Verification of phycological factors related to health-related quality of life in elderly knee osteoarthritis: A prospective cohort study

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Verification of phycological factors related to health-related quality of life in elderly knee osteoarthritis: A prospective cohort study

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ABSTRACT

Background*:* In recent years, locomotive syndrome, which is a condition requiring nursing care due to musculoskeletal disease, has been reported, and interest in knee osteoarthritis has been increasing. Several studies have reported the physical factors influencing the relationship between knee osteoar- thritis and health-related quality of life (HRQOL), but there have been no reports verifying the changes over time in the relationship between psychosocial factors and HRQOL. This study aimed to investigate the influence of psychosocial factors on HRQOL in elderly patients with knee osteoarthritis.

Methods*:* Evaluations were conducted at four time points: before exercise therapy intervention, 1 month
into intervention, 3 months into intervention, and 1 month after completion of intervention. The items investigated were (1) Japanese Orthopedic Association (JOA) score, (2) Kellgren-Lawrence (K-L) grading system, (3) Fall Efficacy Scale (FES), (4) Frenchay Activities Index (FAI), (5) Geriatric Depression Scale (GDS), and (6) Short Form-8 (SF-8).

Results: No significant differences were seen between each time point of exercise therapy intervention in
depression and HRQOL scale but a significant improvement was seen in instrumental ADL and fear of falling at 3 months into intervention. On multiple regression analysis with SF-8 subscales, fear of falling and degree of depression were determined as significant factors affecting physical and mental summary scores.

Conclusion: Elderly patients with knee osteoarthritis require not only intervention for knee function, but also psychological intervention to address decreased activity and depression to improve their HRQOL.

Key words: Knee osteoarthritis; Health-related quality of life; Elderly patients

Introduction

Elderly people experience difficulties performing physical activities due to the presence of locomotor diseases, and this is one of the factors contributing to the decline in quality of life and the need for long-term care [1]. Knee osteoarthritis, in particular, is associated with locomotor diseases [2]. Knee osteoarthritis was reported to affect 25.3 million people in Japan [3]. In addition, increased awareness on health management and locomotive syndrome [4,5] has raised concerns about quality of life, in the medical field, health-related quality of life (HRQOL) based on the patient's subjective perspective has begun to attract attention [6,7]. Among elderly patients with knee osteoarthritis who underwent rehabilitation, some actively participate in society even if they have the same level of motor dysfunction, while others refuse to participate in the society due to fear of falling or fracture. This finding suggests that multiple factors, including not only motor function but also psychological and social factors, are involved in the HRQOL of elderly patients with knee osteoarthritis. However, several studies have examined the physical factors influencing the relationship between knee osteoarthritis and HRQOL [8], but no study has verified the changes in the relationship between psychosocial fac- tors and HRQOL. In this study, we aimed to examine the changes over time in motor function and psychosocial factors by physical therapy in elderly patients with knee osteoarthritis and examined the factors related to HRQOL.

Subjects and Methods

Subjects

Sixty-two patients with knee osteoarthritis aged 65 years or older (13 men and 49 women, with a mean [± standard deviation] age of 75.4 ± 7.6 years) who had undergone physical therapy at our hospital between September 2018 and May 2019 and who consented to participate in the study were prospectively surveyed. The study only included patients who had opted for conservative treatment as the selected therapeutic approach, while those who underwent surgical treatment were excluded from the study. Patients with symptoms, those with knee osteoarthritis and other motor disorders, and those diagnosed with knee osteoarthritis on X-ray were also included. None of the patients withdrew from the study.

The sample size was calculated using a one sample t-test, and 50 samples were calculated using a difference of 9.2, a standard deviation of 19.7, a significance level of 0.05, and a power of 0.8 [9]. As it was possible for some patients to withdraw from the study, the researchers included a total of 62 patients.

The participants were informed about the purpose of the study, that withdrawal from the study was possible at any time, that personal information would be protected, and about other matters prior to conducting the survey. Only those who consented to participate were surveyed. This study was approved by the Institutional Review Board of the authors' affiliated institutions, and informed consent was obtained from each patient.

