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THE EFFECTS OF TELEREHABILITATION IN RHEUMATIC DISEASES DURING COVID-19 PANDEMIC

ORIGINAL ARTICLE

ABSTRACT

Purpose: This study was designed to investigate the effects of telerehabilitation on fatigue, depression, anxiety, disease activity, sleep quality and quality of life in patients with rheumatic diseases.

Methods: This study included 28 patients with rheumatic diseases. Patients were divided into two groups as intervention group (IG) (n=16) and control group (CG) (n=12). Both groups kept on their regular medical care and an IG group additionally had exercise program. An exercise program including strengthening, stretching, breathing, posture and relaxation exercises was practiced to the IG via video-conference method while no additional therapy was applied to the CG. Assessments were performed using SurveyMonkey to avoid face to face connection. Anxiety and depression were assessed with Hospital Anxiety and Depression Scale (HADS), fatigue was assessed with Fatigue Severity Scale (FSS), sleep quality was assessed with Pittsburg Sleep Quality Index (PSQI) and quality of life was assessed with Health Assessment Questionnaire (HAQ). Additionally, disease activity was evaluated with disease-specific measurements.

Results: Significant differences were found in anxiety (p=0.009), fatigue (p=0.003) and sleep quality (p=0.011) in group-by-time assessments in IG while no significant group-by-time difference were observed in any assessments in CG (p>0.05). No significant differences was observed in delta measurements of fatigue, quality of life, depression, anxiety and sleep quality within groups although patients in IG had better outcomes for all parameters compared to CG (p>0.05).

Conclusion: Telerehabilitation was found to be a safe and effective method for patients with rheumatic diseases.

Keywords: COVID-19, Depression, Fatigue, Rheumatic Diseases, Telerehabilitation

COVID-19 PANDEMİ SÜRECİNDE ROMATİZMAL HASTALIĞI OLAN BİREYLERDE TELEREHABİLİTASYONUN ETKİLERİ

ARAŞTIRMA MAKALESİ

ÖZ

Amaç: Bu çalışma romatizmal hastalığı olan bireylerde telerehabilitasyonun yorgunluk, depresyon, anksiyete, hastalık aktivitesi, uyku kalitesi ve yaşam kalitesi üzerine etkilerini incelemek için tasarlandı.

Yöntem: Çalışmaya romatizmal hastalığı bulunan 28 hasta katıldı. Hastalar çalışma grubu (n=16) ve kontrol grubu (n=12) olmak üzere iki gruba ayrıldı. Çalışma grubuna video-konferans yöntemiyle germe, kuvvetlendirme, solunum, postür ve gevşeme egzersizlerini içeren bir egzersiz programı uygulanırken kontrol grubuna bir uygulama yapılmadı. Değerlendirmeler yüz yüze iletişimi engellemek için SurveyMonkey kullanılarak yapıldı. Anksiyete ve depresyon Hastane Anksiyete ve Depresyon Ölçeği, yorgunluk Yorgunluk Şiddet ölçeği, uyku kalitesi Pittsburg Uyku Kalitesi İndeksi ve yaşam kalitesi Sağlık Değerlendirme Anketi ile değerlendirildi. Hastalık aktivitesi ise hastalığa spesifik ölçümler kullanılarak değerlendirildi.

Sonuçlar: Çalışma grubunda tedavi sonrasında anksiyete (p=0.009), yorgunluk (p=0.003) ve uyku kalitesinde (p=0.011) anlamlı fark elde edilmişken, kontrol grubunda değerlendirilen parametrelerde anlamlı fark gözlenmemiştir (p>0.05). Bununla birlikte, çalışma grubunun değerleri daha iyi olmasına rağmen, yorgunluk, yaşam kalitesi, depresyon, anksiyete ve uyku kalitesi değerlendirmelerindeki değişimlerde gruplar arası anlamlı fark bulunamamıştır (p>0,05).

