citizen clubs. Participants were asked to fill out the questionnaire and return it using a return envelope.

### 2.4. Survey Questions

The questionnaire assessed participants' basic attributes, state of health, HRQOL, social support network, and spirituality.

#### Basic attributes

For basic attributes of participants, we asked about age, gender, household structure, job, years of residence, economic affluence, education level, and religion. Regarding job, we asked whether the respondent had a job with income. Years of residence concerned the number of years the respondent had lived at the current address, and religion asked whether the respondent had a religion and, if so, what type it was. As for economic affluence, we asked about it with a 4-point scale, ranging from "Not really affluent" to "Quite affluent."

#### State of health

For state of health, we asked whether the respondent was eligible for long-term care, had any disease under treatment, and had any history of present illness or subjective symptoms. For history of present illness, we asked about common diseases among elderly people such as heart disease, stroke, cancer, gastrointestinal diseases, and osteoarthritis. For symptoms, we asked about lower back pain, headache, knee pain, difficulty seeing, difficulty hearing, and so on. These diseases have been chosen in previous studies as well [11] [19].

#### Health-related quality of life

To minimize the burden on participants, we used the abbreviated version of the standard MOS 36-Item Short Form Health Survey, the MOS 8-Item Short Form Health Survey Japanese version (SF-8) [20] to evaluate HRQOL. The SF-8 has eight items, which include physical functioning, physical role, bodily pain, general health perception, vitality, social functioning, role emotional, and mental

health. These items are separated into two components, physical component summary (PCS) and mental component summary (MCS) scores (SF-36.org, 2014).

### Social support network

To evaluate social support networks, we used the Japanese version of the Abbreviated Lubben Social Network Scale (LSNS-6) [21]. The LSNS-6 measures the sizes of one's family network and friend network with the number of individuals included in each network. The summed score ranges from 0 to 30 points, and less than 12 points (less than 6 points for subscales) indicates social isolation.

### Spirituality

For measuring spirituality, we used the Spirituality Rating Scale Related to Health in the Elderly (SP Health Scale) by Takeda *et al.* [15]. They defined spirituality as "something inherent in all human beings and, while it tends to surface when one faces the crisis of life, it also exists in ordinary daily life and is involved in enhancing the sense of happiness with the quality and spiritual aspects of life," and developed a scale to measure spirituality among the elderly by considering the socio-cultural background of Japan. Its reliability and validity have been demonstrated. This 5-point scale has 18 items and consists of six subscales: meaning and purpose of living, attitudes toward death and dying, self-transcendence, accord with others, spiritual support, and harmony with nature (Table 1). The item scores are simply summed as subscale scores to create an overall score. Higher scores indicate higher spirituality.

**Table 1.** SP Health Scale for the Elderly.

Subscale	Statement
Meaning and purpose of living	1. My sense of gratitude is increasing as I get older.
	2. There is a significant meaning for me to have been born into this world.
	3. There are pleasures and hopes for life in my everyday life.
Self-transcendence	4. I'm connected with my ancestors and descendants.
	5. I'm allowed to live by some kind of unseen force.
	6. My deceased family and ancestors are looking after me.
Accord with others	7. I accept anyone without prejudice.
	8. Sometimes, I tell my deepest feeling to others.
	9. Sometimes, I wish I could reconfirm my life by telling someone about my life events and feelings.
Spiritual support	10. I befriend people around me and live in serenity.
	11. I create harmonious connection with people by having a feeling of compassion and gratitude.
	12. The bonds with my loved ones keep me grounded in my life.
Harmony with nature	13. When I stand in nature, it feels as if I'm being charged from there.
	14. I have had an experience where I was deeply moved by the majesty and beauty of nature.
	15. Sometimes, seeing beautiful nature makes me feel at peace.
Attitudes toward death and dying	16. I'm fine regardless of when my life ends.
	17. I regularly talk about the notion of living and dying with my family.
	18. Before I die, I would like to resolve what is weighing on my mind.

## 2.5. Analysis Method

The difference in SF-8 score (PCS and MCS) was compared by category for each survey item using a t-test or one-way ANOVA. Continuous variables were divided into “high” and “low” values based on the median, such that age was divided into two at 75, and LSNS-6 was divided into two at 12 points (6 points for subscales). This was done to divide elderly participants into old-old vs. young-old populations as well as not socially isolated vs. socially isolated. In addition, a multiple comparison test was performed using the Tukey method when the ANOVA was significant.

