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Original Article

Effectiveness of a Fibromyalgia Online Nursing Consultation in the Quality of Life: A Randomized Controlled Trial

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ABSTRACT

Background: Aim: To evaluate the effectiveness of an online nursing consultation through the Internet platform Red Sinapsis (RS) in improving the perceived quality of life of patients with fibromyalgia (FM).
Method: Eighty patients with FM were randomized to an intervention group (n = 40) or control group (n = 40). The intervention group (IG) was monitored by a nursing specialist through the online platform RS while the control group (CG) received standard follow-up at the clinic. The Fibromyalgia Impact Questionnaire (FIQ) and 36-item Short-Form Health Survey (SF-36) were used at baseline, 6-month, and 12-month follow-up.

Results: The IG showed a 65% improvement in the perception of their general state of health at 12 months into the study, compared with an improvement of 5.6% in the CG ($p < .001$). The IG also achieved better results for emotional status, with a maintained improvement throughout the study of more than 2 points in the anxiety variable (from 7.64 to 5.36), that remained constant in the CG. The depression variable also showed constant improvement over the 12 months of the study in the IG, rising from an average of 7.72 (standard deviation [SD] = 2.05) to 5.33 (SD = 1.65), while in the CG a slight deterioration was observed. In both cases, the difference in mood evolution was significant ($p < .001$).

Conclusions: Online nursing follow-up for people with fibromyalgia improves patients' perceived quality of life related to their welfare and emotional state.

Fibromyalgia (FM) is among the diseases causing the highest rate of occupational disability in Spain. Fibromyalgia (FM) is a complex condition that causes pain, fatigue, non-refreshed sleep, mood disturbance and cognitive impairment.

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Fibromyalgia (FM) is a complex condition with an identity of its own that affects the physical and mental health of those who suffer it. Although pain is the dominant symptom in fibromyalgia, other symptoms such as fatigue, non-refreshed sleep, mood disturbance, and cognitive impairment are common (Macfarlane et al., 2017).

World prevalence of fibromyalgia in the last decade, according to most of the 1990 criteria of the American College of Rheumatology (ACR), is estimated at 2.7% (Queiroz, 2013). In Spain, according to the results of the EPISER 2016 project, this figure is 2.4%, with a significantly higher frequency in women (4.2%) than in men (0.2%), and higher risk to patients aged 40–49 years. This study places FM among the diseases causing the highest rate of occupational disability in Spain. It likewise describes FM as one of the chronic diseases associated with high consumption levels of pharmacologic treatments (Seoane-Mato et al., 2019).

The quality of life perceived by those suffering from chronic pain, especially when the pain is constant and intense, is poor.

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This condition affects patients' mood, causes difficulties in performing everyday activities and problems with personal relations, and encourages social isolation (Beltran-Alacreu et al., 2018; Jonsdottir et al., 2014; Skúladóttir et al., 2020).

Unfortunately, conventional consultations are too brief to meet the needs of patients with chronic pain (Arnold et al., 2016). On the one hand, this has led many health professionals to use the Internet to provide additional tools for monitoring these patients more closely. And, on the other hand, it has caused chronic pain patients to search online for information on their condition (Corcoran et al., 2010; Plinsinga et al., 2019).

Literature Review

In Spain, over 60% of the population uses the Internet as a source of information for health-related subjects and 22.3% use social networks (SN). Internet use is considerably greater among women (63.4%) than men (57.2%). The majority of people making health-related searches resort to general search engines (82%), while only 20.8% use specialized websites (Vázquez & Martínez, 2016).

Insufficient knowledge of the ethology of FM and the lack of any efficient treatment cause insecurity in those affected by this disorder. This situation generates elevated costs to the health system, as people with FM turn to numerous specialists and undergo multiple treatments in their quest for a solution. We also know that these people turn to the Internet for information on their condition, their pain, and on possible treatments (Bragazzi et al., 2017). The quality of information on chronic pain available on the Internet is not always appropriate. This increases the risk of patients making decisions regarding their treatment based on erroneous information (Alioshkin Cheneguín, Salvat Salvat, Romay Barro, & Torres Lacomba, 2020; Bailey et al., 2013).

