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Effectiveness of Patient Education on Patellofemoral Pain Syndrome: A Randomized Controlled Study

Patellofemoral Ağrı Sendromunda Hasta Eğitiminin Etkinliği: Randomize Kontrollü Çalışma

Mustafa YALÇIN[a], Meltem IŞINTAŞ ARIK[b], Uğur SÖZLÜ[c], Salim Murat KADAĞAN[d]

[a]Clinic of Physiotherapy and Rehabilitation, Bursa Çekirge State Hospital, Bursa, TURKIYE
[b]Department of Physiotherapy and Rehabilitation, Kütahya Health Sciences University Faculty of Health Science, Kütahya, TURKIYE
[c]Department of Physiotherapy and Rehabilitation, Tokat Gaziosmanpaşa University Faculty of Health Science, Tokat, TURKIYE
[d]Clinic of Sports Medicine, Bursa City Hospital, Bursa, TURKIYE

ABSTRACT Objective: The aim of this study was to evaluate the effectiveness of the routine physiotherapy program and the education program given to individuals diagnosed with patellofemoral pain syndrome (PFPS) on pain, daily life activities, kinesiophobia, quality of life and functional status. **Material and Methods:** The study included 68 patients who were diagnosed with PFPS. The participants included in the study were randomly divided into 2 groups as control (routine physiotherapy and rehabilitation) and study (routine physiotherapy and rehabilitation+patient education). Visual analogue scale, Knee Outcome Survey Activities of Daily Living, Tampa, EQ-5D-5L, Kujala scales were filled by the participants before and after treatment and at the 6th week. **Results:** Comparing preand post treatment values, significant improvements were found in pain, functionality, activities of daily living and quality of life of both groups ($p<0.05$). However, at the end of the 6th week, it was determined that the study group had significantly better values than the control group in all parameters ($p<0.05$). **Conclusion:** In addition to other routine physiotherapy program in PFPS, patient education was found to be more effective in reducing the pain and kinesiophobia of the patient, increasing daily life activities, functional status and quality of life at 6 weeks follow-up than the routine physiotherapy program. Therefore, it should be remembered that physical activity regulation, life style changes, in short, patient education is the main component of rehabilitation in PFPS. However, with the patient education, we think that the patient will be able to manage himself and hence health expenses can be reduced.

Keywords: Patellofemoral pain syndrome; patient education handout; functional status

ÖZET Amaç: Bu çalışmada amacımız, patellofemoral ağrı sendromu (PFAS) tanılı bireylere, rutin fizyoterapi ve ek olarak verilen eğitim programlarının ağrı, günlük yaşam aktiviteleri, kinezyofobi, yaşam kalitesi ve fonksiyonel durum üzerine olan etkilerini incelemekti. **Gereç ve Yöntemler:** Bu çalışmaya 68 PFAS tanısı alan hasta dâhil edildi. Hastalar rastgele olarak kontrol (rutin fizyoterapi ve rehabilitasyon) ve çalışma (rutin fizyoterapi ve rehabilitasyon+hasta eğitimi) grubu olarak ikiye ayrıldı. Tedavi öncesi, sonrası ve 6. haftada vizüel analog skala, Diz Sonlanım Anketi-Günlük Yaşam Aktiviteleri, Tampa, EQ-5D-5L, Kujala ölçekleri katılımcılar tarafından doldurduldu. **Bulgular:** Tedavi öncesi ve sonrası değerler karşılaştırıldığında, her 2 grupta da ağrı, fonksiyonellik, günlük yaşam aktiviteleri ve yaşam kalitesi açısından anlamlı gelişmeler görüldü ($p<0,05$). Bununla birlikte, çalışma grubunun 6. hafta sonunda tüm parametrelerde kontrol grubuna göre daha iyi verilere sahip olduğu tespit edildi ($p<0,05$). **Sonuç:** PFAS'de rutin fizyoterapi programına ek olarak verilen hasta eğitiminin, hastanın ağrı ve kinezyofobisini azaltmada, günlük yaşam aktiviteleri, fonksiyonel durum ve yaşam kalitesini artırmada rutin fizyoterapi programına göre 6 haftalık takipte daha etkili olduğu bulundu. Bu nedenle PFAS'de fiziksel aktivite düzenlemesi, yaşam tarzı değişiklikleri kısacası hasta eğitiminin rehabilitasyonun temel bileşeni olduğu unutulmamalıdır. Hastaya verilecek hasta eğitimi ile hastanın, kendi kendini yönetmeyi başarabileceğini ve dolayısıyla sağlık harcamalarının azaltılabileceğini düşünmekteyiz.