Next, aiming to understand the extent of each variable’s effect, regression analyses were performed with the forced entry option by setting the basic attributes, state of health, LSNS-6, and SP Health Scale as independent variables and PCS and MCS as dependent variables. Lastly, aiming to further investigate the relation between spirituality and health-related quality of life, partial correlation analysis was conducted with controlling possible confounding factors (age, gender, household structure, economic affluence, job with income, years of residence, education level, and religion).

Statistical analysis was performed using IBM SPSS Statistics Ver. 20 with the significance level set at less than 0.05.

## 2.6. Ethical Considerations

The survey was carried out after receiving approval from the Ethics Review Committees of the University of Human Arts and Sciences (No. 475) and Kameda College of Health Sciences (No. 2015 A 008).

## 3. Results

A questionnaire survey was conducted on 898 people, and 715 cases were obtained (response rate of 79.6%). Of these, 397 cases completed all questions (effective response rate of 44.2%). As 44.2% was fairly low, we excluded those who did not answer two or more consecutive questions under “state of health,” “QOL,” “social support network,” or “spirituality” items and those who did not answer more than 11 questions from 715 cases, and took the remaining 637 as valid cases (valid response rate of 70.9%) and used for the analysis. Note that this does not mean these 637 cases completed all questions. They skipped some questions leaving numbers of respondents varied from attribute to attribute.

### 3.1. Basic Attributes and Scale Scores of Survey Respondents

The mean age of participants was  $77.5 \pm 5.8$  years, and there were 291 men (45.7%) and 346 women (54.3%). Examining the participants by age group, there were 206 (32.3%) former-stage elderly respondents aged between 65 and 74 and 425 (66.7%) latter-stage elderly respondents aged 75 or older. There were 189 (29.7%) respondents who had a job with income. As for subjective sense of economic affluence, 43 (6.9%) of the respondents said they were “quite affluent” while 300 (48.0%) said they were “slightly affluent.” Regarding religion, 255

(40.0%) reported having a religion, and among them, 226 were Buddhists (35.5%). As for state of health, 593 (93.1%) said they had medical conditions, and the mean number of diseases was  $2.3 \pm 1.4$  per person. See **Table 2** and **Table 3** for details.

The mean PCS and MCS were  $45.2 \pm 7.7$  and  $51.4 \pm 5.9$ , respectively. The mean score for the 18 items on the SP Health Scale was  $67.2 \pm 8.0$ . The mean score of the LSNS-6 was  $17.4 \pm 5.5$ , and 13.7% had a score less than 12, which indicates social isolation.

### 3.2. Comparing Health-Related Quality of Life by Independent Variables

The mean HRQOL scores for all respondents were  $45.2 \pm 7.7$  (PCS) and  $51.4 \pm$

**Table 2.** Basic attributes of survey respondents.

Variable	n	Category	n	%
Gender	637	Male	291	45.7
		Female	346	54.3
Age group	631	Ages 65 to 74	206	32.6
		Age 75 or older	425	67.4
Household structure	628	Live alone	114	18.2
		Live with my spouse	272	43.3
		Live with my spouse and children	133	21.2
		Live with children (no spouse)	80	12.7
		Other	29	4.6
Have a job (with income) <sup>a</sup>	635	Yes	189	29.8
		No	446	70.2
Education level	633	Elementary and middle school	181	28.6
		High school	329	52.0
		College	75	11.8
		Other	48	7.6
Religion	617	Yes	255	41.3
		No	362	58.7
Type of religion (multiple answer question)	235	Buddhism	226	96.2
		Shintoism	16	6.8
		Christianity	3	1.3
		Other	10	4.3
Economic affluence (subjective sense of economic affluence)	625	Not affluent	74	11.8
		Not really affluent	208	33.3
		Slightly affluent	300	48.0
		Quite affluent	43	6.9

a: As most Japanese have a pension, they can live without a job.