The important role of nurses in controlling and monitoring patients with rheumatologic problems has been demonstrated. Information and communication technologies (ICT) are a potential alternative and complementary aid in the management of diverse chronic pathologies. Several studies have shown that online consultations used in combination with face-to-face nursing consultations contribute to better patient follow-up and coaching services (Minnock et al., 2018; Van Eijk-Hustings et al., 2012). Recently, teleconsultation has been fostered in rheumatology to provide follow-up and other services for patients during the period of maximum impact of the COVID-19 pandemic (Tornero-Molina et al., 2020).

The aim of this study was to evaluate the effectiveness of online nursing consultations for improving fibromyalgia patients' perceived quality of life. We hypothesized that continuing nursing follow-up through an online platform would raise the perceived quality of life in patients with fibromyalgia, regarding both their physical and emotional well-being, as compared with follow-up sessions programmed at the clinic.

Methods

Trial Design

The study was a parallel trial design, on a simple randomization scheme with a 1:1 ratio, to evaluate the effectiveness on quality of life of using ICT in online nursing consultations at 3 months and 6 months. The study was conducted at a Pain Management Clinic in Madrid, Spain, that deals with cases referred by other professionals for intense or unresponsive pain, from February 2015 to February 2016.

Participants

The study population consisted of patients diagnosed with fibromyalgia as per the criteria of the American College of Rheumatology (ACR, 2010) who met the following conditions for inclusion: (1) aged >18 years; (2) Spanish speakers; and (3) access to a computer to participate in the study. The following participants were excluded: those suffering severe cognitive or mental disorder preventing following instructions in the study. Patients with post traumatic stress disorder (PTSD) and mood disorders were not excluded.

Sample and allocation

Assuming a clinically relevant improvement in health-related quality of life (HRQoL) (in accordance with Leveille et al., 2009) by 20% of the intervention group (IG) versus the control group (CG) with an alpha value of 0.005 and a power of 80% would require 33 patients in each study arm (66 in total). This sample was overestimated by 15% to cover losses in the follow-up program (n = 66).

Recruitment took place between February 2015 and February 2016. Patients were selected consecutively as they came for consultation at the center and gave their consent to take part. Randomization was applied using a program to generate pseudo-random numbers. Distribution was affected by means of white, numbered, sealed, and correlative envelopes. From among the 80 randomized patients, 40 were assigned to the CG and 40 to the IG (Fig. 1).

The study could not be masked to patients and professionals, because the IG was given access to the platform while the CG was not. However, the person carrying out the data evaluation was blinded to the treatment details.

Intervention

The intervention variable was the online nursing consultation on the IT platform Red Sinapsis. This online tool provides patients with information on their illness, access to their clinical history, and a messaging system for communicating with the medical or nursing staff at any time. The patients assigned to the IG were given access to this tool throughout the duration of the study.

Outcomes and Measures

Measures were taken of sociodemographic variables (age, sex, marital state, educational level, place of residence, employment, computer skills, coexistence with dependent persons) and clinical variables (time of diagnosis, painkillers administered, anxiety or depression diagnosis).

The results variables were the perceived state of health and emotional state with regard to anxiety and depression of the subjects in the study, measured through the following questionnaires: Fibromyalgia Impact Questionnaire (FIQ), adapted to Spanish (Esteve-Vives et al., 2007) and 36-item Short-Form Health Survey (SF-36), likewise adapted to Spanish (Vilagut et al., 2005). These variables were measured over a span of 1 year, at the first consultation, at 6 months, and at 12 months.

The FIQ is designed as a self-testing tool and it measures the impact or effects of fibromyalgia on perceived health through a number of problems or difficulties significantly linked to the disorder. This instrument measures physical functioning, work status (missed days of work, job difficulty), depression, anxiety, morning tiredness, pain, stiffness, fatigue, and well-being over the past week. The first section contains 11 questions on various everyday activities referred to physical functions. These are scored as 0 (always able to perform the activity), 1 (on most occasions), 2 (sometimes), or 3 (never). These scores are added up and divided by the number of sub-items answered by the patient, to give a final score between 0 and 3. This value is multiplied by 3.33 for a value on a scale of 0-10. Sections 2 and 3 consist of questions on the number