Anahtar Kelimeler: Patellofemoral ağrı sendromu; hasta eğitim broşürü; fonksiyonel durum

Patellofemoral pain syndrome (PFPS) is a common, multifaceted knee injury that accounts for 16.5% of all consultations in clinics.[1] Patellofemoral pain is the most common knee complaint, which affects 6-7% of the adolescent population. Pain in this syndrome can affect function and health-related qual-

Correspondence: Mustafa YALÇIN
Clinic of Physiotherapy and Rehabilitation, Bursa Çekirge State Hospital, Bursa, TURKIYE/TÜRKİYE
E-mail: pt.mustafayalcin@gmail.com

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ity of life and usually persists for a long time.[2] In one study, 71% to 91% of individuals report the presence of chronic pain that persists for up to 20 years after the initial diagnosis.[3]

It is assumed that an interaction between biomechanical, anatomical, psychosocial, and behavioral factors causes pain in PFPS.[4] It has been emphasized that the non-surgical treatment of PFPS is generally contains a multimodal/combined approach, and includes patient education, exercise, taping, orthosis approach, soft tissue manipulation, acupuncture, and other adjunctive treatments.[5] Although multimodal treatments have been developed for PFPS, 57% of the patients reported negative results after 5-8 years and the need for alternative methods was emphasized.[6]

The number of studies directly evaluating the effectiveness of education in PFPS is limited. Even though increasing emphasis has recently been placed on studies on patient education, the available evidence is quite insufficient. Despite this, patient education in the treatment of PFPS is considered a vital element by experts.[7] It is stated in the literature that, in musculoskeletal system injuries, it is considered clinically reasonable to use patient education in conjunction with other interventions rather than as an independent intervention until its ineffectiveness is established.[8] It is difficult to evaluate patient education in the clinic. Because the concept of education is open-ended. Verbal advice given to the patient is in the domain of patient education, while a more detailed brochure, video, or smartphone application prepared for preventive and therapeutic purposes are also part of it. Therefore, patient education in the clinic is divided into two groups as structured and non-structured.[8] In PFPS, guidelines have been created regarding the content of the education, but its effectiveness in patients has been evaluated in few studies, and it has not been specified whether the education program created was structured or not. In this study, it was aimed to examine the effects of the routine physiotherapy program and the additional education program on pain, daily living activities, kinesiophobia, quality of life, and functional status in individuals with PFPS. Also, we hypothesized that patient education given in addition to a routine physiotherapy program is effective in the treatment of PFPS.

MATERIAL AND METHODS

PARTICIPANTS

The patients included in the study were selected among individuals who were admitted to Çekirge State Hospital Physical Therapy Outpatient Clinic and were examined by a physical medicine and rehabilitation specialist and diagnosed with PFPS.

The inclusion criteria were as follows: 1) diagnosis of PFPS by a specialist physician, 2) history of patellofemoral pain for at least 3 months, 3) having the worst pain intensity level of 3 and above according to the visual analogue scale (VAS), 4) having pain in at least one of the patellar compression or palpation of the patellar facets on clinical evaluatio and 5) having pain triggered by at least two of the following activities: ascending or descending stairs, jumping, running, sitting for a long time, squatting, or kneeling.

The exclusion criteria were as follows: 1) meniscus or other injuries of the knee joint, 2) a damage to the cruciate or collateral ligaments, 3) knee pathologies such as osteoarthritis and chondromalesis, 4) Osgood-Schlatter or Sinding-Larsen Johanssen syndrome, 5) knee laxity significant knee joint effusion, 6) having pain reflected from the hip or lumbar spine to the knee, 7) recurrent patellar subluxation or dislocation and previous surgery in the knee joint, 8) using nonsteroidal anti-inflammatory drugs or cortisone for the last 3 months, 9) patients who have previously had physical therapy for the knee region, and 10) patients who were absent for more than 2 treatment sessions were not included in the study.[9]

The study was approved by the Ethics Committee of Kütahya Health Sciences University (date: 19.03.2019, number: 41997688-402.03.01) and Ministry of Health Bursa Provincial Health Directorate (date: 17.05.2019, number: '69124690-799'-E.1510). Informed consent forms were obtained from all patients. The study was conducted in accordance with the principles of the Helsinki Declaration.

DESIGN

This prospective randomized study was carried out between May and September in 2019. Seventy voluntary patients who applied to the clinic at our hos-

pital complaining of knee pain were diagnosed with PFPS by a physical medicine and rehabilitation specialist. Two patients who did not meet the inclusion criteria were excluded from the study, and 68 patients (44 female, 24 male) were divided into two groups (control: 34 and study: 34 groups). In this study, randomization was performed by an online computer. The data of the study was entered at https://www.randomizer.org and randomization was created (Access date: 25.03.2019). The details of including and excluding subjects through to final data analysis were provided as a flowchart in Figure 1. For eliminating selection bias, a balance was achieved in terms of the number of individuals between the groups. All evaluations were made by the same physiotherapist (M.Y) and at the same time of the day. While only a routine physiotherapy treatment program was provided to the control group, patient education was also given to the study group in addition to the routine treatment program.

