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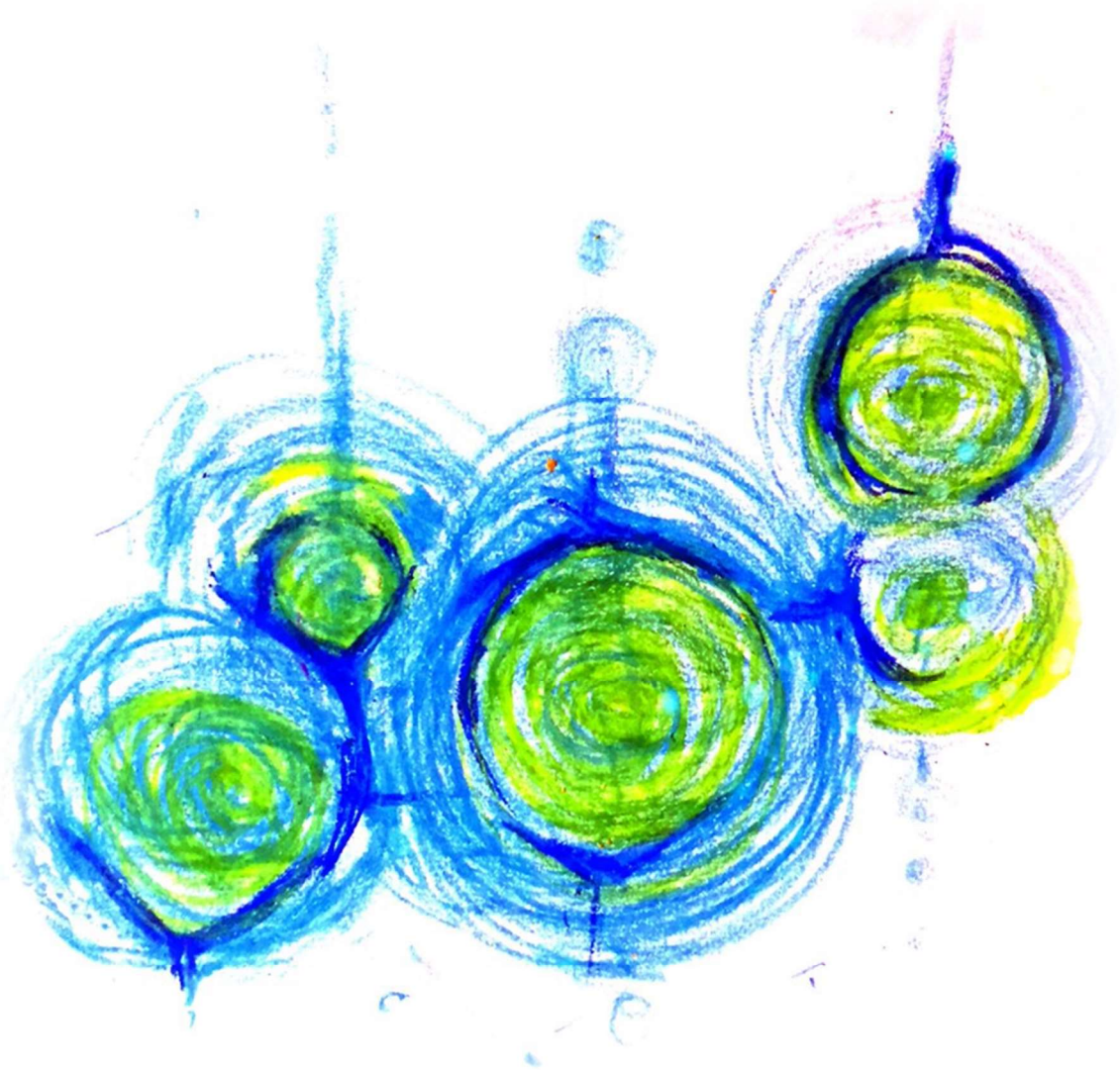

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ORIGINAL ARTICLE

Intervention Through Nutrition Improvement and Exercise Programs of Multi-professional Collaboration for Users of Fee-based Assisted Living Homes for the Older People