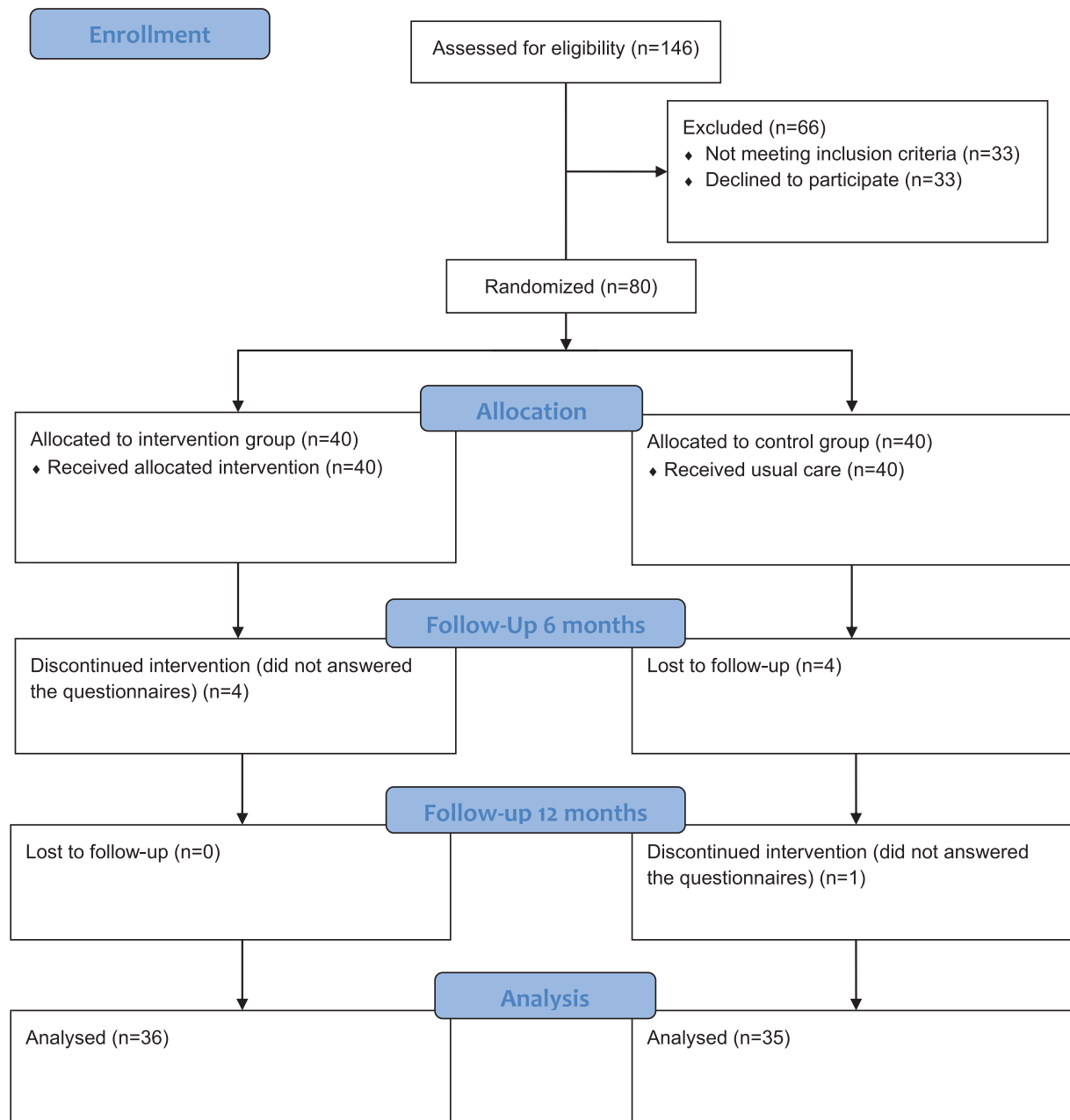


Figure 1. CONSORT flow diagram.

of days on which the patient feels well and able to work. To evaluate section 2 the following codification is applied: 0 days = 7; 1 day = 6; 2 days = 5; 3 days = 4; 4 days = 3; 5 days = 2; 6 days = 1; 7 days = 0. The score thus obtained is then multiplied by 1.43 to obtain a final result on a scale of 0-10. In section 3, the answer given is directly multiplied by 1.43. Sections 4 to 10 are on a numerical scale of 0-10. These sections evaluate the ability to work, pain, fatigue, morning tiredness, rigidity, anxiety, and depression. The overall FIQ score is the sum of the scores obtained in each section. Should any section remain unanswered, all the other sections are added up and the resulting score is divided by the number of items answered. This is then multiplied by 10 to give a final score on a scale of 0-10.