Methods

Evaluations were performed at four time points: before exercise therapy intervention (hereinafter "intervention"); 1 month into intervention; 3 months into intervention; and 1 month after completion of intervention. The items investigated were as follows:

(1) knee osteoarthritis severity (2) knee osteoarthritis staging, (3) fear of falling, (4) instrumental activities of daily living (ADL), (5) degree of depression, and (6) HRQOL. Fear of falling, instrumental ADL, degree of depression, and HRQOL were determined using a self-administered questionnaire directly to subjects, which they returned completed following their medical examination.

Knee osteoarthritis severity was measured using the patient's Japanese Orthopedic Association (JOA) score [10]. The JOA score is useful to evaluate the severity of symptoms in clinical practice, it has become the standard assessment tool for knee osteoarthritis. Respondents choose the closest option to their expressed state in four domains (pain and walking ability, pain and stair-climbing ability, flexion angle and intense and/or severe contraction, and swelling). A judgment is made based on a total score of 100 for each of the right and left knees.

The degree of progression of knee osteoarthritis was classified using the Kellgren-Lawrence (K-L) grading system [11]. The K-L system divides knee osteoarthritis into five grades from 0 to 4: 0 as no osteoarthritis; 1 as doubtful narrowing of the joint space and/or possible osteophytes; 2 as definite osteophytes and possible narrowing of the joint space; 3 as multiple osteophytes, definite narrowing of the joint space, and some sclerosis and deformity of the bone ends; and 4 as presence of large osteophytes, marked narrowing of the joint space, severe sclerosis, and definite deformity of bone ends.

Fear of falling was evaluated using the Fall Efficacy Scale (FES) developed by Tinetti et al. [12]. The FES is a tool that measures the degree of confidence of a person to perform 10 different ADL without falling using a four-point scale. Scores are expressed from 10 to 40 points, and a lower score indicates less fear of falling.

Instrumental ADL was evaluated using the Frenchay Activities Index (FAI) developed by Holbrook et al. [13]. This index is a questionnaire that evaluates 15 applied ADL and social life items on a four-point scale from 0 to 3 points. The maximum score is 45 points, and a higher score indicates greater instrumental ADL ability and independence. Degree of depression was evaluated using the Geriatric Depression Scale (GDS). The GDS was developed to measure depression, and a higher score indicates a higher degree of depression [14e16].

Although the MOS 36 item Short-Form Health Survey (SF -36) is widely used as an HRQOL assessment [17], this survey has a large number of questions which make difficult to answer for the elderly. Short Form-8 (SF-8), a short version of SF -36, was used in this study considering the age of the patients participated in Ref. [18]. SF-8 can be evaluated efficiently with a minimum number of items, and consists of the following eight items (subscales): general health (GH), physical functioning (PF), role physical (RP), bodily pain (BP), vitality (VT), social functioning (SF), role emotional (RE), and mental health (MH). A higher score indicates higher QOL. Physical

component summary (PCS) and mental component summary (MCS) scores are also calculated using regression equations based on the weighting of each item. Use of the SF-8 in this study was registered with the Institute for Health Outcomes & Process Evaluation Research to obtain a license.

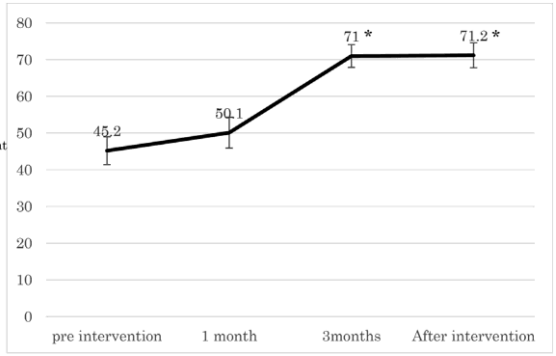
Since the rehabilitation period for knee osteoarthritis in our hospital is approximately 3 months, the patient's rehabilitation period was set at 3 months. The rehabilitation program was done in man-to-man, not in group. The patients were instructed to continue home exercise after completing rehabilitation in our hospital. Therapy sessions were conducted at the hospital once a week for 40 min. The session included stretching of the short muscles and re-education and lifestyle guidance to improve muscle power in the first visit, and the aerobics and leg press training were carried out as the alignment optimization of trunk and leg and muscle function improvement program from the second visit. A stepwise walking program, range of motion training for bathing, and locomo training were performed at home three times a day. Locomo training consists of standing on each leg for 1 min and squatting 5 to 6 times [19].