**Table 3.** State of health of survey respondents.

Variable	n	Category	n	%
Have a disease under treatment	637	Yes	593	93.1
		No	44	6.9
Type of disease and symptoms (multiple answer question)	637	High blood pressure	358	56.2
		Diabetes	104	16.3
		Hyperlipidemia	108	17
		Heart disease	52	8.2
		Stroke	8	1.3
		Cancer	27	4.2
		Gastrointestinal disease	53	8.3
		Osteoarthritis	84	13.2
		Lower back pain	193	30.3
		Knee pain	182	28.6
Eligible for long-term care	626	Yes	15	2.4
		No	611	97.8

5.9 (MCS). In addition, when t-tests and one-way ANOVAs were used to compare the HRQOL scores by each independent variable, significant differences were found in the following basic attributes: age, economic affluence, job, years of residence, and education level. First, in terms of age, PCS was significantly higher among those aged between 65 and 74 ( $p < 0.05$ ). In terms of economic affluence, both PCS and MCS were higher among those who were affluent (PCS:  $p < 0.01$ ; MCS:  $p < 0.001$ ). In addition, the respondents with jobs had a higher MCS ( $p < 0.05$ ), those who had lived for less time at the current address had a higher PCS ( $p < 0.05$ ), and high school and college graduates had a higher PCS than did elementary school and middle school graduates ( $p < 0.001$ ). See **Table 4** for details.

Next, in terms of state of health, both PCS and MCS were significantly lower among those who had some kind of disease (PCS:  $p < 0.001$ ; MCS:  $p < 0.001$ ), symptoms of lower back pain (PCS:  $p < 0.001$ ; MCS:  $p < 0.01$ ), headache (PCS:  $p < 0.001$ ; MCS:  $p < 0.05$ ), and difficulty seeing (PCS:  $p < 0.05$ ; MCS:  $p < 0.05$ ). In addition, those with a heart disease ( $p < 0.05$ ), cancer ( $p < 0.05$ ), gastrointestinal disease ( $p < 0.001$ ), osteoarthritis ( $p < 0.001$ ), knee pain ( $p < 0.001$ ), difficulty hearing ( $p < 0.01$ ), and those who were eligible for long-term care ( $p < 0.01$ ) had a significantly lower PCS but not MCS. See **Table 5** for details.

In terms of the SP Health Scale, when the respondents were divided into two groups of “high” and “low” (high and low spirituality groups) based on the me-

**Table 4.** Health-related quality of life (physical and mental) comparison by basic attributes.

Variable	Category	n	PCS		MCS	
			M ± SD	t/F	M ± SD	t/F
Age	65 - 74	202	47.6 ± 6.8	5.855***	51.9 ± 4.8	1.678
	75-	405	44.0 ± 7.9		51.1 ± 6.4	
Gender	Male	282	45.7 ± 7.3	1.486	51.6 ± 5.7	0.591
	Female	331	44.7 ± 8.1		51.3 ± 6.1	
Household structure	Live alone	107	45.2 ± 8.6	-0.032	52.0 ± 5.7	1.146
	Do not live alone	500	45.2 ± 7.5		51.3 ± 5.9	
Economic affluence	Not affluent	68	42.3 ± 8.2	4.496*** <sup>a</sup>	49.9 ± 7.3	7.116*** <sup>b</sup>
	Not really affluent	202	44.8 ± 7.4		50.4 ± 6.0	
	Slightly affluent	290	46.0 ± 7.5		52.1 ± 5.4	
	Quite affluent	43	45.9 ± 8.6		53.6 ± 4.8	
Have a job	Yes	184	45.4 ± 7.4	0.347	52.3 ± 5.7	2.509*
	No	427	45.1 ± 7.8		51.0 ± 6.0	
Years of residence	<56.5	270	45.9 ± 7.4	2.156*	51.6 ± 5.7	0.775
	≥56.5	258	44.4 ± 8.0		51.2 ± 6.2	
Education Level	Elementary and middle school	173	43.4 ± 7.7	7.806*** <sup>c</sup>	51.4 ± 6.3	0.175
	High school	318	45.5 ± 7.7		51.6 ± 5.8	
	College	73	47.3 ± 6.8		51.2 ± 4.9	
Have a Religion	Yes	249	45.0 ± 7.7	-0.289	51.3 ± 5.8	-0.375
	No	350	45.2 ± 7.7		51.5 ± 6.0	