Quality of life in relation to health was evaluated with the SF-36 (Study Short Form) questionnaire which provides a state of health profile and is one of the generic scales with greatest po-

tential for the assessment of clinical results. It comprises 36 items covering 8 dimensions, aggregated under 2 profiles, physical and mental, as described below: Physical function (10); Social function (2); Physical role (4); Emotional role (3); Mental health (5); Vitality (4); Bodily pain (2); General health (6). The answer options form Likert scales that evaluate intensity or frequency. The number of answer options varies from 3-6, depending on each item. scores for each of the 8 dimensions in the SF-36 range from 0-100, where 100 indicates optimal health and 0 represents the very poorest state of health possible. This questionnaire was not designed for a global index, but nevertheless allows the calculation of 2 summary scores (mental and physical) through the combination of scores for each dimension. To facilitate interpretation, standardized scores are also obtained based on the values for population norms, such that 50 (standard deviation of 10) is the general population mean. Values above or below 50 should be in-

terpreted as better or worse, respectively, than the population of reference.

Procedure

Once the participants were assigned to the study, they received a notification by telephone of the group in which they had been placed. Participants in both groups were sent the first SF-36 and FIQ questionnaires by e-mail or postal service. If these had not been returned after 15 days, participants were contacted by telephone to remind them to return the questionnaires.

The patients assigned to the CG attended 2 face-to-face consultations with the principal researcher, at which patients' knowledge of their condition, its treatment, and the repercussions on their family environment was explored, at 6 months and 12 months into the study. During these consultations, patients were handed the follow-up questionnaires. Patients who were unable to attend these appointments were sent the questionnaires by e-mail or postal service. After the last questionnaires, at 12 months, were received, participants were informed that the study had concluded. In the event that any of the questionnaires had not been returned on time, an e-mail was sent to the participant, and if this was ineffective a reminder was given by telephone.

As soon as patients were assigned to the IG, they were called by telephone for an appointment at the clinic to sign-in to the platform Red Sinapsis and receive access codes, and for a briefing on how to use the system. In this briefing, participants were told that messages would be read within working hours from Monday to Friday, from 10:00 a.m.-10:00 p.m., although the messaging system could be used at any time.

To ensure that patients harbored no doubts regarding the use of the platform, a message was sent to any patient failing to log in to the platform within the first 15 days of their inclusion in the system. These messages contained questions regarding their possible difficulties or doubts with regard to log-in. If these messages produced no response, the participants in question were called by telephone. Through the messaging system, patients were provided with properly documented information based on available scientific information relating to their disorder (FM) and their regular medication schemes, with fact sheets on the suitability, secondary effects, contraindications, and interactions of such medication. Any other queries made by the patients were also addressed. The nursing staff, if deemed appropriate, passed these messages to the medical staff in order to provide a more in-depth response or to make an appointment for the patient at the clinic. At 6 months and, finally, at 12 months, participants were sent the FIQ and SF-36 questionnaires to be completed and returned on the platform. If the questionnaires were not returned within 15 days, participants were sent a reminder on the network messaging system. If participants had still not submitted their final questionnaires after a month, a telephone reminder was given. On reaching the final (twelfth) month of follow-up, and after sending out the FIQ and SF-36 questionnaires, the collaborating researcher at the clinic issued to all participants a satisfaction questionnaire relating to the follow-up conducted by the clinic and collected these for evaluation via the platform.

Ethical Considerations

This project was approved by a University Research Ethics Committee (CEI-46-894; 27/06/2013) and the Ethics Committee at a Hospital (CP-CI 13/208-E; 26/06/2013). All the people meeting the inclusion criteria for this study received an information sheet with a description of the study and an informed consent form, to enable their clinical data to be shared and the effectiveness of the

platform Red Sinapsis to be evaluated, while allowing them to be assigned to either of the 2 monitoring cohorts. Confidentiality of individuals' identification data was guaranteed.