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ABSTRACT

Through activities targeting nutrition improvement and exercise programs, a three-month intervention was conducted for nine users of fee-based assisted living homes for the older people in Kanagawa Prefecture with an Alb level of <3.8g/dl. Interdisciplinary intervention approaches were provided through multi-professional collaboration, while holding monthly case conferences and study meetings. The users' attributes, nutritional status, motor functions, and QOL (SF-8) were evaluated at baseline and Month 3. During the study period, physical deconditioning occurred in 3 users, consequently reducing the mean Alb level. The Alb levels and dietary intake of users with a favorable physical condition were maintained/ increased, while the values of those with a poor physical condition decreased (decreased Alb group). The former's BMI was also maintained/ improved, and total Locomo-25 score and FR tended to be maintained /improved. Mental Component Summary (MCS) scores representing the QOL showed a particularly marked tendency to improve after intervention, and such an improvement was also observed in the decreased Alb group. Season-related physical deconditioning is likely to have been the leading cause of the decrease in the mean Alb level during intervention. The nutritional status of all users, excluding those with a poor physical condition, improved after intervention. The usefulness of the BMI as a nutritional index was also confirmed. As for motor functions, the users' Locomo-25 scores as an index of a reduced walking ability due to motor dysfunction tended to improve. Improvements in the QOL associated with mental factors were also observed in the decreased Alb group. The results support the effectiveness of the interdisciplinary intervention approaches integrating narrative elements provided through multi-professional collaboration.

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I. Introduction

In Japan, residential homes with and without care services are currently available as private homes for the older people. When using home care services based on the Long-term Care Insurance System, subsidies are allocated, corresponding to the category 'daily care for specific facility users'. In recent years, while delays in the construction of Long-term Care Insurance-covered facilities have been noted, the numbers of private (residential) homes for the older people and their residents have steadily increased; the values, which were 276 and 30,792, respectively, in 2008, increased to 7,563 and 315,678, respectively, in 2013. On comparing the national mean Care Grade and that of insurance-covered facility users, the former is still lower, at 2.2, but grades 4 and 5 account for more than 25%, revealing the increasing demand of the older people requiring care for such homes. Residential homes for the older people are regarded as new locations for the older people to relocate from their long-lived-in homes (Toyama, 2014). Furthermore, it is expected that the homes will accommodate needs related to the comprehensive community-based care system as key to social insurance system reform to prepare for 2025, when all baby-boomers will be aged 75 or over. In such a situation, care approaches in their homes should be reviewed, covering the concept of 'private but unaccustomed homes, in addition to that of 'facilities'.

Under these circumstances, the researchers conducted a status survey in 2015, involving 147 users of 3 fee-based assisted living homes for the older people in Kanagawa Prefecture. The results revealed an association between the users' serum albumin (Alb) levels, representing their nutritional status, and mental/physical functions (Fujio, Shimada, Sugiyama et al., 2017). As the former was particularly correlated with their walking ability, the present intervention-based study focused on nutritional improvement for such users and motor functions. With respect to the care-dependent older people's Alb levels, they were also suggested to be associated with their walking ability for mobility, types of food they used, and their dietary intake in the representative researcher's previous study (Fujio, Ogawa, Inoue et al., 2016). Furthermore, in an intervention-based study on nutritional improvement for users of private homes for the older people, intervention group members' Alb levels and BMI values significantly improved after avoiding skipping meals and sufficiently ingesting proteins and lipids for 2 years (Kumagai, Shibata & Watanabe, 1999). In the present study, interdisciplinary intervention approaches were provided through multi-professional collaboration among nurses, care workers, rehabilitation experts, counselors, and registered dieticians belonging to the study facility, while holding monthly case conferences and study meetings. Concerning such collaboration, some researchers regard case management frameworks as useful for multi-professional teamwork (Nonaka, 2016).

The study examined the effects of intervention for individuals with malnutrition or an increased risk of such a condition, who used a fee-based assisted living home for the older people, based on nutrition improvement and exercise and provided through

multi-professional collaboration. Since previous research was a survey of actual situation, we decided to conduct an interdisciplinary intervention approach were provided by multi-professional collaboration and to verify its effect.