PCS: physical component summary; MCS: mental component summary. An F-test was used for economic affluence and education level (multiple comparison tests were done using the Bonferroni method), and a t-test was used for the rest. a. Not affluent < Slightly affluent\*\*; b. Not affluent < Slightly affluent\*, Not affluent < Quite affluent\*\*, Not really affluent < Slightly affluent\*\*, Not really affluent < Quite affluent\*\*; c. Elementary and middle school < High school\*\*, Elementary and middle school < College\*\*; \*, p < 0.05, \*\*, p < 0.01, \*\*\*, p < 0.001.

**Table 5.** Health-related quality of life (physical and mental) comparison by state of health.

Variable	Category	n	PCS		MCS	
			M ± SD	t	M ± SD	t
Disease	Yes	570	44.8 ± 7.6	-4.539***	51.3 ± 6.1	-3.431***
	No	43	50.2 ± 7.1		53.0 ± 2.8	
High blood pressure	Yes	344	45.0 ± 7.6	-0.766	51.1 ± 6.2	-1.471
	No	269	45.4 ± 7.9		51.8 ± 5.5	
Diabetes	Yes	100	44.6 ± 8.0	-0.763	50.8 ± 6.5	-1.086
	No	513	45.3 ± 7.7		51.5 ± 5.8	
Hyperlipidemia	Yes	105	44.4 ± 8.1	-1.091	51.3 ± 7.2	-0.205
	No	508	45.3 ± 7.7		51.4 ± 5.6	

## Continued

Heart disease	Yes	50	41.9 ± 9.5	-2.587*	50.6 ± 6.7	-1.052
	No	563	45.5 ± 7.5		51.5 ± 5.8	
Stroke	Yes	8	44.6 ± 8.4	-0.225	54.2 ± 5.5	1.336
	No	605	45.2 ± 7.7		51.4 ± 5.9	
Cancer	Yes	27	42.0 ± 8.1	-2.174*	50.2 ± 6.6	-1.039
	No	586	45.3 ± 7.7		51.5 ± 5.9	
Gastrointestinal disease	Yes	51	41.7 ± 7.6	-3.361***	49.5 ± 7.4	-1.922
	No	562	45.5 ± 7.7		51.6 ± 5.7	
Osteoarthritis	Yes	82	40.4 ± 8.6	-5.542***	50.8 ± 7.1	-0.986
	No	531	45.9 ± 7.3		51.5 ± 5.7	
Lower back pain	Yes	182	41.4 ± 7.3	-8.362***	50.3 ± 7.0	-2.774**
	No	431	46.8 ± 7.3		51.9 ± 5.3	
Headache	Yes	14	37.5 ± 9.2	-3.783***	45.4 ± 8.9	-2.583*
	No	599	45.3 ± 7.6		51.5 ± 5.8	
Knee pain	Yes	171	41.3 ± 7.6	-8.027***	51.1 ± 6.8	-0.657
	No	442	46.6 ± 7.2		51.5 ± 5.5	
Difficulty seeing	Yes	117	43.5 ± 7.8	-2.669*	50.1 ± 6.7	-2.306*
	No	496	45.6 ± 7.7		51.7 ± 5.7	
Difficulty hearing	Yes	112	43.2 ± 7.9	-3.036**	50.4 ± 7.0	-1.821
	No	501	45.6 ± 7.6		51.6 ± 5.6	
Other disease	Yes	44	45.4 ± 7.9	0.198	50.6 ± 6.5	-0.895
	No	569	45.1 ± 7.7		51.5 ± 5.9	
Eligible for long-term care	Yes	13	32.8 ± 10.9	-4.140**	50.5 ± 4.8	-0.574
	No	592	45.4 ± 7.4		51.4 ± 5.9	

PCS: physical component summary; MCS: mental component summary. \*:  $p < 0.05$ , \*\*:  $p < 0.01$ , \*\*\*:  $p < 0.001$ .

dian of each subscale. The “high” group had a significantly higher PCS and MCS for meaning and purpose of living (PCS:  $p < 0.01$ ; MCS:  $p < 0.001$ ) and spiritual support (PCS:  $p < 0.05$ ; MCS:  $p < 0.001$ ). In addition, MCS was higher for the “high” group for accord with others ( $p < 0.05$ ). See **Table 6** for details.

