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Impact of a virtual reality-delivered attentional focus shifting technique on quality of life and sleep in women with fibromyalgia

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Abstract

The purpose of this study is to assess and compare the effect of the attention-focus shifting approach used with virtual reality (VR) glasses on the quality of life and sleep characteristics of female fibromyalgia patients (FM). The study's sample included 30 female FM patients who came to the Algology Clinic for treatment and volunteered to participate in the study. Participants were randomly assigned to one of two groups: experimental (n=15) or control (n=15). The revised FM Impact Questionnaire (YFEA) was then used to assess the overall impact of fibromyalgia syndrome (FMS) on patients, the Brief Symptom Inventory (BSI) was used to capture mental symptoms, the Quality of Life Questionnaire Short Form (SF-36) was used to assess quality of life, and the Pittsburgh Sleep Quality Index (PUKI) was used to assess sleep quality. Participants in the control group received a one-time patient education session as well as associated written materials. The patients in the experimental group were given three sessions of attention-focus shifting exercises utilizing VR. The scales were reapplied for each patient at the completion of the VR training, and the values were recorded. A 4-question virtual reality satisfaction questionnaire was administered in addition to the patients in the experimental group to examine whether virtual reality technology could be regarded useful and effective in the treatment of a complex ailment such as FM. According to the study's findings, the attention focus shifting strategy used with VR on patients with FMS was not substantially effective in improving sleep quality and general quality of life when compared to patient education used on the control group.

Keywords: Fibromyalgia, patient education, virtual reality, sleep, quality of life

Introduction

Pain is the most common cause of suffering and disability, affecting millions of people worldwide. Fibromyalgia syndrome (FMS) is a clinical condition characterized by widespread pain and muscle tenderness, often accompanied by fatigue, sleep disturbances, particularly non-restorative sleep, and depressive mood, with an unknown etiology [1]. It is estimated that FMS affects approximately 2-4% of the general population [2]. Comorbidities with anxiety disorders are common [3]. FMS is a complex condition involving biological, psychological, and social factors, which negatively impact the quality of life of patients. Due to its association with increased healthcare utilization, emergency department visits, medication use, and work disability, FMS has become a significant public health problem [4,5].

The literature supports the conceptualization of this condition within an integrative biopsychosocial model that encompasses physiological, psychological, and social aspects [6]. This holistic approach has been made possible through significant theoretical perspectives, such as Melzack and Wall's [7] Gate Control Theory, which explains pain processing through both biological and psychological mechanisms. The biopsychosocial model asserts that pain is a complex condition involving biological, psychological, and social factors that have a negative impact on patients' quality of life. In this context, approaching FMS from a multidimensional perspective appears to be more effective than single approaches [8].

A multidimensional perspective includes psychological interventions as promising treatments for FMS. Psychological aspects such as self-efficacy, attention, pain assessment, or

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avoidance are among the best predictors of disability caused by chronic pain [9]. Cognitive Behavioral Therapy (CBT) methods are frequently used in the psychological treatment of FMS [10]. Counting strategies, visual and auditory attentional focus techniques, are some of the recommended components of cognitive-behavioral therapy protocols for chronic pain [11]. The aim of these components is to enhance patients' pain coping strategies and self-efficacy, increase pain management skills, and reduce psychological distress that negatively affects their quality of life, such as sleep and chronic fatigue issues [12].

The Use of Information and Communication Technologies (ICT) in the field of psychology has increased in recent years. Particularly, virtual reality (VR) is an exciting new technology with almost infinite potential applications in medicine and is utilized to treat various psychological disorders [13]. One promising area of application is pain management [14]. The pain-modulating ability of VR is often attributed to its engagement of active attentional focus. This rationale is based on the notion that attention is necessary for pain perception and is a limited resource, thus redirecting attention away from pain reduces the available resources to process it [15-17]. It is believed that VR, with its immersive nature encompassing a patient's visual and auditory processing, and even potentially involving more attention-demanding physical actions, is more effective than traditional attentional focus shifting methods [18].

Based on this information, our study aims to utilize virtual reality to divert patients' attention from their mental processes, thereby focusing their attention on a component that promotes positive emotions (e.g., breathing exercises) and non-pain-related stimuli (e.g., counting strategies and visual distractors), in order to investigate changes in symptoms of fibromyalgia syndrome.

The significance of this study lies in exploring whether the application of virtual reality can be beneficial and well-accepted by patients, potentially assisting in the pharmacological treatment of complex conditions like fibromyalgia (FM). The objective of this study, therefore, is to investigate the effectiveness of a VR-based attentional focus shifting technique on the quality of life and sleep problems experienced by women with FMS, using an experimental clinical study design with an unmatched control group. If significant improvements in measured quality of life and sleep problems are observed with the attentional focus shifting technique applied through virtual reality, it may warrant the implementation of a regular program for patients.

Material and Methods

Sample and Procedure

The sample of the study consisted of female patients with FMS who visited the Algology Clinic of Akdeniz University Faculty of Medicine Hospital for follow-up or treatment between September 15, 2021, and October 15, 2022, met the research criteria, and agreed to participate in the study. Considering the relative variability in the acceptance of the technological element of the study, virtual reality goggles, as well as time constraints and pandemic conditions, a sample of 30 individuals was targeted, with 15 participants assigned to the experimental group and 15 participants assigned to the control group.