Data analysis

A descriptive analysis of the variables was conducted to express the general characteristics of the study population. For qualitative variables, the proportions for the different categories within each variable and their corresponding confidence intervals (CIs) were calculated. For quantitative variables such as age and results in SF-36 domains, the mean was calculated as central trend measure, and SD as dispersion measure.

The Kolmogorov-Smirnov test was used to contrast the hypothesis for normality in continuous variables. When this hypothesis was rejected, hypothesis tests were conducted by transforming the variables, although the data were expressed as described in the foregoing paragraph. For the analysis of similarity among the patients assigned to the 2 branches of the study, we used Fisher's exact test or the χ^2 test for qualitative variables and the Student's *t* test for quantitative variables.

To analyse the effect of intervention, when expressed in qualitative variables, 2 instrumental dichotomic variables were defined for each of the original variables expressing the presence or absence of any favorable development between the initial consultation and the 2 subsequent consultations at 6 months and 12 months. The link between the frequency of favorable or unfavorable development and patients' exposure was established by means of Fisher's exact test or the χ^2 test.

The analysis of the effect of the intervention, as determined by the quantitative variables, was conducted by analyzing the variance of repeated measures. Thus, the possible relationship between exposure and changes at each of the 3 monitoring checkpoints (basal, 6 months, 12 months) for the different variables was examined. The hypothesis testing method used was to measure the independent variable interaction (exposure) factor. With the rejection of the assumption of sphericity (Mauchly's sphericity test), the Greenhouse-Geisser correction was applied to hypothesis testing.

In all the tests the null hypothesis was rejected for *p* values $<.05$ in bilateral contrast. The CIs were calculated at 95%. The data analysis was performed with the statistical package IBM-SPSS v.22.

Results

The selected sample consisted of 80 patients, 78 women and 2 men. Finally, 71 individuals completed the follow-up and were analyzed. This is the result of 4 participants lost in the IG for not answering ≥ 1 questionnaires and 5 losses in CG for the same reasons. The clinical and sociodemographic characteristics of the participants are shown in Table 1.

Perceived Quality-of-Life and the Impact of Fibromyalgia on Health

Table 2 shows the changes observed in perceived quality-of-life through the SF-36 questionnaire at 6- and 12-month follow-up. Statistically significant differences were found between the intervention and CG in the perception of general health, vitality, social functioning, emotional role, mental health, and the evolution of perceived health compared with the baseline measure.

Regarding physical functioning, physical role and bodily pain, although positive development was appreciated in both groups, no significant differences were observed. (Table 2)

The results in the FIQ were similar. No statistically significant differences were found in the baseline measures, 70.23 (14.7) in CG versus 80.09 (12.1) in the IG. After the 12-month follow-up, the

Table 1
Baseline Characteristics of Participants

Variables	Control Group (n = 40)	Intervention Group (n = 40)	p
Sex,% (N)			
Female	48.7% (38)	49.3% (39)	.494
Male	50% (1)	50% (1)	
Age in years, mean (SD)	55.5 (4.06)	53.3 (7.49)	.055
Marital status % (N)			
Married	48.2% (27)	51.8% (29)	.965
Single	55.6% (5)	44.4% (4)	
Divorced	54.5% (6)	45.5% (5)	
Widow	50.0% (2)	50.0% (2)	
Level of education % (N)			
Primary	37.9 % (11)	62.1% (18)	.258
Secondary	53.6% (15)	46.4 % (13)	
Professional	40.0% (2)	60.0% (3)	
University	66.7 % (12)	33.3% (6)	
Personal computer % (N)			
Own	48.0% (12)	52.0% (13)	.625
Share	55.9 % (19)	44.1% (15)	
At work	42.9% (9)	57.1% (12)	
Employment status % (N)			
Active	47.5% (19)	52.5% (21)	.655
Inactive	52.5% (21)	47.5% (19)	
Care-dependency % (N)			
No	45% (18)	30% (12)	.166
Yes	55% (22)	70% (28)	
Years of diagnosis % (N)			
<1 year	5% (2)	5% (2)	1.000
>1 year	95% (38)	95% (38)	
Analgesic use % (N)			
No	0	0	
Yes	100% (40)	100% (40)	
Anxiolytic/Antidepressant use % (N)			
No	15% (6)	5% (2)	.136
Yes	85% (34)	95% (38)	

SD = standard deviation

Table 2

Results in SF-36 domains (the score ranges of SF-36 subscales were 0 to100 each, where 100 indicates optimal health and 0 represents the very poorest state of health possible)