The post-hoc power analysis was performed using G*Power package software program (G*Power, Version 3.0.10). The results of VAS parameters was used to estimate the sample size. We calculated that a sample consisting of 68 participants (34 per group) was needed to obtain 90% power with d=0.32 effect size, α=0.05 type I error.

INTERVENTIONS

Physiotheraphy Treatment: The same physiotherapist who was blinded to the evaluations performed the application of transcutaneous electrical nerve stimulation (TENS) for 20 minutes and hot packs for 20 minutes on the affected knee/knees, which are part of routine physiotherapy programs. The physiotherapist who performed the application was told not to give any advice to the patients. In the first week, 5 sessions were completed in this way. In the second week, in addition to the hotpacks and TENS program, the patients were given a weight between 1 and 2 kg, and 20 repetitions of resistance exercises were performed for the quadriceps muscle in sitting position. During this exercise, the patient was asked to let go of the knee rather slowly. Therefore, the patient was enabled to perform both concentric and eccentric contractions at the same time.

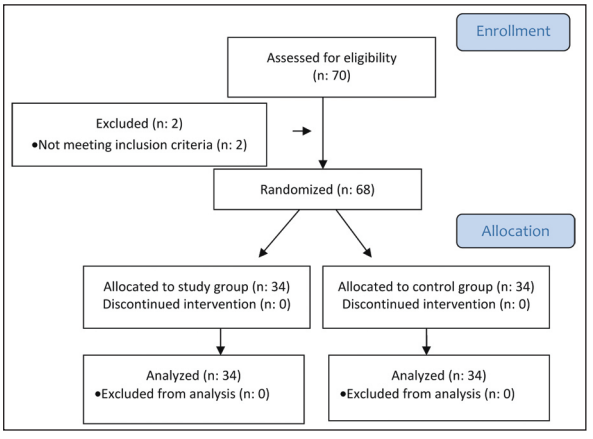

FIGURE 1: Flowchart.

Patient Education: Patient education was carried out face-to-face in the first two weeks (two days a week) and the information obtained by the patients was checked in the form of questions and answers, and the clarity of the brochure was verbally confirmed by this way. Between weeks 2 and 6, exercises and lifestyle changes were followed up by phone calls once a week. The education period took an average of 35 minutes for each patient and was carried out in a quiet room. This education was given by the physiotherapist who conducted the study.

In patient education, the educational brochure developed by Barton et al. based on feedbacks received from 21 clinical academicians and 20 PFPS patients was used (Figure 2).[7] Under the title of the main factors of the brochure, there are information including the definition of PFPS, the biomechanical factors that cause it, the biomechanical factors to be considered, and the basic keys of treatment. Permission was obtained from Christ Barton for the use of the Turkish version of the brochure.

MEASUREMENTS

An evaluation form developed by the authors and inquiring about the participants' gender, background and family history, age, height, weight, profession, and education was administered via face to face interviews. Pre-treatment, post-treatment, and 6th week evaluations of all patients were conducted.

Pain Level: The severity of knee pain (rest pain) was evaluated using VAS. No pain and the most un-

FIGURE 2: Educational brochure.[7]

bearable pain condition were written on both ends of a horizontally positioned 10 centimeter line.[10]

Daily Living Activity Status*:* Knee Outcome Survey Activities of Daily Living (KOSADL) was used to measure the symptoms and functional limitations experienced by people during daily activity.[11,12]

Kinesiophobia: Tampa scale of kinesiophobi, which consists of 17 questions, evaluates the person's fear of moving or re-injury, and accordingly avoidance.[13,14]

Quality of Life: The EQ-5D-5L questionnaire was used to measure the patients' health-related quality of life.[15]

Functional Satus: To evaluate functional status, the Kujala questionnaire was used, which consists of 13 questions, points obtained from all questions are added.[16,17]

STATISTICAL ANALYSIS

The analysis of the data obtained in the present study was performed using the "Statistical Package for Social Sciences" (SPSS) program, version 22.0 (SPSS

inc. Chicago, IL, USA). Whether the distribution of the numerically measured variables is suitable for normal distribution was investigated by the Shapiro-Wilk test and appropriate graphical methods. Descriptive statistics of the numerical variables with normal distribution are expressed as X±SD, and descriptive statistics of numerical variables that did not show normal distribution are expressed as median (inter quantile range). Normally distributed numeric variables related to age, body mass index (BMI), and non-normally distributed variables related to average duration of complaints (ADC), VAS, KOSADL, Kujala, Tampa, and EQ-5D-5L scores were assessed with the independent Sample t-test and the Mann-Whitney U test, respectively. Gender differences, affected sides, and education levels were compared using the Chi-square or Fischer Exact tests. The Friedman test has been used for comparing the means of two groups' pre, post, and sixth week treatment results. Statistical significance level was set at $p<0.05$. The effect size was calculated with Cohen's d to determine the practical significance of the results obtained. As a general recommendation, Cohen says that if the d value is less than 0.2, the effect size can be defined as weak, if it is 0.5, it can be defined as medium, and if it is greater than 0.8, it can be defined as strong.[18]