Individuals who volunteered to participate in the study were randomly assigned to the groups, without selection based on other clinical presentations and demographic characteristics, provided they met the following criteria: being female and within the age range of 18-65 years, having a diagnosis of fibromyalgia syndrome based on the diagnostic criteria, having the cognitive ability to understand the scales and forms used in the study, and not having severe visual or hearing impairments. Gender parity was ensured in the groups, but educational equality could not be achieved. The completion of the scales was conducted with the assistance of the researchers due to the small number of participants, allowing for the identification of incomplete responses and re-administration of the scales, thus minimizing data loss. This approach aimed to enhance the reliability of the data.

After obtaining informed consent from the participants, they were randomly assigned to either the experimental or control group using a random selection method. Randomization was performed based on the order of patients' visits. After obtaining personal information and voluntary consent forms from the patients, the Modified Fibromyalgia Impact Questionnaire (MFIQ) was administered to assess the overall impact of FMS, the Brief Symptom Inventory (BSI) was used to capture psychological symptoms, the Short Form Health Survey (SF-36) was utilized to evaluate quality of life, and the Pittsburgh Sleep Quality Index (PSQI) was employed to assess sleep quality. At the end of the program, the same questionnaires were administered again, and in addition, the Virtual Reality (VR) Satisfaction Questionnaire was given to the experimental group.

Exclusion criteria for the patients in the study were as follows: having a severe mental disorder such as schizophrenia, bipolar disorder, substance abuse, or dependence requiring urgent treatment; having a mental disorder that would interfere with relaxation and virtual reality exercises; having a physical or mental disability that would prevent the reception of relaxation and virtual reality exercises (e.g., deafness, mental retardation, blindness); and being male to ensure gender homogeneity in the study.

Ethical approval for the research was obtained from the Akdeniz University Medical Faculty Clinical Research Ethics Committee (No: 666; Date: 15 September 2021).

Measurement Tools

Personal Information Form and Volunteer Participation Form: This form includes questions about the individual's gender, age, educational level, marital status, employment status, the year when general muscle and joint pain started, the year of FMS diagnosis, medications used, whether there was any significant stress before the diagnosis, and whether they had received psychiatric support before. The volunteer participation form provided participants with information about the variables of the study, the purpose of the research, how the collected data

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would be used, the principle of confidentiality, and obtained written consent from the participants.

Brief Symptom Inventory (BSI): The Brief Symptom Inventory, developed by Derogatis in 1992, aims to capture psychiatric problems in various medical conditions. It is a 53-item scale selected from the Symptom Checklist-90-Revised (SCL-90-R), which is a 90-item scale (Şahin et al., 2002). The BSI is a Likert-type scale. Each item is answered on a scale of "not at all / a little bit / moderately / quite a bit / extremely," and scored from 0 to 4, respectively. The minimum possible score on the BSI is 0, and the maximum score is 212, with no cutoff point. Higher total scores on the scale indicate an increase in individual's psychological symptoms. The Turkish adaptation of the BSI was conducted by Şahin et al. [19].

Revised Fibromyalgia Impact Questionnaire (YFEA): The questionnaire consists of 21 questions divided into three sections. The first section relates to function in the past seven days, the second section assesses the overall impact of FM, and the third section focuses on symptoms. All questions are rated on a numerical scale from 0 to 10. An increase in scores corresponds to an increase in symptoms. The Turkish adaptation of the questionnaire was carried out by Ediz et al. [20].

Short Form Health Survey (SF-36): The SF-36 is a tool consisting of 36 items and eight subscales that assess physical and social functioning as well as mental health. The subscales are "Physical Functioning (10 items), Physical Role Limitations (4 items), Emotional Role Limitations (3 items), Energy/Fatigue (4 items), Emotional Well-being (5 items), Social Functioning (2 items), Pain (2 items), General Health (5 items), and Health Change (1 item)." Scores range from 0 to 100, with 0 indicating poor health status and 100 indicating good health. The Turkish validity and reliability study of the SF-36 was conducted by Koçyiğit et al. [21].

Pittsburgh Sleep Quality Index (PSQI): The primary purpose of the PSQI is to assist in the numerical analysis of sleep quality. The total score ranges from 0 to 21, with higher scores indicating poorer sleep quality. The validity and reliability of the PSQI in Turkey were established by Ağargün et al. [22].

Virtual Reality Satisfaction Questionnaire: This questionnaire, adapted from one of the items of Borkovec and Nau's scale, asks participants, "How satisfied are you with the use of VR in the psychological program you received?" Participants rated their satisfaction on a scale from 0 to 10, where 0 represented "not satisfied at all" and 10 represented "very satisfied." Additionally, participants rated two specific questions on a scale from 0 to 10, where 0 represented "not at all" and 10 represented "very much." These questions were: "To what extent was it helpful to apply therapeutic techniques at home during VR sessions?" and "To what extent were VR sessions helpful in further engaging in treatment?"