Tartışma: Romatolojik hastalıklarda telerehabilitasyonun güvenilir ve etkili bir yöntem olduğu görüldü.

Anahtar kelimeler: COVID-19, Depresyon, Romatizmal Hastalıklar, Telerehabilitasyon, Yorgunluk

INTRODUCTION

Telerehabilitation (TR) aims to decrease barriers such as distance, time and cost by using technology to patients and clinicians. It provides to obtain rehabilitation for patients who cannot go to a medical center due to physical, environmental or economic inadequacies (1,2). It is also applied as a complementary method to the traditional treatment. Studies showed that most patients do not continue home exercises after treatment at medical centers (3). In addition, there is a need to update the treatment program with the improvement of functional status of patients. Therefore, TR may be an opportunity to bridge the gap. It has also become popular recently due to the coronavirus disease 2019 (COVID-19) pandemic, which is risky to go to a rehabilitation center and be together with other people (4).

TR has become more popular during the pandemic worldwide. It was found to be a safe, viable, effective and satisfying approach in some chronic diseases like obesity, stroke, osteoarthritis and diabetes mellitus (5, 6). In addition, physiotherapists explained that TR had made patients more self-disciplined in practicing exercises at home and patients' satisfaction was high according to a recent study investigating patients' attitudes and physical therapists' experiences in TR (7). However, there are limited studies investigating the effects of TR in rheumatic diseases. Hand dysfunction were found to be satisfied with TR (8). Ji et al. (9) investigated smartphone management system applications and found the app as providing important data for clinicians, cost-effective and self-management in patients with AS. Therefore, we investigated the effects of TR on disease-related symptoms in rheumatic patients. No adverse events were encountered in patients during exercise sessions.

COVID-19 is a contagious respiratory disease that is caused Severe Acute Respiratory Syndrome causing Coronavirus-2 (SARS-CoV-2) (10). World Health Organization (WHO) was declared COVID-19 as a pandemic in March 2020 (11). Curfew except necessity was applied in some countries and time of curfew varied by country. Social isolation and curfew triggered physical inactivity and an increased sitting time (12). It is important to be active and maintain an exercise routine to preserve mental and physical health. WHO periodically repeats its calls on this issue (13,14).

One hundred and fifty minutes of moderate-intensity exercise or seventy five minutes of intensity exercise are recommended to be continued physical and mental health in general population by the American College of Sports Medicine and WHO (15). Physical inactivity is found to be the fourth reason of mortality. Moreover, physical inactivity and sedentary behavior cause muscle atrophy, muscle weakness, decreased physical capacity, chronic fatigue, obesity, decreased insulin resistance, dyslipidemia and increased the revelation of negative emotions (16,17). 38-72% of patients with rheumatic diseases are known to have physical inactivity, which is higher than general population, according to studies before the COVID-19 pandemic (16).

Patients with rheumatic diseases are at higher risk of infections because of disease activity and immunosuppression (17). In addition, old age and having concomitant chronic disease are among risk factors for coronavirus. Therefore, national health services recommend patients to practice self-isolation and self-quarantine. However, social isolation was concluded with more increased physical inactivity and sedentary lifestyle (18). Physical inactivity and disuse are proven to cause joint destruction, decreased aerobic capacity and muscle atrophy in patients with rheumatic diseases. Increased physical inactivity and sedentary lifestyle are anticipated to lead to worsened disease activity, poor quality of life, decreased functionality and aerobic capacity, poor cardiovascular risk profile and increased mental distress in these patients (16,18). Additionally, exercise has many benefits on musculoskeletal, cardiovascular and immune system and mental health in rheumatic diseases (19). Home-based exercises or TR are more suitable in the context of the pandemic to prevent face-to-face connection. However, supervised exercise program is superior to home-based exercise owing to regu-

larity (20).