II. Subjects and Methods

1. Study design

Intervention study

2. Study period

16 November, 2016 to 15 February, 2017 (3 months)

3. Subjects

The study was conducted in the facility that showed the lowest mean Alb level in the researchers' status survey in 2015, involving 3 facilities. Among the users of this facility, 9 with Alb levels lower than 3.8 g/dl, indicating malnutrition or an increased risk of such a condition, were included. The exclusion criteria were as follows: those with severe dementia, leading to difficulty in understanding instructions when participating in exercise programs; those classified into Rank C based on their scores from the Degrees of ADL Independence of the Older People with Disabilities, indicating difficulty in participating in such programs; and those with diseases that might influence their nutritional status.

4. Study items

1) Intervention approaches

The following interdisciplinary intervention approaches were provided through multi-professional collaboration, while holding monthly study meetings and case conferences to manage individual cases:

(1) Nutritional improvement: Registered dieticians, nurses, and care workers collaborated to create favorable dietary environments to meet all nutrient requirements (1,500 kcal of energy and 50 g of protein per day) by making seating arrangements, enhancing the colorfulness of each dish, using appropriate types of food and eating utensils, and promoting individualized communication during meals. At the same time, counselors identified the users' food preferences, with cooperation of their families, and purchased their favorite foods to promote their dietary intake. In addition, multiple professionals provided opportunities for the users to lead an enjoyable dietary life by helping them eat out and actively communicate with other users. Dietary supplements (each was equivalent to 80 kcal, containing 6.2 g of protein) were also used to supplement their protein intake.

(2) Exercise: Rehabilitation experts developed a program for the users to perform exercise for 15 minutes twice a week, according to their conditions. The program consisted of: walking training, ascending/descending stairs, machine training using an upper/lower limb ergometer, and others. On the living floors, nurses and care workers provided walking training for the users who also performed self-training for 15 minutes daily.

2) Evaluation

The following items were evaluated before (baseline) and 3 months (Month 3) after intervention:

(1) Basic attributes: the age, sex, and Care Grade

(2) Nutrition: the Alb level, BMI, and dietary intake

(3) Motor functions: the 25-question Geriatric Locomotive Function Scale (Locomo-25; a self-administered questionnaire, consisting of questions to be answered on a 5-point scale. Those with a total score of 16 or higher are rated as Locomo Grade 2, indicating advanced motor dysfunction or reduced mobility) score, Timed Up & Go Test (TUG) score, functional reach (FR), hand grip strength (both sides), maximum number of steps, and the time needed to walk 5 m

(4) Quality of life (QOL): the MOS 8-item Short-form Health Survey (SF-8) score

5. Data collection

On the request of the researchers, data were collected and transcribed using a given form by the same employee of the study facility at both baseline and Month 3.

6. Data analysis

For analyses, chi-square tests were performed to determine the effects of activities targeting nutrition improvement, and Wilcoxon's signed-rank test was performed to compare the subjects' Alb-level-specific motor function and QOL before and after the intervention ($p<0.05$). The collected data from the survey were analyzed using SPSS Ver.22.0 as statistical analysis software.

III. Ethical considerations

This study was conducted with the approval of the Ethics Committee of the Faculty of Health Science and Nursing, Juntendo University. To obtain consent from the study facility and users, they were provided with explanations using explanatory documents that specified: the study objective, methods, ethical considerations, the representative researcher's contact address, cooperation based on free will, no disadvantageous treatment for those not consenting, allocation of an ID number to each name as a preventive measure against the identification of individuals, use of the obtained data limited to research purposes, and participants' right to revoke their consent at any time

during the study period . Furthermore, the exercise program was used under risk management based on the rehabilitation criteria established by Anderson (Japanese Association of Rehabilitation Medicine Clinical Practice Guidelines Committee, 2006).

IV. Results

The users' attributes were as follows: mean age: 89.22±5.38, sex ratio: 3 (33.3%) males and 6 (66.7%) females, and mean Care Grade: 1.22±0.67. During the 3-month intervention period, physical deconditioning due to the development of a new disease or the deterioration of underlying diseases occurred in 3 (33.3%). On comparing mean values representing the nutritional status at baseline and Month 3, the Alb level decreased from 3.58 to 3.41 g/dl. The BMI slightly increased from 20.48 to 20.64 kg/m^2. The dietary intake also increased from 1,280.4 to 1,491.1 kcal (Table 1).