RESULTS

The demographic parameters of both groups are presented in Table 1. The mean age was 43.6±9.6 years in the control group and 39.6±11.2 years in the study group. The BMI of the patients was 28.7±0.6 kg/m^2 in control group and 27±4.2 kg/m^2 in study group. There was no statistically significant difference between the groups in terms of age, BMI, pain duration, affected side, education level, and pre-treatment KOSADL (control: 56.5±24.4, study: 54.6±19.7) Kujala (control: 50.6±20.2, study: 50±20.2), Tampa (control: 45.5±6.6, study: 46.2±11.6), and EQ-5D-5L (control: 2.6±0.9, study: 2.6±1.2) values ($p>0.05$). A statistically significant difference was found in terms of gender distribution ($p<0.05$) (Table 2).

TABLE 1: Demographic characteristics of the groups.

	Control (n: 34)	Study (n: 34)	p value
Age (years) (X±SD)	43.6±9.6	39.6±11.2	0.300
BMI (kg/m^2) (X±SD)	28.7±0.6	27±4.2	0.700
Gender [n (%)]			0.042*
Female	26 (76.5)	18 (52.9)	
Male	8 (23.5)	16 (47.1)	
ADC (months)	5.5 (3-12)	6 (3-12)	0.737
Affectedside [n (%)]			0.675
Right	11 (32.4)	12 (35.3)	
Left	3 (8.8)	5 (14.7)	
Bilateral	20 (58.8)	17 (50)	
Education [n (%)]			0.100
Primary school	7 (20.6)	3 (8.8)	
Secondary school	7 (20.6)	6 (17.6)	
High school	15 (44.1)	12 (35.3)	
University	4 (11.8)	13 (38.2)	
Postgraduate	1 (2.9)	-	
KOSADL [Median (IQR)]	59.9 (31.4-78.9)	55.7 (35.7-73.2)	0.654
Kujala [Median (IQR)]	54 (35.2-64)	52 (41-54)	0.980
Tampa [Median (IQR)]	41.5 (46.5-50.2)	47.5 (41-54)	0.387
EQ-5D-5L [Median (IQR)]	0.73 (0.46-0.83)	0.74 (0.48-0.81)	0.990

*p<0.05; X: Mean; SD: Standart deviation; IQR: Inter-quartile range; BMI: Body mass index; ADC: Average duration of complaints; KOSADL: Knee Outcome Survey Activities of Daily Living.

TABLE 2: Intra-group comparison of VAS, KOSADL, Tampa, EQ-5D-5L, and Kujala values of the patients.

Variable Changes	Group	Pre-treatment Median (IQR)	Post-treatment Median (IQR)	Sixth week Median (IQR)	χ^2	Cohen's d	p value
VAS (cm)	Control (n: 34)	6.5 (5.4-7.5)^x	6 (5-6.5)^y	5.5 (4.5-6)^z	40.807	Pre-Post: 0.60	**0.000***
						Pre-6. week: 0.92	
						Post-6. week: 0.33	
	Study (n: 34)	7 (6-7.5)^x	5 (4-5.5)^y	3 (2-3.6)^z	61.733	Pre-Post: 1.49	**0.000***
						Pre-6. week: 3.10	
						Post-6. week: 1.49	
KOSADL	Control (n: 34)	60 (31-79)^x	68 (45-79)^y	70 (49-82)^z	19.188	Pre-Post: 0.24	**0.000***
						Pre-6. week: 0.38	
						Post-6. week: 0.15	
	Study (n: 34)	56 (36-73)^x	69 (55-76)^y	86 (79-92)^z	61.188	Pre-Post: 0.61	**0.000***
						Pre-6. week: 2.09	
						Post-6. week: 1.61	
Tampa	Control (n: 34)	47 (42-50)^x	45 (40-49)^x	46 (42-50)^x	1.625	Pre-Post: 0.10	0.444
						Pre-6. week: 0.03	
						Post-6. week: 0.15	
	Study (n: 34)	48 (41-54)^x	44 (38-50)^y	42 (31-47)^z	28.429	Pre-Post: 0.36	**0.000***
						Pre-6. week: 0.61	
						Post-6. week: 0.29	
EQ-5D-5L	Control (n: 34)	0.73 (0.46-0.82)^x	0.75 (0.70-0.83)^y	0.80 (0.72-0.91)^z	32.388	Pre-Post: 0.42	**0.000***
						Pre-6. week: 0.72	
						Post-6. week: 0.29	
	Study (n: 34)	0.74 (0.48-0.8)^x	0.76 (0.75-0.83)^y	0.96 (0.76-1)^z	43.381	Pre-Post: 0.63	**0.000***
						Pre-6. week: 1.29	
						Post-6. week: 0.82	
Kujala	Control (n: 34)	54 (35-64)^x	54 (43-63)^{x,y}	55 (45-72)^y	12.017	Pre-Post: 0.20	**0.002***
						Pre-6. week: 0.35	
						Post-6. week: 0.15	
	Study (n: 34)	52 (41-65)^x	68 (56-73)^y	84 (80-88)^z	53.734	Pre-Post: 0.62	**0.000***
						Pre-6. week: 1.65	
						Post-6. week: 1.06	