The importance and requirement for TR were observed better during the COVID-19 pandemic (21). There are limited studies investigating the effects of TR in rheumatic diseases. Pani et al (8) concluded patients with hand dysfunction due to rheumatic diseases were satisfied with home TR. Ji et al (9) investigated disease management and cost-effectiveness of smartphone management system applications in patients with Ankylosing Spondylitis (AS). Researchers found the app as providing important data for clinicians, cost-effective and self-management for AS patients. Srikesavan et al (22) found uncertainty in pain, function, physical activity and quality of life in patients with RA due to the very low quality of evidence mostly from small single studies. Therefore, aim of this study was to investigate the effects of TR on fatigue, depression, anxiety, sleep quality, disease activity and quality of life in patients with rheumatic diseases.

METHOD

Subjects

This prospective and pretest and posttest design study was carried out in accordance with Declaration of Helsinki and approved from the relevant ethics committee (Fırat University Clinical Research Ethics Committee, 05.11.2020, 2020/15-16). An informed consent form was sent patients by e-mail and asked to sign and resent by e-mail.

Patients who were aged between 18-65 years, followed-up in Fırat University Rheumatology Department, having minimal smartphone or computer usage knowledge or an acquaintance with this information who can help in this regard, having a computer and active internet connection at home and volunteer to participate the study were included in the study. We excluded patients who had changes of medical treatments in the last three months, had malignancy, pregnancy, had more than one rheumatic disease, had dysfunction that limited physical activity such as immobility, had psychiatric disease, being uncooperative, severe neurological involvement.

Study design

Priory sample size calculation section of G*Power 3.1.9.2 program (Software, concept and design of the University of Kiel, Germany, free Windows software by Franz) was used to determine minimum patient number. To calculate the minimum required number of the participants, an effect size was calculated based on the results of Sari et al (25). The effect size was calculated as 1.468. In the power analysis, a one tailed test, an alpha level of 0.05, and a power of 95% was used. As a result, the minimum required sample size was determined as 22, 11 in each groups. Eighty patients with rheumatic diseases were invited to this study between December 2020 and February 2021. Thirty-six of 80 patients were eligible for inclusion in the study. The study included questionnaires as assessment. The questionnaires were administered online using SurveyMonkey to avoid face-to-face contact and prevent virus transmission. Patients were invited to the survey via a web link and QR code. Participants were asked to fill out the forms by using their smartphones, computers, or tablet devices, etc. The mean time of completing the forms was 20 minutes. Demographics (age, gender, length, weight and disease duration) anxiety, depression, fatigue, sleep quality, disease activity and quality of life were evaluated by using the survey forms. After evaluation, patients were divided into groups as intervention group (IG) and control group (CG). Patients without access to the internet were included in the control group, while patients who could adapt to TR were included in the intervention group. TR was applied to the IG via the video-conference method (Zoom™ - Zoom cloud meeting, Zoom video communication, San Jose, CA, USA). A portable computer was used for TR and meetings created via Zoom for each session. The built-in camera (720p FaceTime HD camera) was used for the video and the standard headset microphone was used for the sound. Standard broadband internet connection (download speed at least 3 Mbps) was used for the connection. Patients were requested to be ready in time to participate the meeting. The IG was performed exercise program including stretching, strengthening, posture and relaxation exercises by an

experienced physiotherapist for 3 times a week for 8 weeks. No additional therapy was performed to the CG and they were suggested to continue their usual physical activity. The study was explained to the CG; they were informed that they could not be included in the exercise group because they did not have access to the internet. During this period, they were informed that they would be called weekly and asked if there was any change in their condition. At the end of the treatment, they were told that the same exercises would be applied to them after the pandemic period if they accepted according to the results of the exercise treatment. These people were contacted with the end of the pandemic period, and treatment was started for 8 patients with their own consent at the end of the study. The assessments were repeated after 8 weeks for all participants.