Procedures Applied to the Groups

For the control group, patient education was provided by the researcher in a single session, individually, and face-to-face, using prepared texts. The patient education session lasted for about half an hour and covered the following topics: 'What is fibromyalgia, its prevalence, and risk factors? How does fibromyalgia develop, and what are the causes? What are the symptoms of fibromyalgia? What are the treatment methods for fibromyalgia in today's context? How can sleep patterns be regulated? Can fibromyalgia be cured?' At the end of the session, written materials regarding the education were provided to the patients.

For the experimental group, the technique of attentional focus shifting was applied through virtual reality goggles in three sessions. All participants were provided with a 5.5-inch wide screen, 720p HD display resolution, with a 56% sound level and 100% screen brightness.

The virtual reality platform used was Amelia Virtual Care, which contains scenarios designed for education, awareness, relaxation, and exposure (https://professional.ameliavirtualcare.com, version:1.2.0). The "Imagery For Relaxation" scenario was chosen for the application. This scenario presents an ideal tropical island setting with elements typically associated with a sense of well-being, such as lush vegetation, clear sky, crystal water, breeze, bird sounds, and water flow. The tropical island consists of four different areas: "Beach," where patients can see the sea, palm trees, and clouds in the sky, and hear the sound of waves; continuing to walk around the island leads to the "Camp" area, a serene space filled with grass, plants, butterflies, clear sky, and huts. Here, patients can hear bird sounds and footsteps on the grass. By further proceeding and crossing the shore, patients encounter a "Waterfall," which serves as an ideal place for breathing exercises. Finally, by continuing to walk around the island, patients reach a "Platform" and then return to the starting point.

To ensure participants' engagement and ease of understanding the instructions, the application was planned for three sessions, once a week. The first session included the "Beach" and "Camp" areas, the second session included the "Beach," "Camp," and "Waterfall" areas, and the third session included the "Beach," "Camp," "Waterfall," and "Platform" areas. The durations of the sessions were as follows: 3 minutes and 30 seconds + 5 minutes and 40 seconds, 3 minutes and 30 seconds + 5 minutes and 40 seconds + 7 minutes and 42 seconds, and 3 minutes and 30 seconds + 5 minutes and 40 seconds + 7 minutes and 42 seconds + 5 minutes and 40 seconds, respectively.

The researcher sat next to a computer where both the application and the virtual environment shown to the patient could be seen simultaneously. Participants were provided with a comfortable sitting position and were equipped with virtual reality goggles integrated with a phone. To ensure objectivity, a set of instructions was prepared before the study, and all patients received the same instruction. Patients were given guidelines to focus their attention on the auditory and visual cues present in the virtual reality scenario (observing, describing, and participating in the present moment). At the end of each session, patients were instructed to practice the exercises by imagining the images and sounds of the virtual reality environment at home once a day, for a self-determined period and duration until the next session.

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Statistical Analysis

The data obtained from the data collection tools were entered into IBM SPSS Statistics version 26 for analysis. Comparisons were performed using the Mann–Whitney U test and the Wilcoxon Signed-Rank test.

Although the Central Limit Theorem states that sampling distributions tend to approximate normality when the sample size exceeds 30, potential deviations from normality—particularly in smaller subgroups—were taken into consideration. Therefore, non-parametric statistical methods were preferred for the analysis.

For all statistical tests, a 95% confidence interval was used, and a p-value of less than 0.05 was considered statistically significant.

Results

The mean age of the experimental group in the study was 46.13 (SD: 11.15), ranging from 28 to 65 years. The control group had a mean age of 39.73 (SD: 11.85), ranging from 23 to 64 years. Among the female participants in the experimental group, 14 (93.3%) were married and 1 (6.7%) was single. In the control group, 11 (73.3%) were married, 3 (20.0%) were single, and 1 (6.7%) participant was divorced. Among the female participants in the experimental group, 5 (33.3%) had completed primary school, 2 (13.3%) had completed middle school, 6 (40.0%) had completed high school, and 2 (13.3%) had a bachelor's degree or higher. In the control group, 1 (6.7%) participant had completed primary school, 2 (13.3%) had completed middle school, 2 (13.3%) had completed high school, 2 (13.3%) had completed associate's degrees, and 8 (53.3%) had a university degree or higher. Among the female participants in the experimental group, 10 (66.7%) were not employed (engaged in household chores), 4 (26.7%) were employed, and 1 (6.7%) was retired. In the control group, 4 (26.7%) were not employed (engaged in household chores), 10 (66.7%) were employed, and 1 (6.7%) was retired.

When participants were asked about their average duration of pain, those in the experimental group reported an average of 12.10 years (SD: 8.49), while those in the control group reported an average of 7.73 years (SD: 5.61) of experiencing pain. When examining the duration of diagnosis, the average duration since diagnosis was 3.80 years (SD: 4.78) for the experimental group and 4.03 years (SD: 4.29) for the control group. All participating patients reported medication use. Accordingly, 12 (80.0%) individuals in the experimental group reported using SSRIs, 2 (13.3%) used PGB, and 1 (6.7%) used SNRIs. In the control group, 11 (73.3%) individuals used SSRIs, 1 (6.7%) used PGB, and 3 (20.0%) used SNRIs (Table 1). When asked if there were any stress factors before the onset of the disease, 2 (13.3%) individuals in both the experimental and control groups answered "no," while 13 (86.7%) individuals answered "yes." All participants stated that they had consulted a psychiatrist.