^{x,y,z}Different letters within the same line indicate significant difference; *p<0.05; VAS: Visual analogue scale; KOSADL: Knee Outcome Survey Activities of Daily Living; IQR: Inter-quartile range; Pre: Pre-treatment; Post: Post-treatment; 6. week: Sixth week treatment.

The findings showed that both methods were effective in reducing pain (p<0.05); however, the education given in addition to the routine physiotherapy program was found to be more effective in reducing pain as indicated by values obtained right after the treatment and at week 6 (TS; z: -2.493, p: 0.013, 6th week; z: -5.596), (p: 0.000).

It was observed that both methods were effective in increasing daily living activities (p<0.05), but the education given in addition to the routine physiotherapy program was more effective in increasing the activities of daily living at week 6 (z: -4.236, p: 0.000).

It was observed that only the education given in addition to the routine physiotherapy program was effective in reducing kinesiophobia (p<0.005). At the follow-up week 6, a difference was found between the groups in favor of the education group (z: -2.377, p: 0.017).

When the quality of life was examined, it was seen that both methods were effective (p<0.05), but the education given in addition to the routine physiotherapy program was more effective in increasing the quality of life at week 6 (z: -2.288, p: 0.003).

Finally, it was found that the education given in addition to the physiotherapy program (p<0.005) was effective in increasing functionality. After the treatment (z: -2.350, p: 0.019) and at follow-up week 6 (z: -5.390, p: 0.000), there was a difference between groups in favor of the education group (Table 3).

TABLE 3: Comparison of VAS, KOSADL, Tampa, EQ-5D-5L, Kujala values of the cases between groups.

	Control (n: 34) Median (IQR)	Study (n: 34) Median (IQR)	z	Cohen's d	p value
VAS-Pre	6.5 (5.4-7.5)	7 (6-7.5)	-1.250	0.30	0.211
VAS-Post	6 (5-6.5)	5 (4-5.5)	-2.493	0.57	**0.013***
VAS-6. week	5.5 (4.5-6)	3 (2-3.6)	-5.596	1.85	**0.000***
KOSADL-Pre	60 (31-79)	56 (36-73)	-0.448	0.08	0.654
KOSADL-Post	68 (45-79)	69 (55-76)	-0.319	0.18	0.750
KOSADL-6. week	70 (49-82)	86 (79-92)	-4.236	1.24	**0.000***
Kujala-Pre	54 (35-64)	52 (41-65)	-0.025	0.03	0.980
Kujala-Post	54 (43-63)	68 (56-73)	-2.350	0.41	**0.019***
Kujala-6. week	55 (45-72)	84 (80-88)	-5.390	1.33	**0.000***
Tampa-Pre	47 (42-50)	48 (41-54)	-0.866	0.07	0.387
Tampa-Post	45 (40-49)	44 (38-50)	-0.725	0.30	0.469
Tampa-6. week	46 (42-50)	42 (31-47)	-2.377	0.70	**0.017***
EQ-5D-5L-Pre	0.73 (0.46-0.82)	0.74 (0.48-0.8)	-0,12	0.07	0.990
EQ-5D-5L-Post	0.75 (0.70-0.83)	0.76 (0.75-0.83)	-1.176	0.25	0.240
EQ-5D-5L-6. week	0.80 (0.72-0.91)	0.96 (0.76-1)	-2.288	0.67	**0.003***

*p<0.05; VAS: Visual analogue scale; KOSADL: Knee Outcome Survey Activities of Daily Living; IQR: Inter-quartile Range; Pre: Pre-treatment; Post: Post-treatment; 6. week: Sixth week treatment.

DISCUSSION

This is the first study in Turkey examining patient education in PFPS. In the study, the effects of the routine physiotherapy program and the additional education program on pain, activities of daily living, kinesiophobia, quality of life, and functional status on individuals diagnosed with PFPS were examined. It was seen in the present study that both methods were effective in reducing pain and the education given in addition to the routine physiotherapy program after the treatment improved functional outcomes; however, the education given in addition to the physiotherapy program was more effective after the treatment and in follow-up week 6. It was found that both methods were effective in increasing daily life activities and quality of life and in reducing kinesiophobia, but the education given in addition to the physiotherapy program was more effective in follow-up week 6.