Intervention

An exercise program was performed on the IG for 3 times a week for 8 weeks. The importance of exercise was told to the patients in the first session. All sessions began with warm-up and finished with cool-down exercises. Warm-up and cool-down exercises contained relaxation, stretching and flexibility exercises. The program included stretching, strengthening, breathing, posture, proprioceptive, relaxation exercises and segmental extremity movements. Hamstring muscles, lumbar extensor muscles, servical rotation and extension muscles and pectoralis major and minor were applied stretching exercises. Muscle strengthening exercises were performed to back and lumbar extensors, abdominal muscles, shoulder and hip muscles. Each exercise was performed 10 times in a session for the first 4 weeks and 15 times for the last 4 weeks. Exercises were performed progressively on the patients. Feedback about status of patients was received during the sessions. Each session was completed in about 40 minutes (26).

Outcomes

Anxiety and depression were assessed with the Turkish version of the Hospital Anxiety and Depression Scale (HADS) which was developed by Zigmond and Snaith (1983). It consists of 14 questions that which 7 of them evaluate depression and 7 of them evaluate anxiety. Each question is scored from 0 to 3 and high scores indicate severe anxiety and depression (23).

Fatigue was evaluated with the Fatigue Severity Scale (FSS)- Turkish version which consists of 9 questions. Each question is scored from 1 to 7 and high score indicates more severe fatigue (24).

Sleep quality was assessed using the Turkish version of the Pittsburg Sleep Quality Index (PSQI). It assesses sleep quality and disturbances over a month's time interval and consists of 19 self-rated items and five questions. Higher scores indicate worse sleep quality (25).

Health Assessment Questionnaire (HAQ) was used to evaluate quality of life. The questionnaire consists of 20 questions and each question is scored from 0 to 3. It was firstly developed to evaluate patients with arthritis in 1980 and was used for many chronic diseases. The questions of HAQ are about dressing and grooming, arising, eating, walking, hygiene, reach, grip, and activity. Higher scores indicate worse quality of life (26).

Disease-specific measurements were used to assess function and disease activity. Disease activity was assessed with clinical disease activity index (CDAI) for Rheumatoid Arthritis (RA), Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) (31) for Ankylosing Spondylitis (AS) (cutoff value is 40) and Systemic Lupus Erythematosus (SLE) patient's global assessment SLE. Function was evaluated with Fibromyalgia Impact Questionnaire (FIQ) (32) for Fibromyalgia Syndrome (FMS) (33) (cutoff value is 66.25) and Bath Ankylosing Spondylitis Function Index (BASFI) for AS.

Statistical Analysis

Data analysis was performed using Statistical Package for the Social Sciences (SPSS Inc. Version 21; IBM, Raleigh, NC, USA) for Windows program. The variables were investigated using histograms, probability plots and Shapiro-Wilk Test to determine if they were normally distributed. Continuous data were expressed as mean,

standard deviation (SD). The p values were deemed significant at <0.05. Paired samples t-test was used if the data were normally distributed to calculate in group differences before and after the treatment. Wilcoxon signed ranks test and Mann-Whitney U test were used to analyze in group differences. Delta values (Δ) were calculated as subtracting the first values from the last values.

RESULTS

Participants

This study was completed with 28 patients with rheumatic diseases (16 patients in IG, 12 patients in CG) (Figure 1). Two patients from IG and 6 patients from CG were excluded from the study due to lack of attendance and lack of follow-up, respectively. Number of patients with diagnosis was presented in the Figure 2.

The comparisons of baseline parameters

Baseline characteristics and baseline measurements of intervention and control groups were summarized in the Table 1. The results showed that most participants were female in both groups. No significant differences were found either in age, length, weight and disease duration (p>0.05 for all), or in baseline measurements of depression, anxiety, sleep quality, fatigue, quality of life and disease specific measurements (p>0.05 for all).