Table 1. Frequency distributions and percentages regarding medication use, stress factors, and psychiatric consultations of participants variables

Variables	Experimental (n=15)		Control (n=15)	
	n	%	n	%
Medications				
SSRI	12	73.3	11	73.3
PGB	2	6.7	1	6.7
SNRI	1	20.0	3	20.0
Stress factors				
None	2	13.3	2	13.3
Present	13	86.7	13	86.7
Psychiatric consultation				
None	0	0	0	0
Present	15	100.0	15	100.0

SSRI:Selective Serotonin Reuptake Inhibitors, SNRI: Serotonin and Norepinephrine Reuptake Inhibitors, PGB: Pregabalin

When examining the results of the Modified Fibromyalgia Impact Questionnaire (MFIQ) of the participants, it was found that the pretest score averages significantly differed (U=64.00, p=0.04), and the control group had higher impact scores (Table 2). Although the two groups were not initially equal, further analyses were conducted to examine whether the change in pretest-posttest scores was significant between the two groups. The significant difference between the experimental and control groups persisted in the post-tests (U=58.00, p=0.02), with a slight increase in the average scores for the control group and a slight decrease in the experimental group. However, when comparing the score changes between the pretest and posttest for the two groups, no significant difference was found (U=89.00, p=0.33).

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Table 2. Comparison of YFEA scores using Mann-Whitney U test

YFEA scores	Group	n	Mean rank	Sum of ranks	U	p
PSQI pretest	**Experimental**	15	12.27	184.00	64.00	0.044
	Control	15	18.73	281.00		
PSQI posttest	**Experimental**	15	11.87	178.00	58.0	0.02
	Control	15	19.13	287.00		
PSQI score change	**Experimental**	15	17.07	256.00	89.00	0.33
	Control	15	13.93	209.00		

PSQI: The Pittsburgh Sleep Quality Index

In the quality of life scale (SF-36), a comparison of participants' physical, social, and mental functioning was conducted (Table 3). According to the results, there was no significant difference between the experimental and control groups in the pretest scores of Physical Functioning, Physical Role Limitations, Emotional Role Limitations, Vitality, Mental Health, Social Functioning, and General Health Perception subparameters. However, there was a statistically significant difference between the groups in the Pain and Health Transition subparameters. There was no significant difference between the experimental and control groups in the post-test SF-36 subparameter mean scores. It was concluded that there was no significant difference in the score changes between the pretest and post-test for the two groups.

Table 3. Red-flag detection performance (SNNOOP10)

SF-36			Pretest				Posttest				Pretest-posttest score change			
			Mean rank	Sum of ranks	U	p	Mean rank	Sum of ranks	U	p	Mean rank	Sum of ranks	U	p
Physical functioning	**E**	**15**	13.07	196.0	76.00	0.12	12.90	193.5	73.50	0.10	15.27	229.0	109.0	0.88
	C	**15**	17.93	269.0			18.10	271.5			15.73	236.0		
Physical role limitations	**E**	**15**	13.00	195.0	75.00	0.09	13.33	200.0	80.00	0.16	15.83	237.5	107.5	0.82
	C	**15**	18.00	270.0			17.67	265.0			15.17	227.5		
Emotional role limitations	**E**	**15**	15.37	234.5	110.5	0.92	13.30	199.5	79.50	0.14	13.53	199.5	83.00	0.20
	C	**15**	15.63	230.5			17.70	265.5			17.47	203.0		
Energy-vitality	**E**	**15**	13.00	195.0	75.00	0.11	14.47	217.0	97.00	0.51	16.87	253.0	92.00	0.39
	C	**15**	18.00	270.0			16.53	248.0			14.13	212.0		
Mental health	**E**	**15**	14.00	210.0	90.00	0.35	14.10	211.5	91.50	0.38	16.27	244.0	101.0	0.63
	C	**15**	17.00	255.0			16.90	253.5			14.73	221.0		
Social functioning	**E**	**15**	13.63	204.5	84.50	0.24	14.17	212.5	92.50	0.39	16.50	247.5	97.50	0.52
	C	**15**	17.37	260.5			16.83	252.5			14.50	217.5		
Pain	**E**	**15**	10.80	162.0	42.00	0.001	12.70	190.5	70.50	0.07				
	C	**15**	20.20	303.0			18.30	274.5						
General health perception	**E**	**15**	14.57	218.5	98.50	0.56	14.47	217.0	97.00	0.51	14.53	218.0	98.00	0.54
	C	**15**	16.43	246.5			16.53	248.0			16.47	247.0		
Health transition	**E**	**15**	11.97	179.5	59.50	0.02	12.67	190.0	70.00	0.06				
	C	**15**	19.03	285.5			18.33	275.0						

E: Experimental, C: Control

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In Table 4, the Pittsburgh Sleep Quality Index (PSQI) results of the groups are compared. According to the analysis, there was no significant difference between the experimental and control groups in terms of sleep scale pretest and posttest mean scores. It was also found that there was no significant difference in the pretest-posttest score changes between the two groups. This finding indicates that the techniques applied in the experimental and control groups did not result in any changes in PSQI scores.