Current research on PFPS places less emphasis on patient education, and exercise therapy and passive additional therapies have been emphasized more. Barton et al. reported that, although there is no evidence for its isolated effects, patient education is critical in the treatment of PFPS. There exist few sources in the literature regarding the content of the education to be given to the patient with PFPS. Barton et al. published a brochure based on data from the literature and opinions of international experts, and the latest version of this brochure was updated according to the feedback of patients and clinicians.[7] The patient education brochure used in our study was the most up-to-date version prepared by Barton et al.[7]

Another subject of discussion in the literature is about how often physiotherapists should use patient education strategy in the treatment of PFPS. Smith et al. conducted an online survey and received response from 99 physiotherapists. It was observed that a wide range of management strategies are used by physiotherapists regarding PFPS treatment. "Education and counseling strategy" was identified as the second most preferred treatment strategy with 96%.[19] Barton et al. argued that physiotherapists should use patient education actively in PFPS, and that it is time to use patient education to raise awareness of patients about lifestyle changes.[20]

In a review on patient education for the management of musculoskeletal injuries, Randhawa et al. stated that patient education is classified as structured

and unstructured. They reported that structured patient education included brochures, books, videos, and interventions via the Internet, and that there was little information about its effectiveness in treatment. They stated that, in musculoskeletal injuries, the use of patient education in conjunction with other interventions, rather than as an independent intervention, was considered clinically reasonable until its effectiveness is proven.[8] In our study, the education we give to patients falls into the structured education category. Current evidence is quite insufficient, as studies on patient education have recently been getting attention. Verbal advice given to the patient falls into the topic of patient education as well as a more detailed brochure, video, or a mobile phone application prepared for preventive and treatment purposes is also under the same category. In addition, patient education has been used in many conservative treatment programs, but it has not been clearly reported whether the recommendations given in the education have been fulfilled or not, as well as whether it contributes to recovery. In our study, the brochure used in patient education includes the subtitles of pain formation, physical activity management, and exercise principles. In addition, the educational brochure includes the necessary information on restricting activities that are frequently used in Turkish society and involve excessive knee-bending movements (use of squat toilets, floor table, prayers, etc.) in the acute period.

In the literature, the results of the studies examining the effect of education given to the patient on pain in patients with PFPS are contradictory. The different education contents and durations given to patients in studies, the use of different methods for making comparisons, and various measurement times may be the reason for this contradiction. In our study, it was found that both methods were effective in reducing pain, but the education given in addition to the physiotherapy program was more effective after treatment and at week 6. When these results were examined in terms of clinical significance, it was seen that the effect size was medium and high.

Rathleff et al., conducted a study to investigate the effectiveness of exercise therapy with patient education and patient education alone in 121 individuals with PFPS between the ages of 15-19 years, and reported that exercise and education were found to be more effective in reducing pain compared to the group that only received education. Patient education included methods of coping with pain in PFPS and provided to the patient and their parents in a 30-minute session. The measurements in the study were made at months 3, 6, 12, and 24. In the study, KOS-ADLS and EQ-5D scores were found to be more significant at month 3 compared to the group that only received education, and it was emphasized that these patients were always more likely to recover.[21]

In studies examining daily life activities in patients with PFPS, different education contents and durations given to patients, using different methods for comparisons, and making measurements at different times cause contradictory results.[21-23] Contrary to the results of Esculier et al., it was found in our study that, similar to the literature, both methods were effective in increasing daily living activities, but the education given in addition to the physiotherapy program was more effective in follow-up week 6. When these results were examined in terms of clinical significance, it was seen that the effect size was the highest in week 6.[23]

In our study, the EQ-5D-5L scale, which is a scale that evaluates a total of five factors including anxiety and pain, and examines the physical symptoms as well as the psychological symptoms of the individuals participating in the study, was used. As a result, it was found that both methods were effective in increasing the quality of life, but the education given in addition to the physiotherapy program was more effective in follow-up week 6. When these results were analyzed in terms of clinical significance, it was seen that the effect size was at a medium level.

Fear of movement due to pain (kinesiophobia) may occur in patients with PFPS. This fear is sometimes caused by pain, and sometimes due to lifestyle modifications that are recommended to patients in the acute phase or given in patient education. It was observed that the patient had a high level of kinesiophobia when there were many suggestions about the actions that patients should protect themselves and avoid in the acute period in the educational content of

some studies.[24-26] Laerum et al. emphasized the need to focus on the correct biomechanical positions in education on the lower extremity. They stated that a traditional and generalizing advice to the patient could increase kinesiophobia.[27] No studies evaluating kinesiophobia in patient education of patients with PFPS were found in the literature. In our study, unlike Hott A et al., it was found that both methods were effective in reducing kinesiophobia, but the education given in addition to the routine physiotherapy program was more effective in follow-up week 6. When these results were examined in terms of clinical significance, it was seen that the effect size was medium and high.[9]

It was observed that the Kujala values obtained in the present study supported the literature, and they increased in the education provided in addition to the routine physiotherapy program, before, after, and week 6 measurements. In the group that received routine physiotherapy, no change was observed after the treatment. It was found that the education given in addition to the routine physiotherapy program was more effective in improving functionality after the treatment and at week 6. When these results were examined in terms of clinical significance, it was seen that the effect size was medium and high.

