

Research Article

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Association Between Frailty and Optimism in Japanese Elderly People with Exercise Habits

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Abstract

Objective: Local governments have established an elderly care prevention project while incorporating the concept of frailty in Japan. We analyzed the association between frailty and optimism of middle-aged and elderly people with exercise habits living in Japan.

Design: This cross-sectional study was conducted using a self-administered questionnaire survey and the results of physical strength measurement by a physiotherapist.

Sample: Middle-aged and elderly people with exercise habits living in Japan

Measurements: The correlation coefficient between the revised Life Orientation Test (LOT) results ranged from 1 to 5 (total score: 30, highest), and each variable was calculated. Two sex groups were then compared according to the LOT score level. Statistical data were analyzed using the SPSS version 23.

Results: We analyzed 137 (66 male) participants. The LOT score was inversely correlated with the CES-D score and physical and social frailty, whereas sex was correlated with variables indicating social activity. Differences in sociality because of optimism were found to be remarkable in males.

Conclusions: Optimistic thinking may improve the health of the middle-aged and elderly people. In particular, men were associated with mental health and physical and social frailty. Support measures toward achieving optimistic thinking may contribute to maintaining mental and physical health.

Keywords: Cross-Sectional Studies, Frailty, Mental Health, Physical Examination, Social Support

Background

Japan is the most aging country in the world. Considering the health status of the elderly, medical costs are high, indicating a major problem of the country. The aging rate in 2019 was 28.1% and is expected to reach 30% by 2025 [1]. Medical expenditures for those who aged 75 years or older accounted for a large proportion of 34.1% in the national medical expenditure in 2016 [2]. Under the Japanese nursing care system, for elderly people aged 65 years and over, much of the medical and nursing costs due to mental and physical deterioration are covered by the government. Even so, not all elderly people receive adequate medical and nursing care. Based on a follow-up study involving elderly people living at home in Japan, 7.4% of nonhomebound elderly people required nursing care compared with 25.0% of those who were homebound. According to statistics released by the Tokyo Metropolitan Inspection and Medical Service, 1,441

lonely deaths were recorded in the 23 wards of Tokyo in 2003; the number almost doubled in 2012, reaching 2,727 deaths in 10 years. Noticeably, most of the lonely deaths were poorly socialized men who were not good at socializing [3].

Therefore, the country's goal is to lessen the requirement of nursing care. To reduce medical costs, local governments have introduced an elderly care prevention nationwide while incorporating the concept of frailty. Although without clear definition, frailty is defined by many researchers as follows. It is a state of vulnerability caused by a poor homeostatic resolution after a stressful event and by a progressive decrement in several physiological systems [4]. In such state, physical health, mental and psychological functions, and social functioning will affect each other, leading to negative health outcomes [5]. Some reports revealed that exercise can improve and prevent frailty

by preventing falls and improving physical functions such as muscle strength, cardiopulmonary function, and flexibility. Studies focusing on physical aspects have been extensively studied [6,7].

However, the International Classification of Functioning (ICF) components such as Body Functions and Activities and Participation are frequently linked to frailty instruments; body structures and environmental and personal factors were sparingly represented in the multidomain frailty instruments. ICF translation can be a cornerstone for the future standardization of frailty assessment (International classification of functioning, disability, and health (ICF), 2013). Social frailty is clearly the most important risk factor for frailty and sarcopenia development [8]. Tanaka defines frailty as a dangerous condition that is likely to cause various health hazards, including death, in which vulnerability to stress is high because of a decrease in physiological reserve accompanying aging [9].

Considering their definitions comprehensively, social behavior and participation in social activities, the ability to manage oneself, and the lack of social resources should be taken into account. Social frailty can also be defined as a continuum of being at risk of losing or having lost resources that are important for fulfilling one or more basic social needs during one's life span. The results of Bunt's scoping review indicate that not only the (threat of) absence of social resources should be a component of the concept of social frailty to fulfill basic social needs but also the (threat of) absence of social behaviors and social activities, as well as the (threat of) absence of self-management abilities. This conception of social frailty provides opportunities for future research and guidelines for practice and policy [10]. Social frailty that has been determined by focusing on social participation, including opportunities to go out and relationships with family and friends, are important risk factors for future care-required conditions, such as physical frailty and depression. Support measures that can improve social frailty, such as encouraging participation and securing opportunities to interact with family, friends, and neighbors, should be developed.