Table 4. Comparison of PSQI scores using Mann-Whitney U test

PSQI scores	Group	n	Mean rank	Sum of ranks	U	p
PSQI pretest	**Experimental**	15	16.93	254.00	91.00	0.37
	Control	15	14.07	211.00		
PSQI posttest	**Experimental**	15	16.03	240.50	104.50	0.73
	Control	15	14.97	224.50		
PSQI score change	**Experimental**	15	14.77	221.50	101.50	0.64
	Control	15	16.23	243.50		

PSQI: The Pittsburgh Sleep Quality Index

Table 5 compares the Brief Symptom Inventory (BSI) and its subscale results of the experimental and control groups. There was no significant difference between the groups in terms of both the total BSI scores and the BSI subscale scores in pretest, posttest, and the changes between the two measurements. This finding indicates that the techniques applied in the experimental and control groups did not result in any changes in BSI scores.

Table 5. Comparison of BSI results of the experimental and control groups

BSI			Pretest				Posttest				Pretest-posttest score change			
			Mean rank	Sum of ranks	U	p	Mean rank	Sum of ranks	U	p	Mean rank	Sum of ranks	U	p
Total	**E**	**15**	16.63	249.5	95.50	0.48	16.03	140.5	104.5	0.74	15.00	225.0	105.0	0.75
	C	**15**	14.37	215.5			14.97	224.5			16.00	240.0		
Anxiety	**E**	**15**	16.40	246.0	99.00	0.57	15.67	235.0	110.0	0.91	14.90	223.5	103.5	0.70
	C	**15**	14.60	219.0			15.33	230.0			16.10	241.5		
Depression	**E**	**15**	17.23	258.5	86.50	0.28	16.40	246.0	99.00	0.57	14.63	219.5	99.50	0.58
	C	**15**	13.77	256.5			14.60	219.0			16.37	245.5		
Negative self	**E**	**15**	16.37	245.5	99.50	0.58	15.17	227.5	107.5	0.83	14.67	220.0	100.0	0.60
	C	**15**	14.63	219.5			15.83	237.5			16.33	245.0		
Somatisation	**E**	**15**	16.23	243.5	101.5	0.64	16.93	254.0	91.00	0.37	15.90	238.5	106.5	0.80
	C	**15**	14.77	221.5			14.07	211.0			15.10	226.5		
Hostility	**E**	**15**	15.73	236.0	109.0	0.88	15.27	229.0	109.0	0.88	14.40	216.0	96.00	0.49
	C	**15**	15.27	229.0			15.73	236.0			16.60	249.0		

E: Experimental, C: Control

The participants' satisfaction with virtual reality (S1) was determined to be 25.17%; the extent to which VR sessions were beneficial for VR sessions (S2) was 27.25%; the extent to which the therapeutic techniques applied with VR were useful for home practice (S3) was 21.70%; and the extent to which VR sessions were useful for greater engagement in treatment (S4) was 25.86% (Figure 1). These results indicate that participants had a low level of satisfaction with the techniques applied through VR.

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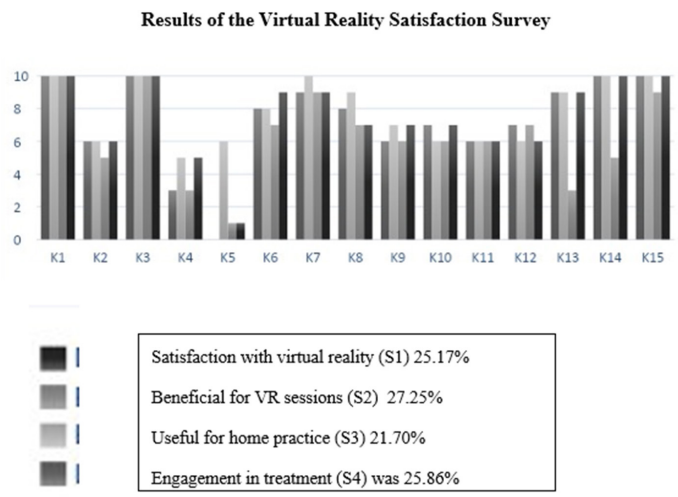

Figure 1. Results of the virtual reality satisfaction survey in the experimental group

Discussion

The purpose of this study was to evaluate and compare the effects of attention-focus shifting technique applied through virtual reality (VR) goggles on the quality of life and sleep variables of female patients diagnosed with fibromyalgia (FM). The findings indicate that virtual reality applications did not have a statistically significant effect on the quality of life, pain, sleep, and BSI levels of FMS patients.