Patients in the study group we trained may have participated in the treatment more actively, as their awareness of their own diseases increased. This situation has increased the patient's autonomy and enabled him to have a more control over his own disease. At 6 weeks, the control group had no awareness of the disease compared to the study group.

CONCLUSION

As a result, the patient education given in PFPS in addition to the routine physiotherapy program was found to be more effective in reducing the pain and kinesiophobia of the patient and increasing the daily life activities, functional status, and quality of life compared to the routine physiotherapy program in follow-up week 6. Therefore, it should be noted that physical activity programs, lifestyle changes, and patient education are the main components of rehabilitation in PFPS. Since PFPS is a chronic syndrome, these patients may need to consult a healthcare institution at certain times. However, we think that with the patient education, they will be able to manage some problems by themselves to some extent, and therefore, health expenses can be reduced.

LIMITATIONS

There are five important limitations in this study that should be considered when interpreting the data. First, block randomization for the gender variable could be performed, since PFPS is commonly seen in females and it may reveal clinical effect or clinical importance of the study. Second, pain values in our study were measured only when the patients were at rest. Assessment of pain during activity could make the study more effective. Third, the data on whether the participants performed the exercise program or not were collected based on the participant's statement. An objective system that inquired whether the participants were performing their exercises would improve the quality of the study, while reducing the likelihood that an error based on participant statement would affect the study results. Fourth, a statistically significant difference was found in demographic findings in terms of gender distribution of the participants.

Source of Finance

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Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Mustafa Yalçın;* ***Design:*** *Mustafa Yalçın;* ***Control/Supervision:*** *Meltem Işıntaş Arık;* ***Data Collection and/or Processing:*** *Mustafa Yalçın;* ***Analysis and/or Interpretation:*** *Mustafa Yalçın, Uğur Sözlü;* ***Literature Review:*** *Mustafa Yalçın, Meltem Işıntaş Arık;* ***Writing the Article:*** *Mustafa Yalçın;* ***Critical Review:*** *Salim Murat Kadağan;* ***Materials:*** *Salim Murat Kadağan;* ***Statistical Analysis:*** *Salim Murat Kadağan.*