Patients with pain were treated with anti-inflammatory analgesics and received intra-articular injection of hyaluronic acid to control pain, and patients were instructed to perform exercise therapy on the same menu.

Multiple comparisons were used in the statistical analysis to examine the changes over time at the four time points: before intervention, 1 month into intervention, 3 months into intervention, and 1 month after completion of intervention. Associations of factors with HRQOL at the four time points were examined using Spearman's rank correlation coefficient to analyze the correlations. Stepwise multiple regression analysis was used to determine the factors associated with HRQOL. The PCS and MCS, calculated using the HRQOL scale were set as the dependent variables, while the JOA score, K-L grade, FES, FAI, GDS and clinical characteristics of participants were set as the independent variables. The statistical software used was IBM SPSS Statistics 25, and the level of significance was set at 5%.

Results

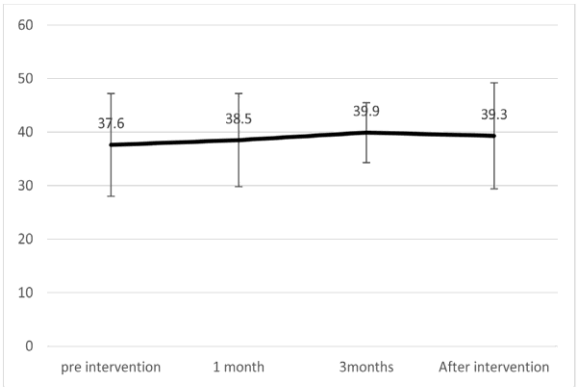
The baseline characteristics of the subjects are presented in Table 1. The JOA score at 3 months after the intervention improved significantly compared with that before the intervention (Fig. 1). There was no significant difference in the presence or absence of anti-inflammatory analgesics and intra-articular injection of hyaluronic acid and JOA score. SF-8 transition is presented in Figs. 2 and3. No missing values were noted among the survey items. PCS scores of all subjects, which were calculated before the intervention, decreased below 50. There were variations in the



JOA: Japanese Orthopaedic Association.

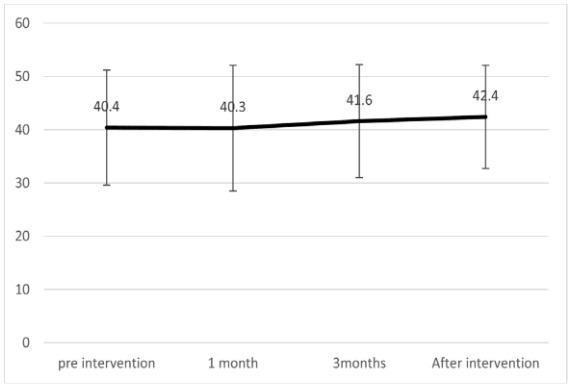
paired t-test. *: p<0.05 (vs. pre intervention)

Fig1.Change in average JOA score



PCS: Physical component summary.
paired t-test: not significant.

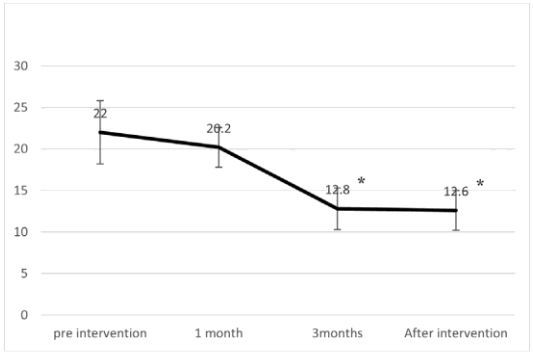
Fig2. Change in average PCS score



MCS: Mental component summary.
paired t-test: not significant.