Meanwhile, optimism is "the tendency to have things generally go well and the general belief that better things will happen other than bad things." Optimism was associated with numerous causes of mortality, but it may provide a valuable target for new research on strategies to improve health [11].

However, research on optimism and long-term health is currently limited, with the most rigorous work primarily evaluating associations with cardiovascular morbidity and mortality. Moreover, optimism is significantly associated with socioeconomic status indicators, and individuals with higher education levels or more income evidently have higher optimism. Optimism may also be associated with a reduced likelihood of acquiring various health-related conditions, such as an unhealthy lipid profile or type 2 diabetes mellitus. These reports suggest that optimistic thinking can extend healthy life expectancy. However, the link between frailty and optimism remains unreported.

Hence, this study aimed to identify the association between optimism and frailty among middle-aged and elderly people in Japan.

Methods

Study design

This study is cross-sectional. It used a self-administered questionnaire survey and physical strength results, which were measured by a physiotherapist.

The subjects were middle-aged and elderly people who had been participating in nursing prevention classes continuously for 3 years in Satte-shi. All of them provided an informed consent, and the local ethics committees of Japan University of Health Sciences approved this study (No.2906-2). The contents of the questionnaire are as follows.

The revised Life Orientation Test (LOT) had been verified in Japanese and English languages [12]. LOT is a five-point Likert scale that is composed of 10 items including 4 excluded items; the higher the scores, the higher the optimism level. The Center for Epidemiologic Studies Depression Scale (CES-D) is a widely used tool that is proven reliable in measuring depressive symptoms according to the National Institute of Mental Health [13]. The CES-D is a 20-item scale with four reversals, and its maximum score is 60; the higher the score, the higher the depression. In addition, 16 points indicate the cutoff points. The 25 items of locomotive syndrome are on a five-step Likert scale.

Regional characteristics

Located 50 km from Tokyo, Satte-shi covers an area of 33.93 square kilometers, with a total population of 50,944 [14].

The aging rate in this city is continuously rising, exceeding 25% in 2013 and reaching 30.7% in 2016. The National Health Insurance medical expenses reached 360,697 Yen (approximately \$3,400)/person in 2016, ranking first in the prefecture. In Satte-shi, by increasing the number of citizens who exercise continually with high awareness on health promotion and by supporting the training and activities of "walking leaders" who spread health promotion based on their own areas, the average number of steps that all citizens are capable of increased. Since 2016, we have been working on a healthy longevity model business with the aim of preventing lifestyle-related diseases, improving health awareness, and reducing medical expenses.

Considering that the average number of steps per day for citizens has decreased (5,500 steps/day) since 2015, "10,000-step daily exercise class" has been conducted for elderly people. As a result, 95.7% of them continued walking in 2017, and the average number of steps increased to 8,478 steps. The HDL, LDL, and HbA1c values have also improved. Participants are recruited using public relations papers, city websites, flyers, and posters. Various groups in the city and participants in health programs hosted by the city were also invited to participate. Satte-shi is a place that flourished as a key point of transportation in the Edo period (Samurai Era), and the course was set up, taking advantage on its characteristics and visiting historic sites and sights in the city. Participants then walked and modified the course, and officials worked with the participants to develop program details. Every June, participants conducted physical measurements, blood tests, physical fitness measurements, and questionnaire surveys. In the survey of this study, physical therapists measure the participants' physical fitness and physical items, and the CES-D was used as the questionnaire to measure mental health, of which 25 items are related to locomotive syndrome. The items on the optimism scale were collected using self-administered questions.

Analysis

We calculated the descriptive statistics for the attributes of the subjects. For the LOT and other items, we extracted the relevant items by calculating the Pearson's correlation coefficient. To clarify the characteristics of the subjects by the LOT score, the participants were divided into the high-score group and the low-

score group according to the average value in this survey; then, two groups of men and women were compared according to the score group.

Results

The characteristics of the survey subjects are shown in Table 1. A total of 137 (66 males) participants were included, with an average age of 69.1 years (range: 54-74 years). Among them, 13% lived alone, with an average LOT score of 19.4.