<Table.1> Nutritional states (n=9)

	Mean		Med.		Max.		Min.	
	Baseline	Month 3	Baseline	Month 3	Baseline	Month 3	Baseline	Month 3
Alb levels	3.58	3.41	3.60	3.60	3.8	3.9	3.2	2.7
BMI	20.48	20.64	21.10	19.70	24.7	26.9	17.2	16.8
Dietary intake	1280.4	1491.1	1216.0	1487.0	1630.0	1809.0	1047.0	1019.0

When focusing on the relationship between the physical condition and Alb level, the latter was maintained/increased (maintained/increased Alb group) in users with a favorable physical condition, while it decreased (decreased Alb group) in those with a poor physical condition (Figure 1) (Figure 2). As for the relationship between the physical condition and dietary intake, the latter was maintained/increased in users with a favorable physical condition, while it decreased in those with a poor physical condition (Figure 3) (Figure 4). The differences in these items were significant (p<0.05) (Table 2). In the maintained/increased Alb group, the BMI was also maintained/increased (p<0.05) (Table 3).

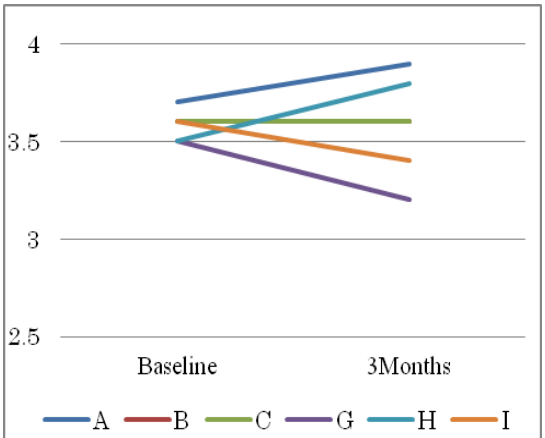

Figure.1 Alb levels of physical condition maintained normal(n=6)

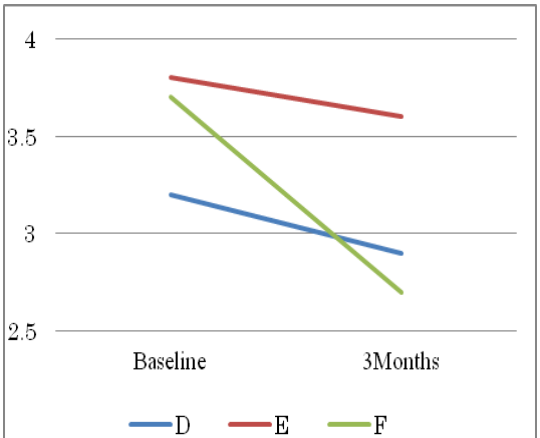

Figure2. Alb levels of bodily discomfort(n=3)

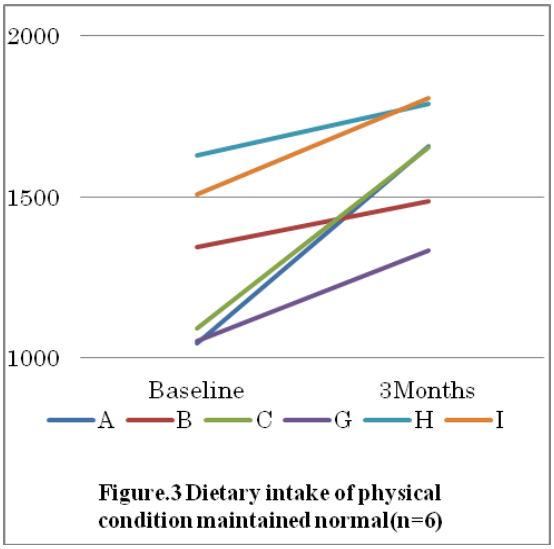

Figure.3 Dietary intake of physical condition maintained normal(n=6)