Fig3.Change in average MCS score

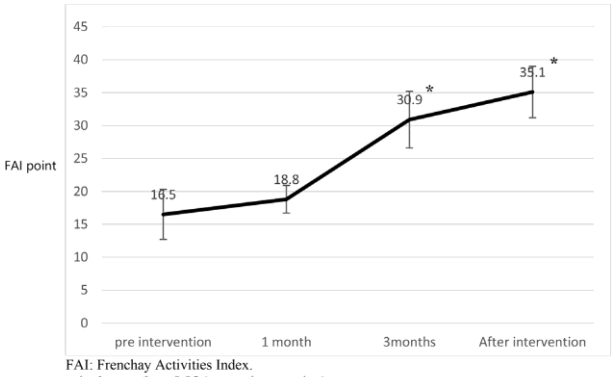
MCS and PCS scores, but no significant differences were observed between the evaluation time points. Fig. 4 shows the changes in FES scores. FES scores significantly improved 3 months after the intervention. Changes in the FAI are shown in Fig. 5. Similar to the FES, FAI scores significantly improved 3 months after the intervention. GDS trends are shown in Fig. 6, and there was no significant difference in each period.



FES: Fall Efficacy Scale
paired t-test. *: p<0.05 (vs. pre intervention)

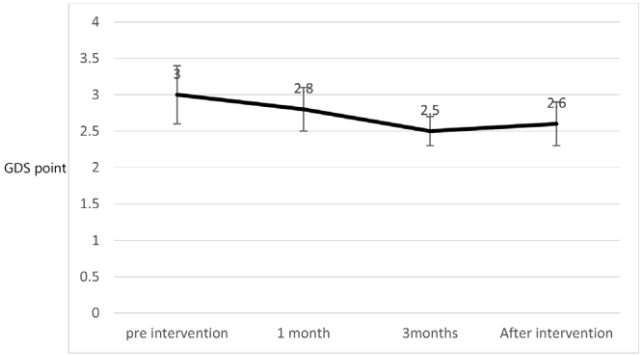
Fig4.Change in average FES

With regard to the relation between the HRQOL scale and each item, the PCS showed a moderate positive correlation with the JOA score and K-L grade and a weak negative correlation with depression before the intervention. Depression and fear of falling showed a moderate negative correlation at 3 months into intervention and 1 month after completion of intervention. The MCS showed a moderate negative correlation with depression and fear of falling at each evaluation time point and a negative correlation at 1 month after completion of intervention



FAI: Frenchay Activities Index.
paired t-test. *: p<0.05 (vs. pre intervention)

Fig5.Change in average FAI



GDS: Geriatric Depression Scale
paired t-test: not significant.

Fig6.Change in average GDS

(Table 2). Factors identified as affecting the PCS were K-L grade before intervention, fear of falling at 1 and 3 months into intervention, and depression at 1 month after completion of intervention. Factors identified as affecting the MCS were depression and fear of falling at each time point (Table 3).

Table1 Clinical characteristics of the participants.

	N (%)	Mean±SD
Patients	62	
Age (years) (%)		75.4 ± 7.6
65-69	23 (37%)	
70-79	26 (42%)	
≥80	13 (21%)	
Female (%)	49 (79%)	
BMI, kg/m^2 (%)		24.6 ± 3.8
<18.5	17 (27%)	
18.5-25	31 (50%)	
>25	14 (23%)	
K-L classification (%)		
1	16 (26%)	
2	19 (31%)	
3	21 (34%)	
4	6 (9%)	
Comorbidities		
Hypertension	11 (18%)	
Diabetes mellitus	5 (8%)	
Congestive heart failure	2 (3%)	
Coronary artery disease	1 (2%)	
Pulmonary disease	1 (2%)	

BMI: body mass index,
K-L classification: Kellgren-Lawrence classification

Discussion

To clarify the factors that affect HRQOL in elderly patients with knee osteoarthritis who underwent outpatient rehabilitation, instrumental ADL, fear of falling, degree of depression, and HRQOL were investigated over time. In an HRQOL study of knee osteoar- thritis, Kraus et al. [20] found that HRQOL improved after improvement of pain and motor function through exercise therapy. However, most of the patients with knee osteoarthritis were elderly, and their HRQOL was not only affected by motor function, but also by psychological and other issues such as fear of falling and and HRQOL, as well as factors affecting HRQOL, were all investigated.