Table 2 shows the items that have a significant correlation with LOT. People who obtained a higher LOT score tended to be “people who can be trusted” and had reduced depressive symptoms and physical and social frailty. The results of the t-test between men and women are summarized in Table 3. Given that the items have significant differences between men and women, many items

related to human relationships were extracted. Furthermore, LOT significantly correlated with the item of “trusting people.” Thus, the effect of LOT was sex dependent. The analysis results by sex on the comparison between the two groups of the high- score and low- score groups using the average score of all subjects are displayed in Table 4. Men had more items with significant differences, and their differences in optimistic personality greatly affected the items related to frailty. Men who were pessimistic tended to be depressed and have low self-esteem and narrow relationships. In addition, the number of relevant items in the social frailty and the locomotive syndrome scores were high, but that of mental and physical health was significantly low. In women, the difference in the number of items due to the difference in LOT scores was small, and only two items, namely, “human relationships with relatives and family members excluding spouses” and “friends listening to complaints,” showed significant differences.

Table 1: Characteristics of subjects

Characteristics	Average (±SD) or n (%)
Sex [male: n (%)]	66(48.2)
Age [mean±SD (year)]	69.1(±7.4)
Height [cm: mean ±SD]	158.8(±8.5)
Weight [kg: mean ±SD]	58.0(±9.9)
Abdominal girth [cm: mean ±SD]	84.0(8.70)
Chronic disease[Yes: n (%)]	80(58.4%)
Exercise habits [minutes: mean ±SD]	75.7(±45.8)
Living alone [Yes: n (%)]	18(13.1%)
CES-D total [mean ±SD]	10.1(±6.4)
LOT-R [mean ±SD]	19.4(±3.8)

Table 2: Correlation with the revised Life Orientation Test (Optimism and Pessimism)

Items	Pearson’s correlation coefficient	P
I visit a friend’s house	.170	.050
I talk with others every day	.200	.021
CES-D total	-.218	.014
Feeling attached to the neighborhood	.172	.047
People can be trusted	.267	.002
Joining a volunteer group	.177	.041
Physical frailty total	-.241	.006
Social frailty	-.251	.004

✧ Only items with significant correlation

Table 3: Items with significant differences by sex (Only items other than physical strength measurement are shown.)

Items	male		female		t	freedom	P (two-sided)
	Ave.	SD	Ave.	SD			
Age	70.45	7.07	67.79	7.44	2.15	135	.034
I rely on my spouse	.85	.36	.61	.49	3.14	126.94	.002
I rely on my children separated	.29	.46	.51	.50	-2.68	132.9	.008
I rely on my siblings and relatives	.38	.49	.60	.49	-2.54	132.38	.012
I rely on my friend	.57	.50	.76	.43	-2.33	127	.021
My spouse hears bitches	.85	.36	.56	.50	3.86	125.9	.000
My friend hears bitches	.58	.50	.80	.40	-2.76	123.39	.007
Anxiety to fall	.11	.31	.27	.48	-2.37	119.61	.019
I find myself useful	.82	.39	.94	.23	-2.28	103.02	.025
I talk with others every day	.91	.29	.99	.12	-2.02	81.8	.047

✳️The higher the score reveals the more so. (except age)

Table 4: Comparison between two groups by LOT score (by gender)

Variables	Male					Female				
	High score 9 10 (>20 n = 34)		Low score (≤20 n = 30)		P	High score (>20 n = 30)		Low score (≤20 n = 39)		P
	M	SD	M	SD		M	SD	M	SD	
Participation in hobby group	3.10	1.58	2.26	1.48	0.32	2.67	1.45	2.54	1.41	ns
People can be trusted ¹⁾	4.13	0.67	3.74	0.67	.021	3.83	0.53	3.92	0.66	ns
People try to serve people ¹⁾	3.94	0.57	3.65	0.54	.042	3.7	0.65	3.64	0.63	ns
I rely on my siblings and relatives	0.48	0.51	0.29	0.46	ns	0.8	0.41	0.44	0.50	.001
I have a friend who listens to bitches	0.55	0.51	0.62	0.49	ns	0.67	0.48	0.90	0.31	.026
CES-D Total ²⁾	6.76	5.66	11.33	6.84	.006	10.93	5.55	11.0	6.52	ns
I can travel by train or bus ¹⁾	0.15	0.36	0.00	0.00	.023	0.70	0.25	0.80	0.27	ns
I can do simple housework ¹⁾	0.12	0.33	0.00	0.00	.044	0.70	0.25	0.80	0.27	ns
I'm involved with local people	0.10	0.30	0.44	0.79	.022	0.33	0.80	0.21	0.47	ns
Locomotive syndrome ²⁾	3.03	3.53	5.76	6.18	.031	4.66	4.74	4.85	8.01	ns
I visit a friend's house	0.68	0.48	0.41	0.50	.032	0.57	0.50	0.67	0.48	ns
I feel useful	0.97	0.18	0.68	0.48	.002	0.93	0.25	0.95	0.22	
Number of social frailty ²⁾	0.55	0.57	1.42	1.30	.001	0.87	0.93	0.72	0.83	ns