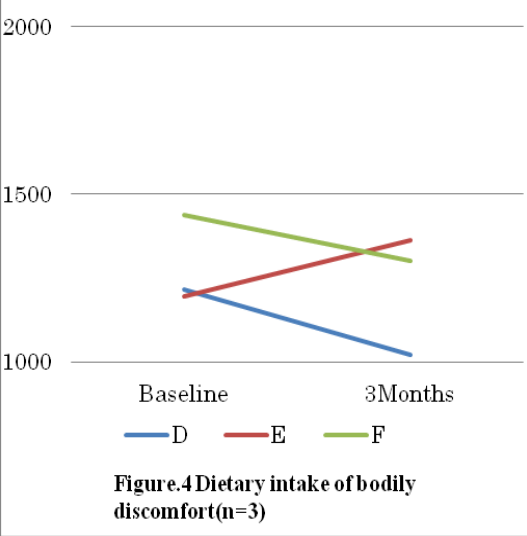

Figure.4 Dietary intake of bodily discomfort(n=3)

<Table.2> Relationship of bodily discomfort with Alb levels and dietary intake (n=9)

		Bodily discomfort				
		No	Yes	χ2	df	*p*
Alb levels	Maintained or increased	4(66.7%)	0(0.0%)	3.600	1	0.05
	Decreased	2(33.3%)	3(100.0%)			
Dietary intake	Maintained or increased	6(100.0%)	1(33.3%)	5.625	1	0.02
	Decreased	0(0.0%)	2(66.7%)			

Pearson's χ2

<Table.3> Relationship of Alb levels with the BMI (n=9)

		Alb levels				
		Maintained or increased	Decreased	χ2	df	*p*
BMI	Maintained or increased	4(100.0%)	2(40.0%)	3.600	1	0.05
	Decreased	0(0.0%)	3(60.0%)			

Pearson's χ2

On examining changes in mean values representing motor functions after intervention, the left and right hand grip strength decreased, but the Locomo-25 and TUG test scores, FR, maximum number of steps, and the time needed to walk 5 m improved (Table 4). None of these items showed an association with the physical condition. On the other hand, on comparing the values between the maintained/increased and decreased Alb groups, the median Locomo-25 score (Table 5) and FR (Table 6) tended to improve in the former (p=0.06).

<Table.4> Motor Function

	Mean		Med.		Max.		Min.	
	Baseline	Month 3	Baseline	Month 3	Baseline	Month 3	Baseline	Month 3
Locomo25(n=9)	42.8	35.7	41.0	31.0	61.0	67.0	24.0	12.0
TUG(n=7)	17.6	16.1	18.5	17.9	23.2	20.6	10.9	10.2
F-reach(n=7)	16.5	21.4	16.5	24.5	23.5	33.5	10.2	9.5
Grip/R(n=9)	14.6	13.0	11.4	11.2	23.3	22.5	9.4	5.1
Grip/L(n=7)	14.2	13.3	16.3	10.4	22.1	22.4	6.5	6.9
A lot of steps(n=9)	52.4	56.7	51.0	55.0	84.0	84.0	39.0	33.0
5m-walking(n=9)	9.30	8.69	6.96	7.26	26.75	20.94	4.34	5.07

<Table.5> Comparison of the locomo25 before and after the intervention according to Alb levels

		25%	50%(Median)	75%	Z	*p*
Alb						
Group with maintained or increased Alb levels(n=4)	Locomo25 at the baseline	34.25	36.50	44.75	-1.826	0.06
	Locomo25 at month 3	15.00	25.50	34.50		
Group with decreased Alb levels(n=5)	Locomo25 at the baseline	32.50	51.00	57.50	-0.406	0.68
	Locomo25 at month 3	23.00	45.00	65.00		

Wilcoxon's signed-rank test

<Table.6> Comparison of the F-reach before and after the intervention according to Alb levels

		25%	50%(Median)	75%	Z	*p*
Alb						
Group with maintained or increased Alb levels (n=4)	F-reach at the baseline	10.27	12.75	21.37	-1.826	0.06
	F-reach at month 3	16.77	25.85	31.92		
Group with decreased Alb levels(n=5)	F-reach at the baseline	16.50	17.50	22.00	-0.535	0.59
	F-reach at month 3	9.50	16.00	25.00		

Wilcoxon's signed-rank test

On examining mean SF-8 scores related to the QOL, the physical functioning (PF), role- physical (RP), bodily pain (BP), social functioning (SF), and physical component summary (PCS) domains worsened, while the general health perception (GH), vitality (VT), role-emotional (RE), mental health (MH), and MCS domains improved after intervention (Table 7). The median MCS score showed a particularly marked tendency to improve after intervention (p=0.06) (Table 8). Furthermore, on comparison based on the Alb level, such an improvement was also observed in the decreased Alb group (p<0.05) (Table 9).