Table2 HRQOL scale correlations

		JOA	K-L	GDS	FAI	FES
PCS	Pre intervention	0.23*	0.38*	-0.22*	-0.25*	-0.12
	1 month	0.22	0.21	-0.28**	-0.19	-0.43*
	3 months	0.34*	0.23*	-0.35**	-0.15**	-0.46**
	After intervention	0.24	0.25	-0.46*	-0.23	-0.32*
MCS	Pre intervention	-0.12	-0.08	-0.49**	-0.28	-0.45**
	1 month	0.13	0.14	-0.47**	-0.18	-0.52**
	3 months	-0.22	0.18	-0.49**	-0.13	-0.51**
	After intervention	0.15	0.21	-0.46**	-0.12	-0.59**

JOA: Japanese Orthopaedic Association , K-L: Kellgren-Lawrence grading system, GDS: Geriatric Depression Scale, FAI: Frenchay Activities Index, FES: Fall Efficacy Scale, PCS: Physical component summary, MCS: Mental component summary,
Spearman rank correlation coefficient *p<0.05 **p<0.01

With regard to knee osteoarthritis severity, depression, fear of falling and instrumental ADL, and HRQOL, no significant differences were observed between each time point of exercise therapy inter- vention in depression and the HRQOL scale. By contrast, a signifi-

cant improvement was observed in knee osteoarthritis severity, instrumental ADL, and fear of falling at 3 months into intervention. This finding indicates that treatment of knee osteoarthritis takes approximately 3 months severity, and that function is maintained even after completion of the intervention. However, although rehabilitation intervention was effective in improving knee osteoarthritis severity and ADL, the depressive tendency or HRQOL remained unchanged. Therefore, it was inferred that HRQOL could not be changed only by healing knee osteoarthritis severity. With regard to the relationship between each factor and HRQOL, there was a positive correlation between pre-intervention PCS and K-L grade. This finding suggests that the physical component related to HRQOL was maintained even when knee osteoarthritis was severe prior to the rehabilitation intervention. On the contrary, there were variations in the MCS scores, but no significant differences were observed between each of the time points. Furthermore, no sig nificant improvement was observed in the degree of depression as a result of exercise therapy. This finding indicated that the MCS is correlated with social functioning, everyday mental functioning, and mental health, and that sufficient improvement in the MCS may not be achieved with exercise therapy. The results of the present study suggest that exercise therapy in elderly patients with knee osteoarthritis is effective in improving fear of falling and instrumental ADL, but that a psychological approach or an approach that addresses lifestyle, such as social participation, is also needed to address depression and improve HRQOL.

Table3 Factors affecting HRQOL

		Variables	95% confluence interval		β	*P*-value
			Lower	Upper		
PCS	Pre Intervention	K-L grade	0.001	0.003	0.401	0.012*
	1 month	FES	—1.087	—0.329	—0.453	0.002**
	3 months	FES	—0.086	—0.043	—0.332	0.016*
	After Intervention	GDS	—0.072	—0.021	—0.302	0.001**
MCS	Pre Intervention	GDS	—2.417	—0.431	—0.341	0.015*
	1 month	FES	—2.876	—0.354	—0.478	0.031*
	3 months	FES	—2.740	—0.723	—0.382	0.024*
	After Intervention	FES	—2.941	—0.207	—0.301	0.015*

PCS: Physical component summary, MCS: Mental component summary
Multiple regression analysis: Stepwise regression *p<0.05, **p<0.01