The effects of TR on psychosocial status

Significant differences were found in HADS-anxiety (p= 0.009), FSS (p= 0.003) and PSQI (p= 0.011) in group-by-time assessments in IG (p<0.05 for all) while no significant differences were found in these parameters in CG (p>0.05 for all) (Table 2). Other assessments including HADS-depression, HAQ, BASFI and FIQ showed no significant group-by-time differences in both groups (p>0.05) (Table 2). ΔValues was obtained by subtracting the values obtained after treatment from the baseline values. ΔHADS- anxiety, ΔHADS-depression, ΔFSS and ΔHAQ were more prominent in IG, but could not reach statistical significance (p>0.05 for all) (Table 2).

Improvement ratio was 81.3% in IG and 50% in

Table 1. Comparisons of Baseline Characteristics and Baseline Measurement Results of Study and Control Groups

	IG (n: 16) Mean ± SD (min-max)	CG (n: 12) Mean ± SD (min-max)	p
Age (year)	40.25±10.89 (23-54)	39.25±13.93 (20-59)	0.882
Gender-Females (n)	14 (88%)	10 (83%)	0.268
Length (m)	1.63±0.07 (1.5-1.7)	1.64±0.06 (1.54-1.74)	0.900
Weight (kg)	69.93±1.87 (42-89)	65.25±11.77 (48-82)	0.285
Disease Duration (year)	6.25±5.24 (1-20)	6.08±5.26 (1-16)	0.726
HADS (anxiety)	11.87±5.28 (4-20)	8.50±4.25 (3-16)	0.073
HADS (depression)	8.81±5.29 (0-21)	6.50±5.86 (0-18)	0.247
FSS	46.56±14.04 (18-63)	38.16±15.53 (8-57)	0.113
HAQ	0.97±1.11 (0-3,2)	0.41±0.42 (0-1.30)	0.249
PSQI	7.93±4.56 (1-15)	6.50±3.28 (2-13)	0.545
FIQ	62.67±11.67 (45.7-72.1)	46.92±15.46 (28.6-64.6)	0.837
CDAI	11.5±3.9 (2-19)	9.7±3.2 (6-16)	-
BASFI	5.13±1.00 (4.2-6.2)	5.50±1.13 (4.70-6.3)	-
BASDAI	7.70±2.25 (5.1-9)	2.50±3.53 (0-5)	-
Patient's global assessment for SLE	4.5±3.1 (1-8)	4±1.4 (3-5)	-

SD: Standard Deviation, IG: intervention group, CG: control group, cm: centimeters, kg: kilograms, m: meters, HADS: Hospital Anxiety and Depression Score, FSS: Fatigue Severity Scale, HAQ: Health Assessment Questionnaire, PSQI: Pittsburg Sleep Quality Index, FIQ: Fibromyalgia Impact Questionnaire, CDAI: clinical disease activity index BASFI: Bath Ankylosing Spondylitis Function Index, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index. Mann - Whitney U test
* p < 0.05, **p < 0.005.