REFERENCES

1. Mølgaard C, Rathleff MS, Simonsen O. Patellofemoral pain syndrome and its association with hip, ankle, and foot function in 16- to 18-year-old high school students: a single-blind case-control study. J Am Podiatr Med Assoc. 2011;101(3):215-22. [Crossref] [PubMed]
2. Collins NJ, Bierma-Zeinstra SM, Crossley KM, van Linschoten RL, Vicenzino B, van Middelkoop M. Prognostic factors for patellofemoral pain: a multicentre observational analysis. Br J Sports Med. 2013;47(4):227-33. [Crossref] [PubMed]
3. Lankhorst NE, Bierma-Zeinstra SM, van Middelkoop M. Risk factors for patellofemoral pain syndrome: a systematic review. J Orthop Sports Phys Ther. 2012;42(2):81-94. [Crossref] [PubMed]
4. Powers CM, Witvrouw E, Davis IS, Crossley KM. Evidence-based framework for a pathomechanical model of patellofemoral pain: 2017 patellofemoral pain consensus statement from the 4th International Patellofemoral Pain Research Retreat, Manchester, UK: part 3. Br J Sports Med. 2017;51(24):1713-23. [Crossref] [PubMed]
5. Barton CJ, Lack S, Hemmings S, Tufail S, Morrissey D. The 'Best Practice Guide to Conservative Management of Patellofemoral Pain': incorporating level 1 evidence with expert clinical reasoning. Br J Sports Med. 2015;49(14):923-34. [Crossref] [PubMed]
6. Lankhorst NE, van Middelkoop M, Crossley KM, Bierma-Zeinstra SM, Oei EH, Vicenzino B, et al. Factors that predict a poor outcome 5-8 years after the diagnosis of patellofemoral pain: a multicentre observational analysis. Br J Sports Med. 2016;50(14):881-6. [Crossref] [PubMed]
7. Barton CJ, Rathleff MS. 'Managing My Patellofemoral Pain': the creation of an education leaflet for patients. BMJ Open Sport Exerc Med. 2016;2(1):e000086. [Crossref] [PubMed] [PMC]
8. Randhawa K, Côté P, Gross DP, Wong JJ, Yu H, Sutton D, et al. The effectiveness of structured patient education for the management of musculoskeletal disorders and injuries of the extremities: a systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMa) Collaboration. J Can Chiropr Assoc. 2015;59(4):349-62. [PubMed] [PMC]
9. Hott A, Brox JI, Pripp AH, Juel NG, Paulsen G, Liavaag S. Effectiveness of isolated hip exercise, knee exercise, or free physical activity for patellofemoral pain: a randomized controlled trial. Am J Sports Med. 2019;47(6):1312-22. [Crossref] [PubMed]
10. Chesworth BM, Culham E, Tata GE, Peat M. Validation of outcome measures in patients with patellofemoral syndrome. J Orthop Sports Phys Ther. 1989;10(8):302-8. [Crossref] [PubMed]
11. Irrgang JJ, Snyder-Mackler L, Wainner RS, Fu FH, Harner CD. Development of a patient-reported measure of function of the knee. J Bone Joint Surg Am. 1998;80(8):1132-45. [Crossref] [PubMed]
12. Evcik D, Ay S, Ege A, Turel A, Kavuncu V. Adaptation and validation of Turkish version of the Knee Outcome Survey-Activities for Daily Living Scale. Clin Orthop Relat Res. 2009;467(8):2077-82. [Crossref] [PubMed] [PMC]
13. Vlaeyen JWS, Kole-Snijders AMJ, Boeren RGB, van Eek H. Fear of movement/(re)injury in chronic low back pain and its relation to behavioral performance. Pain. 1995;62(3):363-72. [Crossref] [PubMed]
14. Yilmaz ÖT, Yakut Y, Uygur F, Uluğ N. [Turkish version of the Tampa Scale for Kinesiophobia and its test-retest reliability]. Fizyoterapi Rehabilitasyon. 2011;22(1):44-9. [Link]
15. Brooks RG, Jendteg S, Lindgren B, Persson U, Björk S. EuroQol: health-related quality of life measurement. Results of the Swedish questionnaire exercise. Health Policy. 1991;18(1):37-48. [Crossref] [PubMed]
16. Kujala UM, Jaakkola LH, Koskinen SK, Taimela S, Hurme M, Nelimarkka O. Scoring of patellofemoral disorders. Arthroscopy. 1993;9(2):159-63. [Crossref] [PubMed]
17. Kuru T, Dereli EE, Yaliman A. Validity of the Turkish version of the Kujala patellofemoral score in patellofemoral pain syndrome. Acta Orthop Traumatol Turc. 2010;44(2):152-6. [Crossref] [PubMed]
18. Cohen J. The analysis of variance. Statistical Power Analysis For The Behavioral Sciences. 2nd ed. Hilsdale: Lawrence Erlbaum Associates; 1988. p.567. [Link]
19. Smith BE, Hendrick P, Bateman M, Moffatt F, Rathleff MS, Selfe J, et al. Current management strategies for patellofemoral pain: an online survey of 99 practising UK physiotherapists. BMC Musculoskelet Disord. 2017;18(1):181. [Crossref] [PubMed] [PMC]
20. Barton CJ, Crossley KM, Macri EM. Should we consider changing traditional physiotherapy treatment of patellofemoral pain based on recent insights from the literature? Br J Sports Med. 2018;52(24):1546-7. [Crossref] [PubMed]
21. Rathleff MS, Roos EM, Olesen JL, Rasmussen S. Exercise during school hours when added to patient education improves outcome for 2 years in adolescent patellofemoral pain: a cluster randomised trial. Br J Sports Med. 2015;49(6):406-12. [Crossref] [PubMed]
22. Rathleff MS, Graven-Nielsen T, Hölmich P, Winiarski L, Krommes K, Holden S, et al. Activity modification and load management of adolescents with patellofemoral pain: a prospective intervention study including 151 adolescents. Am J Sports Med. 2019;47(7):1629-37. [Crossref] [PubMed]
23. Esculier JF, Bouyer LJ, Dubois B, Fremont P, Moore L, McFadyen B, et al. Is combining gait retraining or an exercise programme with education better than education alone in treating runners with patellofemoral pain?A randomised clinical trial. Br J Sports Med. 2018;52(10):659-66. [Crossref] [PubMed]
24. Maclachlan LR, Matthews M, Hodges PW, Collins NJ, Vicenzino B. The psychological features of patellofemoral pain: a cross-sectional study. Scand J Pain. 2018;18(2):261-71. [Crossref] [PubMed]
25. Doménech J, Sanchis-Alfonso V, Espejo B. Changes in catastrophizing and kinesiophobia are predictive of changes in disability and pain after treatment in patients with anterior knee pain. Knee Surg Sports Traumatol Arthrosc. 2014;22(10):2295-300. [Crossref] [PubMed]
26. Maclachlan LR, Collins NJ, Matthews MLG, Hodges PW, Vicenzino B. The psychological features of patellofemoral pain: a systematic review. Br J Sports Med. 2017;51(9):732-42. [Crossref] [PubMed]
27. Laerum E, Indahl A, Skouen JS. What is "the good back-consultation"? A combined qualitative and quantitative study of chronic low back pain patients' interaction with and perceptions of consultations with specialists. J Rehabil Med. 2006;38(4):255-62. [Crossref] [PubMed]