Upon examining the findings obtained from the research, it was observed that there was no significant difference in the scores obtained from the YFEA and SF-36 scales between the experimental and control groups before and after the intervention. Furthermore, there was no significant difference in the score changes between the two measurements. When similar studies in the literature were examined, Cortés-Pérez et al. [23] reported in their meta-analysis study evaluating the effects of VR-based therapies on women with FMS that these therapies had a significant impact in reducing the effects of FMS and improving the quality of life. Gülşen et al. [24] demonstrated in their study that the combination of pilates and aerobic exercise with VR was more effective in terms of the mental component of the quality of life. Similarly, Polat et al. [25] found that the addition of VR exercises to aerobic training significantly increased the quality of life. Additionally, another randomized controlled study by Villafaina et al. [26] found beneficial effects of VR treatment on quality of life in FM. Lastly, another randomized controlled trial reported a significant improvement in quality of life in FMS with VR exercise games [27]. These findings contradict the results obtained in this study. It is thought that this may be due to the fact that in the aforementioned studies, VR was used as a support to other treatments rather than being used alone.

Although a significant decrease was expected in the sleep questionnaire measurements of the participants in the experimental group, no significant change was observed in this parameter. The patients included in this study had been experiencing chronic pain for a long time, with an average duration of 4 years since the diagnosis of FM, and they had been experiencing symptoms for some time even before the official diagnosis. It is possible that they had sleep problems even before the diagnosis. Therefore, it can be assumed that at the moment they started the program, this issue was a deeply ingrained problem in the patients' routines and would not improve rapidly. It is important to examine the effort and time required to change entrenched, unhealthy behaviors in chronic conditions like FM. Some findings already support the idea that there is a positive relationship between treatment efficacy and its duration [28]. The duration, effort, and content of the programs applied to patients are important issues that need to be addressed in order to improve treatment programs for FM. In studies reporting multidisciplinary treatments to improve various symptoms associated with FMS [29,30], it has been suggested that the combination of different treatments would be effective in improving sleep quality in these patients. In this context, the findings that VR alone was ineffective in improving sleep quality in this study are consistent. In contrast to this study, Darnall et al. [31] reported in their research conducted on 74 patients with FM or chronic low back pain that therapeutic VR could help subjects sleep. No other study supporting or contradicting the findings related to sleep was found.

Another finding of the study regarding FM is that in the functional status analyses measured by YFEA, the experimental group obtained lower scores on this scale compared to the control group. However, there was no statistically significant difference in the evaluation of pre-post test score differences. One of the most significant impairments of FMS is its impact on daily life events, as assessed by YFEA [32]. In a meta-analysis study by Cortés-Pérez et al. [23] evaluating the effects of VR-based treatments to reduce the impact of FMS, they reported that the significant decrease in YFEA scores indicates that VR is an active and effective treatment method in reducing its impact on daily life events. In the same study, they also mentioned that the combination of customized VR videos for each woman with FMS and traditional therapeutic approaches is the best therapeutic option for improving YFEA scores in women. Regarding the inconsistency in the results of studies related to the findings of this study, we believe that it can be attributed to temperament and character traits such as alexithymia mentioned in the conceptual framework section, as well as significant cultural differences between societies leading to substantial changes in individuals' personality traits and perspectives on health.

Sato et al. [33] investigated the use of VR for treating complex regional pain syndrome in adults. The study involved patients attending five to eight outpatient treatment sessions, resulting in at least a 50% reduction in impact questionnaire scores for four out of five patients. Carvalho et al. [34] reported improvements in FMS-related symptoms based on the FEA,

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including the fatigue domain, with VR exercises. In the same study, they also demonstrated that VR exercises had another benefit of improving quality of life related to functionality. The results reported in the literature do not fully coincide with our findings, which may be attributed to the fact that the sessions conducted with VR in the researchers' studies were more numerous compared to our study.

Additionally, it can be considered that the biopsychosocial characteristics were different in our study in a way that would disadvantage the individuals, and the extremely hot climate in the city where the study was conducted may have negatively affected functionality in individuals. Furthermore, the higher average age in the experimental group compared to the control group can also be seen as a disadvantage. In the study of new and technological elements such as VR, opting for younger samples, which can provide treatment motivation, may lead to different results.

When reviewing the literature, it is observed that studies related to VR are generally conducted in a group format to reduce costs. Moreover, it is known that universal values such as being part of a group and establishing solidarity in shared problems also influence individuals' well-being. In this context, presenting the study as a group therapy instead of individual interviews with each patient may yield consistent results with the literature.

There were no significant differences between the groups in terms of the values of anxiety, depression, negative self, somatization, and hostility measured by BSI and KSE before and after the intervention. In contrast to the findings of this study, Botella et al. [35] presented preliminary data on the effectiveness of VR as an adjunct to CBT in the treatment of FM, showing decreased depression and increased positive effects in the long term. Similarly, Cortés-Pérez et al. [23] reported significant reductions in depression outcomes after the use of VR-based treatments in women with FMS in their meta-analysis study. However, in these studies, the relevant parameter was measured using the Beck Depression Inventory. A review of the literature did not reveal similar studies conducted on FM patients in terms of methodology and evaluation methods. However, the clinical/pathogenetic relationship between FMS and depression is well-known [36]. Additionally, in a study on YFEA/FM subgroups, it was reported that higher YFEA scores were associated with higher levels of depression [37]. In parallel with this finding, no decrease in the depression subscale was observed for high YFEA scores.