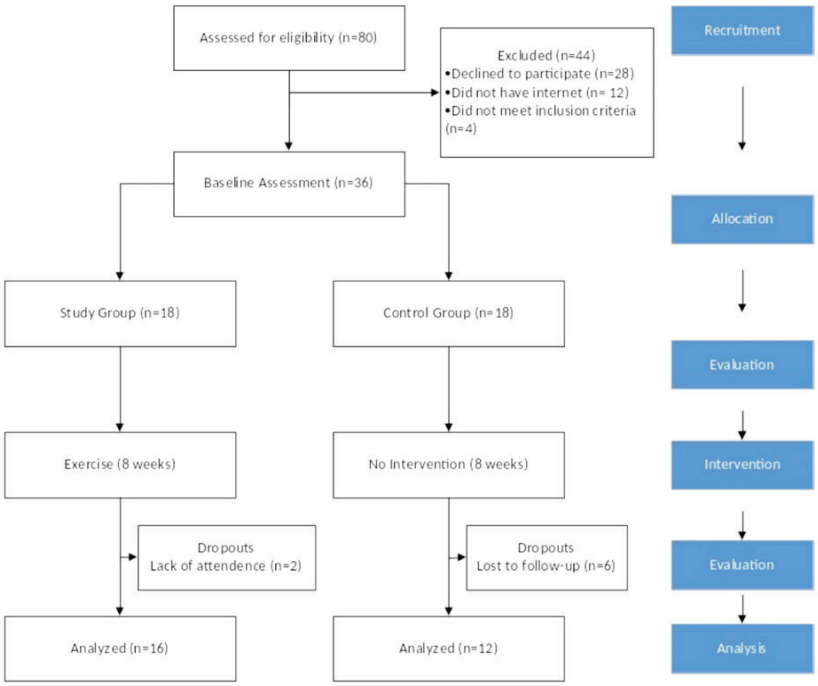


Figure 1: Study Flow Chart

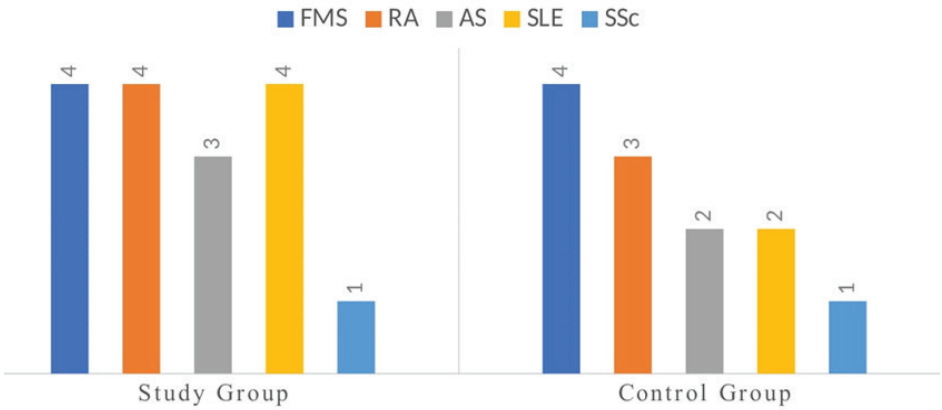
CG (OR:2.1, 95% CI: 0.94-4.7, p=0.080) for HADS-anxiety and 62.5% in IG and 50% in CG (OR: 1.3, 95% CI: 0.57-3.1, p=0.508) for HADS-depression. Similarly, improvement rates of fatigue (81.3% in IG vs. 66.7% in CG) and HAQ (50% in IG and 33.3% in CG) was higher in IG than CG, but it was not statistically significant (p>0.05 for both). Improvement rate of FIQ was 50% in IG while all patients in CG had improvements in FIQ scores (p=0.102).