Finally, with the LSNS-6, when the respondents were divided into “high” and “low” groups (high = not socially isolated, low = socially isolated) at a cut-off point of 12 for the overall score and 6 for the subscale scores, PCS was significantly higher for the socially isolated group in terms of family ( $p < 0.05$ ), and MCS was significantly higher for the not socially isolated group in terms of friends ( $p < 0.01$ ). See **Table 6** for details.

### 3.3. Multiple Regression Analysis

Using basic attributes, state of health, SP Health Scale, and LSNS-6 as independent variables and SF-8 scores (PCS and MCS) as the dependent variables, mul-

**Table 6.** Health-related quality of life (physical and mental) comparison by spirituality and social support network.

Variable	Category	n	PCS		MCS	
			M ± SD	t	M ± SD	t
SP (Meaning and purpose of living)	≥12.00	330	46.0 ± 8.0	2.696**	52.2 ± 5.7	3.878***
	<12.00	277	44.3 ± 7.3		50.4 ± 6.0	
SP (Self-transcendence)	≥12.00	322	45.6 ± 7.7	1.537	51.7 ± 6.2	1.347
	<12.00	280	44.6 ± 7.8		51.0 ± 5.6	
SP (Accord with others)	≥11.00	298	45.4 ± 8.1	0.681	51.9 ± 5.8	2.010*
	<11.00	292	45.0 ± 7.3		50.9 ± 5.9	
SP (Spiritual support)	≥12.00	485	45.6 ± 7.7	2.540*	51.9 ± 5.6	3.948***
	<12.00	120	43.6 ± 7.3		49.6 ± 6.2	
SP (Harmony with nature)	≥12.00	392	45.7 ± 7.7	1.922	51.7 ± 5.8	1.322
	<12.00	202	44.4 ± 7.6		51.0 ± 5.7	
SP (Attitudes toward death and dying)	≥10.00	328	45.2 ± 7.8	-0.136	51.3 ± 6.0	-0.129
	<10.00	255	45.3 ± 7.6		51.4 ± 5.6	
LSNS-6 (Family)	≥6.00	535	45.1 ± 6.0	-2.375*	51.5 ± 5.8	1.593
	<6.00	66	46.8 ± 5.4		50.3 ± 6.1	
LSNS-6 (Friends)	≥6.00	501	45.4 ± 7.8	1.326	51.8 ± 5.7	2.688**
	<6.00	89	44.3 ± 6.8		50.0 ± 5.9	
LSNS-6 (Overall)	≥12.00	506	45.3 ± 7.9	0.265	51.7 ± 5.7	1.929
	<12.00	77	45.1 ± 6.0		50.3 ± 6.0	

PCS: physical component summary; MCS: mental component summary; LSNS-6: Abbreviated Lubben Social Network Scale; SP: Spirituality Rating Scale Related to Health in the Elderly. \*:  $p < 0.05$ , \*\*:  $p < 0.01$ , \*\*\*:  $p < 0.001$ .

tiple regression analyses were performed with the forced entry option.

The factors that increased PCS were economic affluence ( $\beta = 0.094$ ,  $p < 0.05$ ) and meaning and purpose of living on the SP Health Scale ( $\beta = 0.165$ ,  $p < 0.01$ ). The factors that reduced PCS were age ( $\beta = -0.206$ ,  $p < 0.001$ ), heart disease ( $\beta = -0.139$ ,  $p < 0.01$ ), gastrointestinal disease ( $\beta = -0.096$ ,  $p < 0.05$ ), osteoarthritis ( $\beta = -0.180$ ,  $p < 0.001$ ), knee pain ( $\beta = -0.209$ ,  $p < 0.001$ ), lower back pain ( $\beta = -0.188$ ,  $p < 0.001$ ), and eligibility for long-term care ( $\beta = -0.145$ ,  $p < 0.01$ ). The only factor that increased MCS was economic affluence ( $\beta = 0.152$ ,  $p < 0.01$ ), and the factors that decreased MCS were cancer ( $\beta = -0.104$ ,  $p < 0.05$ ), headache ( $\beta = -0.139$ ,  $p < 0.01$ ), and self-transcendence ( $\beta = -0.148$ ,  $p < 0.05$ ). As the variance inflation factor ranged between 1.055 and 2.239, it was deemed that there was no multicollinearity among the independent variables. See **Table 7** for details.