Another noteworthy point is that the patients reported accepting the use of VR but mentioned that it did not make a difference in implementing therapeutic techniques at home and that they could not recall the images of the scenarios without using VR while at home. Herrero et al. [38], in their study investigating the use of VR to promote positive emotions in FM treatment, reported significant increases in patients' positive emotions, motivation, and self-efficacy. Based on these findings, they emphasized the need for further controlled studies to investigate the effectiveness of VR procedures in improving patients' quality of life.

Lastly, due to the lack of randomized controlled studies comparing the effectiveness of attention-focus shifting technique using VR on sleep and quality of life, as well as the absence of similar studies, the level of evidence from the comparative studies is subject to debate.

This study has several limitations. Firstly, conducting the study with only female participants who sought treatment at the Algology outpatient clinic of University Medical Faculty Hospital negatively affects the generalizability of the results. Due to the short duration of the technique applied in the study and the absence of a follow-up study, gains over time or additional changes could not be determined. Furthermore, considering the program applied, the limited number of sessions conducted using VR goggles due to pandemic conditions, the limited sample size, and the provision of a standard patient education to all patients instead of an intervention specifically targeting their sleep and daily life problems may have contributed to the lack of improvement in sleep and quality of life scores. Additionally, the unknown compliance of patients with the given homework assignments is another limitation of our study. The lack of homogeneity in the experimental and control groups in our study can also be considered as limitations.

Conclusion

This study evaluated the effects of attention-focus shifting technique applied with virtual reality (VR) on the quality of life and sleep in women diagnosed with fibromyalgia (FM). The findings indicate that attention-focus shifting technique using VR did not have a significant impact on improving sleep quality and overall quality of life in patients with fibromyalgia syndrome (FMS).

However, future research is recommended to be conducted with larger populations, gender matching, and longer-term interventions. These studies should aim to develop programs targeting the improvement of sleep and quality of life by utilizing customized VR treatments based on the specific pathology of FMS.

In the current literature, the number of studies using VR in fibromyalgia patients is quite limited. Therefore, more controlled studies need to be conducted and more attention should be given to this topic in the literature to understand the effectiveness of this technology.

Virtual reality goggles can be used as an adjunct to treatment due to their painless and easy applicability. Additionally, further research is recommended to determine the effectiveness of videos with different themes.

VR-based treatments can offer a more enjoyable and motivating alternative for FMS patients who struggle to adhere to traditional

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treatment methods. To reduce costs, group interventions may be considered as an effective method for FMS patients; however, the efficacy of such interventions needs to be tested with a controlled and randomly selected large sample.

Considering the complexity of fibromyalgia, VR should be considered not only as a single technique but also as an adjunct to a broader cognitive-behavioral therapy (CBT) program. Further research is needed to examine the therapeutic benefits and positive effects when methods such as relaxation, cognitive restructuring, and mindfulness-based group therapies are used to enhance therapeutic effectiveness.

Ethical Approval
The study was approved by the Akdeniz University Medical Faculty Clinical Research Ethics Committee (No: 666; Date: 15 September 2021).

Patient Consent
Informed consent was waived due to the retrospective design.

Conflict of Interest
The authors declare no conflict of interest.