Table 2: Differences Before and After the Treatment Within Groups

	IG (n=16) Mean ± SD (min-max)				CG (n=12) Mean ± SD (min-max)				P** for ΔValues
	Baseline	**After Treatment**	**P***	ΔValues	**Baseline**	**After Treatment**	**P***	ΔValues	
HADS (anxiety)	11.87±5.28 (4-20)	9.06±6.02 (2-19)	**0.009**	-2.81±4.33 (-14-7)	8.50±4.25 (3-16)	7.83±3.37 (3-14)	0.656	-0.66±4.97 (-10-6)	0.223
HADS (depression)	8.81±5.29 (0-21)	7.56±6.22 (1-21)	0.349	-1.25±6.800 (-19-12)	6.50±5.86 (0-18)	6.16±3.43 (1-12)	0.682	-0.33±4.00 (-9-8)	0.423
FSS	46.56±14.04 (18-63)	43.12±15.36 (13-63)	**0.003**	-3.43±3.42 (-11-4)	38.16±15.53 (8-57)	38.58±12.92 (5-50)	0.479	0.41±11.34 (-13-26)	0.725
HAQ	0.97±1.11 (0-3,2)	0.64±0.79 (0-2,9)	0.146	-0.32±0.78 (-2-0,7)	0.41±0.42 (0-1,30)	0.50±0.41 (0-1,25)	0.878	0.83±0.47 (-0.50-1.20)	0.272
PSQI	7.93±4.56 (1-15)	6.43±4.64 (1-14)	**0.011**	-1.50±2.06 (-7-2)	6.50±3.28 (2-13)	4.66±2.49 (2-10)	0.056	-1.83±3.15 (-10-2)	0.981
FIQ	62.67±11.67 (45,7-72,1)	57.37±22.11 (26-73)	-	-5.2±10.9 (-19.7-5.6	46.92±15.46 (64.7- 28.6)	34.80±6.10 (27.8-42.7)	-	-12.1±12.3 (-22 - 5.6)	-
BASFI	5.13±1.00 (4.2-6.2)	4.30±0.88 (3.30-5)	-	-0.8±0.4 (-1.2 - -0.4)	5.50±1.13 (4.70-6.3)	6.10±0.42 (5.8-6.4)	-	0.6±1.6 (-0.5-1.7)	-
BASDAI	7.70±2.25 (5.1-9)	6.57±2.87 (3.40-9)	-	-1.1±0.9 (-1.7 - 0)	2.50±3.53 (0-5)	6.20±5.84 (5.6-6.8)	-	3.7±4.4 (0.6-6.8)	-
CDAI	11.5±3.9 (2-19)	8.5±2.1 (4-12)	-	-3.0±3.9 (-7 - 2)	9.7±3.2 (6-16)	2.1±3.6 (4-11)	-	-2.7±2.5 (-5.0-0))	-
Patient's global assessment for SLE	4.5±3.1 (1-8)	3.5±3.7 (1-9)	-	-1.0±2.8 (-5 - 1)	4±1.4 (3-5)	6±0 (6-6)	-	2.0±1.4 (1-3)	-

SD: Standard Deviation, IG: intervention group, CG: control group, HADS: Hospital Anxiety and Depression Score, FSS: Fatigue Severity Scale, HAQ: Health Assessment Questionnaire, PSQI: Pittsburg Sleep Quality Index, FIQ: Fibromyalgia Impact Questionnaire, CDAI: clinical disease activity index, BASFI, Bath Ankylosing Spondylitis Function Index, BASDAI: Bath Ankylosing Spondylitis Disease Activity Index.

*Wilcoxon Signed Rank Test P values and **Mann - Whitney U test P value



Abbreviations: FMS: Fibromyalgia Syndrome, RA: Rheumatoid Arthritis, AS: Ankylosing Spondylitis, SLE: Systemic Lupus Erythematosus, SSc: Scleroderma

Figure 2: Number of Patients in Study and Control Groups

The effects of TR on disease activities

Improvements in BASDAI score was 66.7% in IG while no improvement was observed in CG. Improvement rate of CDAI was 75% in IG and 66.7% in CG. All patients were seen improvements in SLE patient's global assessment in IG while 50% of improvement rate was observed in CG. Improvements in FIQ score was 50% in IG while 75% in CG.

DISCUSSION

This study was aimed to investigate the effects of TR on fatigue, anxiety, depression, sleep quality, disease activity and quality of life in patients with rheumatic diseases during the COVID-19 pandemic period. The results of the study demonstrated significant improvements on fatigue, anxiety and sleep quality in the intervention group while no significant differences were found in the control group. Although, there was no significant difference in ΔMeasurements between-group analysis, changes for measurements in IG was greater than changes in CG. TR was found to may be an applicable, safe, and effective method in patients with rheumatic diseases according to our study.

Patients with rheumatic diseases are known to have low level of physical activity. It was reported increased smoking, weight gain, alcohol consumption and reduced physical activity in a study including 1707 patients with rheumatic musculoskeletal disorders during the COVID-19 pandemic. Patients also revealed inability to continue exercise programs (27). Supervised exercise is key and cornerstone of nonpharmacologic treatment of rheumatic diseases. There is extensive evidence in literature to emphasize that regular physical activity and exercise are effective at decreasing symptoms including fatigue, depression, sleep quality, pain and quality of life in these patients (28). Recent evidence suggests telehealth and remote data collection to avoid face-to-face connection during the pandemic (29). Additionally, patients with rheumatic diseases are at high risk to infections (17) and avoiding coronavirus is crucial for them.