However, depression and fear of falling showed a weak negative correlation at 3 months into intervention. This finding suggests the need for intervention that takes into consideration subjective severity, fall history, fear of falling, and psychological aspects. The results of a multiple regression analysis identified knee osteoar- thritis severity before intervention, depression and fear of falling at 1 and 3 months into intervention, and depression at 1 month after completion of intervention as factors affecting the PCS, which showed that depression and fear of falling affected physical func- tioning during exercise therapy. This finding suggests the need for not only an approach to address objective knee osteoarthritis severity, but also an approach to address subjective severity, a psychological

and social approach, and lifestyle guidance including how to prevent falls. Meanwhile, the MCS showed a weak negative correlation with instrumental ADL and a moderate correlation with depression at 1 month into intervention, as well as a moderate negative correlation with depression and fear of falling at 1 month after completion of intervention. The results of multiple regression analysis identified depression before intervention, and fear of fall- ing after completion of intervention as factors affecting the MCS. This demonstrated that depression and fear of falling are factors that potentially affect HRQOL.

An association between HRQOL and depression has been re- ported in various diseases; Margiotta et al. [24] and Shrestha et al. [25,26] described the associations between systemic lupus ery- thematosus (SLE) and HRQOL plus depression and between human immunodeficiency virus (HIV) infection and HRQOL plus depres- sion, respectively. Moreover, both studies described the need for a psychological and social approach. Shah et al. [27]also wrote about the simultaneous need for pain therapy and an approach to depression to address the association between treatment for depression and HRQOL in adults with arthritis.

The present study showed that depression is also associated with HRQOL in knee osteoarthritis, suggesting that a psychological and social approach is effective in improving HRQOL.

With regards to fear of falling, Simsek et al. [28] reported that elderly women aged 80 years or above are afraid of falling, and that fear of falling tends to be especially strong in those living alone and in women. An exercise therapy approach is also necessary in elderly female knee osteoarthritis patients aged 80 years or older to address their fear of falling. The results of the present study suggest the need to investigate the efficacy of a psychological and social approach, to compare different motor disorders in the elderly, and to monitor changes over time.

Regarding the relationship between knee osteoarthritis and psychological factors, Tanaka et al. [29] established a prediction model that takes into account psychological factors for knee osteoarthritis. They noted that the accuracy of the prediction model, which takes into account pain-related emotional and/or cognitive characteristics, is moderate for pain relief in patients with knee osteoarthritis receiving conservative treatment. A few studies reported the relationship between mental health and knee osteoarthritis [30], and it is necessary to conduct inter- vention studies on psychosocial factors in order to verify their effects.

The first limitation of this study is that the JOA score is useful for evaluating knee osteoarthritis, but the evaluation of the knee joint function such as muscle strength, walking distance and balance evaluation was insufficient. It is necessary to evaluate knee joint function in detail and to verify the relationship between the JOA score and psychological factor. Second, the survey period after rehabilitation intervention is short. Future studies should verify the long-term progress after the rehabilitation intervention is

completed.

Conclusion

We have concluded that elderly patients with knee osteoar- thritis require not only intervention for knee function, but also psychological intervention to address decreased activity and depression to improve their HRQOL.

Declaration of Competing Interest

The authors declare no conflict of interest.

Acknowledgments

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補足資料

Fig.1【膝関節機能（JOA スコア）推移】

正規性の検定

kolmogorov-smirnov の正規性検定で有意確立の値が 0.05 未満であり、正規分布をしていないという対立仮説が採用されたため、ノンパラメトリック検定を行う。

正規性の検定

	Kolmogorov-Smirnov の正規性の検定（探索的）[a]			Shapiro-Wilk		
	統計量	自由度	有意確率.	統計量	自由度	有意確率.
介入前	.228	62	.000	.849	62	.000

a. Lilliefors 有意確率の修正

フリードマン検定

フリードマン検定の仮説は“リハ開始前、開始後 1 ヵ月、3 ヵ月、終了後の JOA スコアに差はない”となるが、有意確率が 0.000 であり、仮説は棄てられる。よって、“リハ開始前からリハ終了時までの JOA スコアに差がある“ことがわかる。

検定統計量[a]