1)High scores are healthier

2)Low scores are healthier

Discussion

Elderly in the community and optimistic thinking

Elderly people with long-term care risk tended to perceive themselves negatively; they lacked social relationships and had low life satisfaction levels, morale, and self-esteem [14,15]. The items “negative beliefs about one’s self” and “life satisfaction” are regarded as important factors. Reconsidering the components of positive thinking and clarifying their relationship with long-term care risk are necessary [16]. Resilience and depression were significantly associated with self-rated successful aging, with effects comparable in size to those for physical health. While no causality can be inferred from the cross-sectional

data, increasing resilience, and reducing depression might have effects on successful aging as strong as that of reducing physical disability; thus, these steps may play important roles for psychiatry in promoting successful aging [16]. This study also supported such results.

Seligman et al. reported that positive psychology, including optimism, is not merely a positive emotion; it also has the ability to manage one’s mental health [17,18]. In general, physical illness, financial problems, mental illness, and human relationship problems increase with age, but focusing on optimism may improve the ability to cope with predictable stress. Meanwhile,

given that the number of elderly people living alone increases, creating regional structures that are ideal for living alone increases the sense of belonging, shifts to optimistic thinking, and may prevent the decline of mental and physical health in the elderly. Furthermore, positive psychology, including optimism, can help improve mental health in public health [18]. In addition, taking preventive interventions in mental health can reduce costs [19].

Sex-based differences in attributes and optimistic personality trends

In this survey, a significant difference was found between men and women in items with significant differences in the comparison between the two groups based on the LOT score.

A significantly lower age among women may have influenced these results. However, considering that the age between men and women was not significantly different in the comparison between the two groups using the LOT score and that the age difference was less than 3 years, the effect of the age difference is considered to be minimal. Although men and women have different items, the optimistic thinking tended to broaden human relationships in both sex groups. Women had only few items with significant differences, possibly because elderly women in Japan have friends in the community and raise children as housewives. Moreover, women have higher communication skills than men. In the Japanese community, women are more related to men of the same sex and education than men [20]. The current study also supported this point.

In Japan, a retirement system has been established according to age, and men only have social experience in the corporate society and still have to build human relationships in the community after retirement. However, many male elderly people are reluctant to create new human relationships in the community because of the pride cultivated in their career experience and the exhaustion of human relationships in the lifetime employment system; they are not also accustomed to the community [21]. A concrete method that considers regional and sex-based differences is necessary to promote activities for Japanese elderly people. This study showed that creating an atmosphere that encourages optimistic thinking of the elderly is effective [22]. Satte-shi is an area where many employees work long distances to Tokyo, and most men in their 60s and 70s have hardly been involved in childcare at home. Men with pessimistic thinking tend to have distant relationships with their children, suggesting that they can only rely on their wives in terms of family relationships. Some men with low LOT scores could not fulfill their domestic role as fathers during childcare, thereby affecting their old age relationships and neglecting living in areas without work. Hence, degree of mental and physical health is possibly reduced. Furthermore, women have a role in housework, whereas men often have no role; thus, men may feel that they are not useful, thereby affecting their optimistic thinking [23].

Elderly men living alone can increase their sense of isolation from society; this circumstance is a regret for their families [24]. From the perspective of successful aging, support from the child-rearing generation to create roles in the community and at home for men may be effective.

Limitation

Generalization of the results in this study should be taken with heedfulness because this study is a survey of residents living in one local government in Japan. We need to interpret this result

as the result of a group that has high health awareness and has built up human relations in the community, considering that the participants were only those who continued to participate in the exercise program. In addition, given that this study involved a cross-sectional survey, we could not to clarify the effect of participating in the exercise program on the survey results [25].

In conclusion, this study clarified the relationship between the optimistic thinking and frailty among elderly people. Optimistic thinking may improve the health of the elderly, especially in men, who were associated with mental health and physical and social frailty. Thus, support measures that lead to optimistic thinking may contribute to maintaining mental and physical health. For example, elderly people who are reluctant to engage in the community should be encouraged to participate with joy in care prevention measures. Furthermore, support for elderly people living alone and for families and child-raising generations with a view to successful aging may improve the psychiatric health of the elderly and make them optimistic. Therefore, social and physical frailty in old age may be possibly prevented.

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