<Table.7> QOL SF-8 (n=9)

	Mean		Med.		Max.		Min.	
	Baseline	Month 3	Baseline	Month 3	Baseline	Month 3	Baseline	Month 3
PF	51.55	50.21	53.54	53.54	53.54	53.54	41.45	41.45
RP	51.85	48.94	54.09	54.09	54.09	54.09	40.65	27.91
BP	55.43	50.62	60.35	60.35	60.35	60.35	38.21	31.59
GH	48.81	49.60	50.27	50.27	58.54	63.38	40.40	34.38
VT	49.32	50.72	44.48	53.74	60.01	60.01	38.51	38.51
SF	55.14	54.08	55.14	55.14	55.14	55.14	55.14	45.60
RE	51.66	52.86	54.19	54.19	54.19	54.19	31.42	42.24
MH	51.97	52.93	56.93	56.93	56.93	56.93	36.30	44.94
PCS	50.52	47.30	52.82	52.12	54.73	56.31	36.07	34.60
MCS	50.99	53.51	53.93	54.09	55.14	60.88	35.89	46.84

<Table.8> PCS and MCS(n=9)

		25%	50%(Median)	75%	Z	*p*
PCS	PCS at the baseline	49.45	52.82	53.40	-1.521	0.12
	PCS at the month 3	39.92	52.12	53.77		
MCS	MCS at the baseline	49.19	53.93	54.53	-1.859	0.06
	MCS at the month 3	50.29	54.09	55.60		

Wilcoxon's signed-rank test

<Table.9> Comparison of the SF-MCS before and after the intervention according to Alb levels

		25%	50%(Median)	75%	Z	*p*
Alb						
Group with maintained or increased Alb levels (n=4)	MCS at the baseline	52.29	54.53	55.09	-0.447	0.65
	MCS at month 3	52.88	54.01	59.18		
Group with decreased Alb levels (n=5)	MCS at the baseline	40.86	52.54	53.97	-2.023	0.04
	MCS at month 3	47.44	54.09	55.60		

Wilcoxon's signed-rank test

V. Discussion

In the present study, 3-month interdisciplinary intervention based on nutritional improvement and exercise was provided through multi-professional collaboration for 9 users of a fee-based assisted living home for the older people, whose Alb levels were lower than 3.8 g/dl. On comparing their baseline and Month-3 values, their nutritional status worsened after the intervention. Considering that both the Alb level and dietary intake were maintained/increased in users with a favorable physical condition, while they decreased in those with a poor physical condition, it is likely that physical deconditioning due to the development of a new disease or the deterioration of underlying diseases was the leading cause of such a result. The tendency toward physical deconditioning is more marked in winter compared with summer, and seasonal changes in death rates become more noticeable with age, as shown in 2 studies by Kitajima, entitled: <Seasonal Changes of the Death Rates of Senility> (Kitajima, 2014) and <Seasonal Changes of Death Rates of Heart Diseases and of Cerebrovascular Diseases for the Age Groups 75-84 and 85-94 by Prefecture> (Kitajima & Ota, 2013). As the present study was conducted during the winter season from November to February, involving older individuals with a mean age of 89.22±5.38, seasonal changes in their physical conditions may have been more marked, suggesting the necessity of also providing nutritional management for individuals with a poor physical condition using fee-based assisted living homes for the older people as residential facilities targeting these age groups. Furthermore, in the maintained/increased Alb group, the BMI was also maintained/increased, supporting the effectiveness of nutritional improvement for all subjects, excluding those with a poor physical condition. In a previous study, in which 2-year interdisciplinary intervention based mainly on nutritional improvement was provided for users of private homes for the older people, the frequencies of ingesting meat, eggs, fruits, and oils/fats, serum Alb level, and BMI significantly increased after the intervention (Watanabe, Kumagai & Shibata, 2010). Similarly, in the present study in which intervention was provided, adopting a similar interdisciplinary method, nutritional improvement was also shown to be effective. In addition, it was confirmed that the BMI, which showed a significantly correlation with

the Alb level in the representative researcher's previous study (Fujio, Ogawa, Inoue et al., 2016), is a useful nutritional index.