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References

1. Theadom A, Cropley M, Humphrey KL. Exploring the role of sleep and coping in quality of life in fibromyalgia. J Psychosom Res. 2007;62:145-51.
2. Mease P. Fibromyalgia syndrome: review of clinical presentation, pathogenesis, outcome measures, and treatment. J Rheumatol. 2005;75:6-21.
3. Fietta P, Fietta P, Manganelli P. Fibromyalgia and psychiatric disorders. Acta Biomed. 2007;78:88.
4. Langley PC. The prevalence, correlates and treatment of pain in the European Union. Curr Med Res Opin. 2011;27:463-80.
5. Spaeth M. Epidemiology, costs, and the economic burden of fibromyalgia syndrome: efficacy of operant behavioral and cognitive behavioral treatments. Arthritis Res Ther. 2009;11:1-2.
6. Van Houdenhove B, Egle UT. Fibromyalgia: a stress disorder? Psychother Psychosom. 2004;73:267-75.
7. Melzack R, Wall PD. Pain mechanisms: a new theory. Science. 1965;150:971-9.
8. Häuser W, Arnold B, Eich W, et al. Management of fibromyalgia syndrome: an interdisciplinary evidence-based guideline. GMS Ger Med Sci. 2008;6.
9. Turk DC, Okifuji A. Psychological factors in chronic pain: evolution and revolution. J Consult Clin Psychol. 2002;70:678.
10. Nüesch E, Häuser W, Bernardy K, et al. Comparative efficacy of pharmacological and non-pharmacological interventions in fibromyalgia syndrome: network meta-analysis. Ann Rheum Dis. 2013;72:955-62.
11. Waters SJ, McKee DC, Keefe FJ. Cognitive behavioral approaches to the treatment of pain. Psychopharmacol Bull. 2007;40:74-88.
12. Thieme K, Flor H, Turk DC. Psychological pain treatment in fibromyalgia syndrome: efficacy of operant behavioural and cognitive behavioural treatments. Arthritis Res Ther. 2006;8:1-12.
13. Powers M, Emmelkamp PM. Virtual reality exposure therapy for anxiety disorders: a meta-analysis. J Anxiety Disord. 2008;22:561-9.
14. Mahrer NE, Gold JI. The use of virtual reality for pain control: a review. Curr Pain Headache Rep. 2009;13:100-9.
15. Li A, Montaño Z, Chen VJ, Gold JI. Virtual reality and pain management: current trends and future directions. Pain Manag. 2011;1:147-57.
16. Malloy KM, Milling LS. The effectiveness of virtual reality distraction for pain reduction: a systematic review. Clin Psychol Rev. 2010;30:1011-8.
17. Pourmand A, Davis S, Marchak A, et al. Virtual reality as a clinical tool for pain management. Curr Pain Headache Rep. 2018;22:1-6.
18. Keefe FJ, Huling DA, Coggins MJ, et al. Virtual reality for persistent pain: a new direction for behavioral pain management. Pain. 2012;153:2163.
19. Şahin HN, Batıgün DA, Uğurtaş S. The validity, reliability and factor structure of the brief symptom inventory (BSI). Türk Psikiyatri Derg. 2002;13:125-35.
20. Ediz L, Hiz O, Toprak M, et al. The validity and reliability of the turkish version of the revised fibromyalgia impact questionnaire. Clin Rheumatol. 2011;30:339-46.
21. Koçyigit H, Gülseren S, Erol A, et al. The reliability and validity of the turkish version of quality of life questionnaire of the european foundation for osteoporosis (QUALEFFO). Clin Rheumatol. 2003;22:18-23.
22. Ağargün MY, Kara H, Anlar O. The validity and reliability of the pittsburgh sleep quality index. Türk Psikiyatri Derg. 1996;7:107-15.
23. Cortés-Pérez I, Zagalaz-Anula N, Ibancos-Losada MDR, et al. Virtual reality-based therapy reduces the disabling impact of fibromyalgia syndrome in women: systematic review with meta-analysis of randomized controlled trials. J Pers Med. 2021;11:1167.
24. Gulsen C, Soke F, Eldemir K, et al. Effect of fully immersive virtual reality treatment combined with exercise in fibromyalgia patients: a randomized controlled trial. Assist Technol. 2022;34:256-63.
25. Polat M, Kahveci A, Muci B, et al. The effect of virtual reality exercises on pain, functionality, cardiopulmonary capacity, and quality of life in fibromyalgia syndrome: a randomized controlled study. Games Health J. 2021;10:165-173.
26. Villafaina S, Collado-Mateo D, Dominguez-Munoz FJ, et al. Benefits of 24-week exergame intervention on health-related quality of life and pain in women with fibromyalgia: a randomized controlled trial. Games Health J. 2019;8:380-6.
27. Collado-Mateo D, Dominguez-Muñoz FJ, Adsuar JC, et al. Effects of exergames on quality of life, pain, and disease effect in women with fibromyalgia: a randomized controlled trial. Arch Phys Med Rehabil. 2017;98:1725-31.
28. Glombiewski JA, Sawyer AT, Gutermann J, et al. Psychological treatments for fibromyalgia: a meta-analysis. Pain. 2010;151:280-95.
29. Arnold LM, Clauw DJ. Fibromyalgia syndrome: practical strategies for improving diagnosis and patient outcomes. Am J Med. 2010;123:S2.
30. Scascighini L, Toma V, Dober-Spielmann S, et al. Multidisciplinary treatment for chronic pain: a systematic review of interventions and outcomes. Rheumatology. 2008;47:670-8.
31. Darnall BD, Krishnamurthy P, Tsuei J, et al. Self-administered skills-based virtual reality intervention for chronic pain: randomized controlled pilot study. JMIR Form Res. 2020;4:e7293.
32. Bennett RM, Friend R, Jones KD, et al. The revised fibromyalgia impact questionnaire (FIQR): validation and psychometric properties. Arthritis Res Ther. 2009;11:R120.

DOI: 10.5455/medscience.2025.03.088

33. Sato K, Fukumori S, Matsusaki T, et al. Nonimmersive virtual reality mirror visual feedback therapy and its application for the treatment of complex regional pain syndrome: an open-label pilot study. Pain Med. 2010;11:622-9.

34. Carvalho MSD, Carvalho LC, Menezes FDS, et al. Effects of exergames in women with fibromyalgia: a randomized controlled study. Games Health J. 2020;9:358-67.

35. Botella C, Garcia-Palacios A, Vizcaíno Y, et al. Virtual reality in the treatment of fibromyalgia: a pilot study. Cyberpsychol Behav Soc Netw. 2013;16:215-23.

36. Bradley LA. Pathophysiology of fibromyalgia. Am J Med. 2009;122:S22-30.

37. Calandre EP, Garcia-Carrillo J, Garcia-Leiva JM, et al. Subgrouping patients with fibromyalgia according to the results of the fibromyalgia impact questionnaire: a replication study. Rheumatol Int. 2011;31:1555-9.

38. Herrero R, García-Palacios A, Castilla D, et al. Virtual reality for the induction of positive emotions in the treatment of fibromyalgia: a pilot study over acceptability, satisfaction, and the effect of virtual reality on mood. Cyberpsychol Behav Soc Netw. 2014;17:379-84.