### 3.4. Partial Correlation Analysis

In order to investigate the relation between spirituality and health-related quality

**Table 7.** Multiple regression analyses predicting health-related quality of life (physical and mental).

Independent variable	PCS		MCS	
	$\beta$	p	$\beta$	p
Age	-0.206	<0.001	0.036	0.526
Gender <sup>a</sup>	-0.005	0.909	0.006	0.907
Household structure <sup>b</sup>	-0.039	0.384	-0.043	0.415
Economic affluence <sup>c</sup>	0.094	0.032	0.152	0.003
Job with income <sup>d</sup>	-0.046	0.306	0.081	0.120
Years of residence	-0.002	0.973	-0.072	0.190
Education level <sup>e</sup>	0.020	0.666	-0.056	0.305
Religion <sup>d</sup>	-0.046	0.292	-0.033	0.524
Disease free <sup>d</sup>	-0.001	0.981	0.019	0.727
High blood pressure <sup>d</sup>	-0.011	0.822	-0.030	0.586
Diabetes <sup>d</sup>	-0.015	0.722	0.011	0.832
Hyperlipidemia <sup>d</sup>	-0.056	0.204	-0.040	0.439
Heart disease <sup>d</sup>	-0.139	0.001	-0.088	0.076
Stroke <sup>d</sup>	-0.019	0.659	0.081	0.103
Cancer <sup>d</sup>	-0.043	0.324	-0.104	0.041
Gastrointestinal disease <sup>d</sup>	-0.096	0.031	-0.057	0.270
Osteoarthritis <sup>d</sup>	-0.180	<0.001	0.020	0.698
Lower back pain <sup>d</sup>	-0.188	<0.001	-0.073	0.164
Knee pain <sup>d</sup>	-0.209	<0.001	0.083	0.125
Headache <sup>d</sup>	-0.053	0.221	-0.139	0.006
Difficulty seeing <sup>d</sup>	-0.075	0.087	-0.040	0.429
Difficulty hearing <sup>d</sup>	-0.044	0.321	0.006	0.901
Other disease <sup>d</sup>	-0.015	0.729	-0.051	0.321
Eligible for long-term care <sup>d</sup>	-0.145	0.001	-0.001	0.985
SP (Meaning and purpose of living)	0.165	0.007	0.136	0.058
SP (Self-transcendence)	0.047	0.436	-0.148	0.037
SP (Accord with others)	-0.064	0.277	-0.040	0.562
SP (Spiritual support)	0.030	0.622	0.111	0.113
SP (Harmony with nature)	0.020	0.745	-0.015	0.839
SP (Attitudes toward death and dying)	-0.029	0.546	-0.069	0.213
LSNS-6 (Family)	-0.028	0.636	0.048	0.484
LSNS-6 (Friends)	0.078	0.177	0.093	0.166
R <sup>2</sup> (Adjusted R <sup>2</sup> )	0.390	(0.336)	0.167	(0.094)

PCS: physical component summary; MCS: mental component summary; LSNS-6: Abbreviated Lubben Social Network Scale; SP: Spirituality Rating Scale Related to Health in the Elderly. a. Male = 0, Female = 1; b. Living alone = 0, Not living alone = 1; c. Not affluent = 1, Not really affluent = 2, Slightly affluent = 3, Quite affluent = 4; d. No = 0, Yes = 1; e. Elementary and middle school = 1, High school = 2, College = 3.