Significant differences were found in fatigue, anxiety and sleep quality in IG while no significant differences were found in CG. Regular physical activity and exercise are known to modify the levels of hypothalamic-pituitary function and neurotransmitters. This modification results in improvements of pain, depression, anxiety and stress (30). Patients have biological, psychological and social features and disease-related symptoms could influence each other. Improvements in a symptom may cause improvements in other related symptoms (31). In addition, regular exercise has anti-inflammatory effects, and our results may have resulted from these effects. It is

well known that supervised exercise is one of the most effective methods on disease-related symptoms in rheumatic diseases in literature (32). However, there are few studies investigating effects of TR in rheumatic diseases. Hernando-Garijo et al was found significant improvements on pain intensity and psychological distress in FMS patients practicing TR program based on aerobic exercise while no significant improvements in control group with no additional intervention (21). Van den Berg et al (33) concluded increased physical activity level in patients with RA who performed home-based physical activity intervention with individually tailored supervision using internet technology. Srikesevan et al. reviewed effects of web-based rehabilitation interventions on quality of life, pain, self-efficacy, RA knowledge and physical activity in RA patients. Estimates of the effects for all assessments were reported to be uncertain due to low quality of evidence (22). In addition, TR was preferred due to cost effectiveness in many disorders. It can be preferred in patients with rheumatic diseases considering that cost effectiveness and improvements symptoms (41). These studies are in parallel with our study.

No significant differences were found in depression and quality of life in both groups in this study. However, improvements in depression and quality of life were seen in patients, but this difference was not statistically significant. Therefore, significant differences can be reached with larger number of patients in subgroups. In addition, baseline HAQ scores of the patients were low which demonstrates high quality of life for patients. This finding could be related with leaving little room for improvement. Van den Berg et al. (33) investigated the effects of 2 internet-based physical activity interventions in patients with RA. Individualized physical activity program was practiced to intervention group, while general information on exercise and physical activity was practiced to control group for 12 months. Significant improvement was found in physical activity level while no significant improvement was found in functional ability and quality of life, which was interpreted a result of low sample size. Studies comparing TR with in-person therapy were not found significant different outcomes (depression and quality of life), suggesting that TR was not inferior in patients with stroke (42). Therefore, further studies should involve larger number of patients or longer exercise duration.

Exercise is known as a valid and safe method for rheumatic diseases (32). In this study, no significant difference was found in disease activity in both groups. Participants of our study had low levels of disease activity at baseline and no adverse event was seen during sessions. Additionally, patients completed the sessions with low disease activity score. Therefore, it could be interpreted tele-exercise as safe method for patients with rheumatic patients. However, it should be supported with studies including high number of patients and long-lasting studies. No significant differences were found between-group comparisons of Δmeasurements in this study. Although improvements of measurements in the intervention group were more than control group, it was not significant statistically possibly stem from low number of patients.

This study has some limitations. The low number of subgroups made it difficult to achieve significant differences especially in between-group analyses. Second, applying questionnaires as assessment was given subjective information in the study. However, avoiding face-to-face connection was survival in the COVID-19 pandemic and it was not possible to have objective data.

In conclusion, this study demonstrates that TR could be a safe, effective, and valid method for patients with rheumatic diseases in improving fatigue, anxiety and sleep quality. It is used as a mandatory method during pandemic outbreak, but considering the advantages of TR, it can be practiced for rheumatic diseases in the post-pandemic period. Further studies should include comparison of TR with face-to-face supervised exercise methods and investigation of effects of TR on arthritis and inflammation in patients with rheumatic diseases.

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