N	62
カイ 2 乗	160.621
自由度	3
漸近有意確率	.000

a. Friedman 検定

多重比較

ウィコクスンの符号付順位検定で、仮説は“リハ開始前と開始後 1 ヵ月の JOA スコアは等しい”
“リハ開始前と開始後 3 ヵ月の JOA スコアは等しい“、”リハ開始前と終了後の JOA スコアは等しい“であるが、有意確率がいずれも 0.000 であり、どの組み合わせにおいても差があるといえる。

検定統計量[b]

	一カ月 - 介入前	三ヵ月 - 介入前	終了後 - 介入前
Z	-4.644[a]	-6.872[a]	-6.894[a]
漸近有意確率（両側）	.000	.000	.000

a. 負の順位に基づく

b. Wilcoxon の符号付き順位検定

Fig.2【身体的サマリースコア(PCS) 推移】

正規性の検定

kolmogorov-smirnovの正規性検定で有意確立の値が0.05未満であり、正規分布をしていないという対立仮説が採用されたため、ノンパラメトリック検定を行う。

正規性の検定

	Kolmogorov-Smirnov の正規性の検定 (探索的)[a]			Shapiro-Wilk		
	統計量	自由度	有意確率.	統計量	自由度	有意確率.
介入前	.285	62	.000	.852	62	.000

a. Lilliefors 有意確率の修正

フリードマン検定

フリードマン検定の仮説は“リハ開始前、開始後 1 ヵ月、3 ヵ月、終了後の身体的サマリースコアに差はない”となるが、有意確率が 0.162>有意水準α＝0.05 であり、仮説は成立することがわかる。

検定統計量[a]

N	62
カイ 2 乗	5.141
自由度	3
漸近有意確率	.162

a. Friedman 検定

Fig.3 【精神的サマリースコア(MCS) 推移】

正規性の検定

kolmogorov-smirnov の正規性検定で有意確立の値が 0.05 未満であり、正規分布をしていないという対立仮説が採用されたため、ノンパラメトリック検定を行う。

正規性の検定

	Kolmogorov-Smirnov の正規性の検定 (探索的)[a]			Shapiro-Wilk		
	統計量	自由度	有意確率.	統計量	自由度	有意確率.
介入前	.295	62	.000	.867	62	.000

a. Lilliefors 有意確率の修正

フリードマン検定

フリードマン検定の仮説は“リハ開始前、開始後 1 ヵ月、3 ヵ月、終了後の精神的サマリースコアに差はない”となるが、有意確率が 0.5>有意水準α＝0.05 であり、仮説は成立することがわかる。

検定統計量[a]

N	62
カイ 2 乗	2.364
自由度	3
漸近有意確率	.500

a. Friedman 検定

Fig.4【転倒恐怖感(FES) 推移】

正規性の検定

kolmogorov-smirnov の正規性検定で有意確立の値が 0.05 未満であり、正規分布をしていないという対立仮説が採用されたため、ノンパラメトリック検定を行う。

正規性の検定

	Kolmogorov-Smirnov の正規性の検定 (探索的)[a]			Shapiro-Wilk		
	統計量	自由度	有意確率.	統計量	自由度	有意確率.
介入前	.225	62	.000	.907	62	.000

a. Lilliefors 有意確率の修正

フリードマン検定

フリードマン検定の仮説は“リハ開始前、開始後 1 ヵ月、3 ヵ月、終了後の転倒恐怖感に差はない”となるが、有意確率が 0.000 であり、仮説は棄てられる。よって、“リハ開始前からリハ終了時までの転倒恐怖感に差がある“ことがわかる。

検定統計量[a]

N	62
カイ 2 乗	157.981
自由度	3
漸近有意確率	.000

a. Friedman 検定

多重比較

ウィコクスンの符号付順位検定で、仮説は“リハ開始前と開始後 1 ヵ月の転倒恐怖感は等しい”、“リハ開始前と開始後 3 ヵ月の転倒恐怖感は等しい “、” リハ開始前と終了後の転倒恐怖感は等しい “となる。ボンフェローニの不等式を利用して、有意確率が $\alpha/3=0.05/3$ より小さい組み合わせのところに差があるとする。有意確率がいずれも 0.05/3 より小さく、どの組み合わせにおいても差があるといえる。

検定統計量[b]