**Table 8.** Partial correlation analyses between spirituality and health-related quality of life (physical and mental).

	MCS	SP (Meaning and purpose of living)	SP (Self-transcendence)	SP (Accord with others)	SP (Spiritual support)	SP (Harmony with nature)	SP (Attitudes toward death and dying)
PCS	-0.052	0.224***	0.174***	0.137**	0.203***	0.156**	0.039
MCS		0.141**	0.018	0.065	0.153**	0.044	-0.033
SP (Meaning and purpose of living)			0.590***	0.528***	0.562***	0.532***	0.293***
SP (Self-transcendence)				0.427***	0.483***	0.55***	0.214***
SP (Accord with others)					0.518***	0.524***	0.372***
SP (Spiritual support)						0.532***	0.230***
SP (Harmony with nature)							0.335***

PCS: physical component summary; MCS: mental component summary; Controlled variables: age, gender, household structure, economic affluence, job with income, years of residence, education level, religion.

of life, partial correlation analysis was conducted with controlling basic attributes (age, gender, household structure, economic affluence, job with income, years of residence, education level, and religion).

The result showed that PCS was positively associated with most of SP subscales ( $r = 0.137 - 0.224$ ) while MCS was positively associated with only SP (Meaning and purpose of living) and SP (Spiritual support) ( $r = 0.141 - 0.153$ ) (Table 8).

## 4. Discussion

### 4.1. Characteristics of Respondents

The standard values of PCS and MCS are  $46.25 \pm 7.10$  and  $51.50 \pm 5.75$ , respectively, for Japanese individuals aged 70 to 79 [22]. As the mean age of the participants in this study was 77.5, and PCS and MCS were  $45.16 \pm 7.73$  and  $51.40 \pm 5.91$ , respectively, there was no substantial difference. Participants had a normal level of physical and mental wellness, even though 93.1% were being treated for multiple diseases.

The mean score for the 18 items on the SP Health Scale was  $67.2 \pm 8.0$ . This was not much different from the results of a survey conducted on elderly people living in the East Asian region including Japan, Korea, and China by Takeda [23] ( $68.4 \pm 6.6$ ).

The mean score of the LSNS-6 for the participants in this study was  $17.4 \pm 5.5$ , and 13.7% had a score below 12, which indicates social isolation. As the average score was  $16.2 \pm 5.1$ , with 19.4% scoring below 12, in a previous study by Kurimoto *et al.* [21] on community-dwelling elderly individuals in Japan, the participants in this study had slightly larger social support networks.

The above results indicate almost the same scores for HRQOL, SP Health Scale, and LSNS-6 as in previous studies. Therefore, the participants in this study can be regarded as representative of the community-dwelling elderly population of Japan.

## 4.2. Health-Related Quality of Life (Physical and Mental) Comparisons by Independent Variables

Those who were younger than 65, more economically affluent, lived shorter in the current place, had higher education level, higher SP Health Scale scores (meaning and purpose of living and spiritual support), and less family support had higher PCS scores. In contrast, having a disease under treatment or symptoms such as heart disease, cancer, gastrointestinal disease, osteoarthritis, lower back pain, knee pain, headache, difficulty seeing, difficulty hearing, and eligibility for long-term care was associated with reduced PCS scores.

On the other hand, those who were more economically affluent, had a job, higher SP Health Scale scores (meaning and purpose of living, accord with others, and spiritual support), and more friend support had higher MCS scores. In contrast, having a disease under treatment or symptoms such as lower back pain, headache, and difficulty seeing were associated with lower MCS scores.

The results are consistent with a previous study by Hatayama *et al.* [5], who showed that education level and income had positive effects, while chronic disease, pain, difficulty seeing, and difficulty hearing had negative effects on HRQOL. Tsutsumi's [22] comparison between elderly people with a certain degree of independence and elderly people requiring long-term care also showed that the latter had significantly lower PCS scores. In addition, some previous studies reported that aging was not related to MCS, although it lowered PCS [6] [24], which was also observed here.

## 4.3. Multiple Regression Analysis

The results of multiple regression analyses showed that the factors predicting PCS scores were basic attributes (age and economic affluence), state of health (heart disease, gastrointestinal disease, osteoarthritis, lower back pain, knee pain, and eligible for long-term care), and SP Health Scale (meaning and purpose of living). Of those, economic affluence and meaning and purpose of living had positive effects, and the rest had negative effects. These results were consistent with the results of the t-tests.

The finding that economic affluence has a positive effect on PCS is consistent with de Belvis's report [6] indicating that subjective income has a positive effect on PCS. The result was also consistent with reports that those with higher incomes have lower rates of mortality and eligibility for long-term care [25] as well as higher basic and instrumental activities of daily living, social activity, sense of wellness, and less disease [4], and that those who feel their life circumstances are poor tend to have a lower sense of wellness [26].