In a national survey on exercise-based intervention (Ministry of Health, Labour, and Welfare 2014), individuals with exercise habits (defined as 'continuously performing exercise for 30 minutes or longer per session twice a week or more frequently for 1 year or longer') accounted for 49.2 and 36.9% among males and among females, respectively, aged 70 or older, revealing that the older people's rate of habitually performing exercise does not reach 50%. In the present study, elderly facility users performed exercise for 15 minutes/session daily for 3 months, and this may have help them develop exercise habits as another outcome. In fact, some of the users also performed self-training on the living floors during the study period. On comparing their motor functions, the Locomo-25 score and FR tended to improve after intervention. In the presence of 'locomotive syndrome', a reduced walking ability due to motor dysfunction (Nakamura, 2016), reductions in mobility-related abilities, such as the abilities to ascend/descend stairs and walk fast, are detected earlier than those in abilities related to instrumental activities of daily living (IADL) when screening it using the Locomo-25 (Iwaya, Akai & Doi, 2014). In the present study, the mean Care Grade was 1.22±0.67, indicating a relatively high degree of independence, but the mean total Locomo-25 score was 42.8 at baseline, which was classified as Locomo Grade 2 or advanced motor dysfunction leading to reduced mobility. In contrast, at 3 months after intervention, although the Locomo Grade remained at 2, the mean total Locomo-25 score decreased to 35.7, showing a tendency toward improvement and supporting the effectiveness of the exercise-based intervention approach. Intervention focused on motor activities has already been reported to be effective to address functional declines in the older people, such as reduced mobility and muscle strength, as well as an impaired balance (Pahor M, Guralnik JM, Ambrosius WT et al., 2014).

On the simple tabulation of SF-8 scores representing the QOL, the PCS and other physical domains such as PF, RP, and BP worsened, indicating a reduced QOL; as previously mentioned, this may have been due to seasonal changes in the physical condition. In contrast, the mental domains such as GH, VT, RE, MH, and MCS improved, indicating an enhanced QOL. Among these domains, the MCS showed a particularly marked tendency to improve after intervention, and such an improvement was also observed in the decreased Alb group. In a previous study examining the correlation between the level of life satisfaction and each scene of life, <cleanliness (71.0%)> and <diet (59.4%)> showed higher coefficients of determination, suggesting the necessity of providing practical, direct, and individualized support in these scenes of life (Ito & Wata, 2004). In this respect, the interdisciplinary intervention approaches provided through multi-professional collaboration in the present study may have been practical, direct, and individualized. Wata et al. described the QOL as 'a vector indicating the volume and direction, although its structure is complex and associated with a large number of factors' (Wata & Yamazaki, 1997 and 1998). Based on this, the combination of 2 vectors,

nutritional improvement and interdisciplinary approaches provided through multi-professional collaboration, may have been effective to improve the mental domains of the QOL of the older facility users, including those who did not show nutritional improvement after intervention. In addition, Lawton defined the QOL as 'the multidimensional evaluation, by both intra-personal and socio-economic criteria of the person-environment system of the individual in the past and present and during an expected period' (Lawton, 1991). Similarly, Yoshimura presented the idea of 'narrative thinking' (Yoshimura, Morioka & Kamino, 2007) to understand an individual's identity, individuality, and reality of life. These ideas suggest that the improvements in the mental domains of the users' QOL were an outcome of the interdisciplinary approaches provided through multi-professional collaboration, integrating narrative elements.

VI. Conclusion

Interdisciplinary intervention approaches based on nutritional improvement and exercise for care-dependent individuals with malnutrition or an increased risk of such a condition, who used a fee-based assisted living home for the older people, were provided through multi-professional collaboration for 3 months. The nutritional status of all users, excluding those with season-related physical deconditioning, improved after intervention. The usefulness of the BMI as a nutritional index was also confirmed. As for motor functions, the users' Locomo-25 scores as an index of a reduced walking ability due to motor dysfunction tended to improve. Improvements in the QOL associated with mental factors were also observed in the decreased Alb group. The results support the effectiveness of the interdisciplinary intervention approaches integrating narrative elements provided through multi-professional collaboration.

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