	一カ月 - 介入前	三ヵ月 - 介入前	終了後 - 介入前
Z	-3.255[a]	-6.803[a]	-6.868[a]
漸近有意確率 (両側)	.001	.000	.000

a. 正の順位に基づく

b. Wilcoxon の符号付き順位検定

Fig.5【手段的 ADL(FAI) 推移】

正規性の検定

kolmogorov-smirnov の正規性検定で有意確立の値が 0.05 未満であり、正規分布をしていないという対立仮説が採用されたため、ノンパラメトリック検定を行う。

正規性の検定

	Kolmogorov-Smirnov の正規性の検定 (探索的)[a]			Shapiro-Wilk		
	統計量	自由度	有意確率.	統計量	自由度	有意確率.
介入前	.212	62	.000	.797	62	.000

a. Lilliefors 有意確率の修正

フリードマン検定

フリードマン検定の仮説は“リハ開始前、開始後 1 ヵ月、3 ヵ月、終了後の手段的 ADL に差はない”となるが、有意確率が 0.000 であり、仮説は棄てられる。よって、“リハ開始前からリハ終了時までの手段的 ADL に差がある“ことがわかる。

検定統計量[a]

N	62
カイ 2 乗	155.964
自由度	3
漸近有意確率	.000

a. Friedman 検定

多重比較

ウィコクスンの符号付順位検定で、仮説は“リハ開始前と開始後 1 ヵ月の手段的 ADL は等しい”、“リハ開始前と開始後 3 ヵ月の手段的 ADL は等しい“、”リハ開始前と終了後の手段的 ADL は等しい“となる。ボンフェローニの不等式を利用して、有意確率が $\alpha/3=0.05/3$ より小さい組み合わせのところに差があるとする。有意確率がいずれも 0.05/3 より小さく、どの組み合わせにおいても差があるといえる。

検定統計量[b]

	一カ月 - 介入前	三ヵ月 - 介入前	終了後 - 介入前
Z	-4.241[a]	-6.761[a]	-6.847[a]
漸近有意確率 (両側)	.000	.000	.000

a. 負の順位に基づく

b. Wilcoxon の符号付き順位検定

Fig.6【抑うつ度(GDS) 推移】

正規性の検定

kolmogorov-smirnov の正規性検定で有意確立の値が 0.05 未満であり、正規分布をしていないという対立仮説が採用されたため、ノンパラメトリック検定を行う。

正規性の検定

	Kolmogorov-Smirnov の正規性の検定 (探索的)[a]			Shapiro-Wilk		
	統計量	自由度	有意確率.	統計量	自由度	有意確率.
介入前	.210	62	.000	.929	62	.001

a. Lilliefors 有意確率の修正

フリードマン検定

フリードマン検定の仮説は“リハ開始前、開始後 1 ヵ月、3 ヵ月、終了後の抑うつ度に差はない”となるが、有意確率が 0.618>有意水準α＝0.05 であり、仮説は成立することがわかる。

検定統計量[a]

N	62
カイ 2 乗	1.785
自由度	3
漸近有意確率	.618

a. Friedman 検定

【考察】

フリードマン検定では膝関節機能（JOA スコア)、手段的 ADL（FAI)、転倒恐怖感（FES）で有意確率が＜0.05 となり、“リハ開始前、開始後 1 ヵ月、3 ヵ月、終了後の膝関節機能・手段的 ADL・転倒恐怖感に差がある”という対立仮説が採用された。さらに、多重比較で JOA スコア、手段的 ADL、転倒恐怖感は各介入時期とリハ開始前とで差があるという対立仮説が採用された。

抑うつ度（GDS）および身体的サマリースコア（PCS)、精神的サマリースコア（MCS）ではフリードマン検定で有意差がなく、各時期において抑うつ度および身体的サマリースコア、精神的サマリースコアは差がないといえる。

以上の結果からリハ介入により、膝関節機能、手段的 ADL、転倒恐怖感は有意に改善したが、抑うつ度と健康関連 QOL の身体的サマリースコア、精神的サマリースコアに関してはリハ介入後も有意な改善が認めないことがわかった。