Meaning and purpose of living—a subscale of the SP Health Scale—also had a positive effect on PCS. Considering that these components are fundamental to human existence and that humans with fuller meaning and purpose should be able to lead a life full of vitality, the results appear reasonable.

Meanwhile, the factors that predicted lower PCS were age, heart disease, gastrointestinal disease, osteoarthritis, lower back pain, knee pain, and eligibility

for long-term care. These factors likely reduce PCS because they reduce daily life activities, motor functions, and vitality.

On the other hand, factors predicting MCS were basic attributes (economic affluence), state of health (cancer and headache), and SP Health Scale (self-transcendence), and all except economic affluence had a negative effect. Although economic affluence and headache were consistent with the results of the t-tests, cancer and self-transcendence were not.

The finding that economic affluence had a positive effect on MCS is consistent with de Belvis's finding [6] that subjective income had a positive effect on MCS. This is also consistent with Fujiwara [27], who found that income and life circumstances affect mental health (Geriatric Depression Scale scores and anxiety about the future).

Headache is closely related to mental health [28], and cancer is linked directly to life and death; therefore, it is possible that their effects on mental health are large. However, the t-test showed no significant relationship with MCS.

Meanwhile, self-transcendence, a subscale in the SP Health Scale, also had a negative effect on MCS. We can interpret that this result was obtained because mentally exhausted elderly individuals are more likely to think about their connection with ancestors and descendants or feel support from power beyond them. However, this result is contrary to the theory and previous studies that elderly people solve spiritual problems in relation to something that transcends themselves [29]. In addition, as the t-test did not indicate a significant relationship, we cannot conclude that self-transcendence has a negative effect on the mental health of elderly individuals.

Although meaning and purpose of living was not significant, its p-value (0.058) is quite close to 0.05, and the absolute value of its coefficient (0.136) is almost same as that of self-transcendence (-0.148). These imply that if sample size had been large enough, this factor could have a significant effect on MCS.

#### **4.4. Partial Correlation Analysis**

The result of partial correlation analysis showed that both PCS and MCS were positively related with spirituality, but the former were stronger. The result that SP (Meaning and purpose of living) and SP (Spiritual support) were positively related with both PCS and MCS was consistent with that of t test (**Table 6**). Moreover, the finding that SP (Meaning and purpose of living) was positively related with PCS was consistent with that of multiple regression analysis (**Table 7**).

#### **4.5. Effects of Spirituality**

In sum, the results concerning the effect of spirituality suggest that individuals with a higher score on meaning and purpose of living on the SP Health Scale had higher HRQOL. Therefore, to improve HRQOL in elderly individuals, it might be effective to provide support, such as creating opportunities and forums to identify one's purpose in life and sources of hope, as well as offering methods for

recollection and life review to identify the meaning and purpose of one's life [30].

In the past, spirituality has been discussed only in settings of intractable diseases and end of life. Therefore, it is a unique contribution of this study to have shown the potential to enhance physical and mental health of community-dwelling elderly individuals by organically integrating aspects of body, mind, and society from the perspective of spirituality [31].

## 5. Conclusion

In this study, we conducted multiple regression analyses by adding SP Health Scale elements as independent variables to the factors identified through reviewing previous studies and using HRQOL (PCS and MCS) of community-dwelling elderly individuals as dependent variables. The results showed that economic affluence and spirituality (meaning and purpose of living) had positive effects and age and state of health (heart disease, gastrointestinal disease, osteoarthritis, lower back pain, knee pain, and eligible for long-term care) had negative effects on PCS. These are consistent with the results of the t-tests and the partial correlation analysis. As for MCS, although economic affluence had a positive effect and headache, cancer, and spirituality (self-transcendence) had negative effects, the t-tests and the partial correlation analysis did not indicate that cancer and self-transcendence had significant associations with MCS.

Based on these results, we suggest that increasing economic affluence; preventing or alleviating heart disease, gastrointestinal disease, painful motor system disorders, and headache; and reconfirming the meaning and purpose of life are effective in increasing HRQOL among elderly individuals.

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