Domain	Intervention Group			Control Group			p
	Baseline, mean (SD)	6 months, mean (SD)	12 months, mean (SD)	Baseline, mean (SD)	6 months, mean (SD)	12 months, mean (SD)	
Physical functioning	21.9 (15.8)	23 (15.3)	24 (13.9)	29.3 (26.0)	29.8 (25.7)	30.7 (25.2)	.776
Physical role	15.9 (21.7)	20.1 (27.3)	28.4 (35.4)	29.3 (36.1)	35 (34.9)	36.4 (35.5)	.273
Bodily pain	10.6 (9.0)	17.0 (11.4)	20.9 (10.7)	13.2 (14.1)	17.1 (13.5)	23.2 (11.1)	.393
General health	8.4 (6.5)	15.5 (7.4)	29.0 (7.9)	4.7 (5.5)	4.7 (6.0)	6.3 (6.8)	<.001
Vitality	3.6 (3.5)	5.7 (5.2)	8.7 (6.8)	6.2 (4.9)	6.2 (4.9)	6.2 (4.9)	<.001
Social functioning	25.7 (17.4)	36.8 (15.2)	44.4 (18.0)	26.0 (23.4)	28.2 (22.3)	31.0 (20.9)	<.001
Emotional role	26.8 (34.6)	47.2 (36)	67.6 (36.9)	25.7 (33.4)	27.6 (36.6)	35.2 (40.4)	<.001
Mental health	25.7 (33.4)	27.6 (36.6)	35.2 (40.4)	30.2 (25.6)	33.0 (23.8)	38.5 (19.2)	<.001
1-year compare health	4.86 (0.35)	3.14 (0.90)	2.42 (0.69)	4.23 (0.55)	3.89 (0.58)	3.54 (0.74)	<.001

SD = standard deviation

mean FIQ score in the IG was 66.03 (10.1) ($p < .001$). The CG also showed a slight improvement 65.61 (11.6).

Emotional Status: Anxiety and Depression

For the assessment of emotional status, an entire section of the health questionnaire SF 36 is dedicated to exploring how the patient has felt over the previous 4 weeks. Among the feelings reported, the following are collected: the ability to keep up everyday activities and social life, happiness or despondency, a calm or anxious state of mind, feeling discouraged, being less careful of feeling sad or depressed. The FIQ questionnaire, in turn, inquires in 2 of its 10 questions whether the person has felt anxious or nervous and sad or depressed during the previous week.

For the item 'feeling nervous', most participants in both groups reported feeling better, as seen in Table 3. There were significantly

more participants in the IG that improved in this variable than those in the CG. To assess evolution in patients' mood, we evaluated peace of mind and calmness. Interestingly, after the 6-month follow-up 1 participant in the CG and 2 participants in the IG reported feeling worse than before. Nevertheless, as seen in Table 3, more than three-quarters of the participants in the IG reported feeling better after the 6-month follow-up and at 12 months. Most participants in the CG reported feeling the same as they did at baseline after the 6-month follow-up (88.6%) and after 12-month follow-up (66.7%). Regarding the evolution of mood in relation to despondency and sadness, improvement was very significant in the IG compared with the CG. No participants in the IG and 2 participants in the CG reported feeling worse after 12-month follow-up. Finally, in the evolution of mood in relation to happiness, more participants in the IG than those in CG reported having improved in the 2 stages of

Table 3

Participants feeling better in SF-36 mood items (the score ranges of SF-36 subscales were 0 to 100 each, where 100 indicates optimal health and 0 represents the very poorest state of health possible)

Mood Items	Control Group	Intervention Group	p
Feeling nervous			
6 months	8 (22.9%)	31 (86.1%)	.002
12 months	22 (61.1%)	35 (92.1%)	.002
Peace of mind and calmness			
6 months	3 (8.6%)	28 (77.8%)	<.001
12 months	11 (30.6%)	32 (84.2%)	<.001
Despondency and sadness			
6 months	4 (11.4%)	31 (86.1%)	<.001
12 months	13 (36.1%)	33 (86.8%)	<.001
Happiness			
6 months	2 (5.7%)	18 (50%)	<.001
12 months	5 (13.9%)	28 (73.7%)	<.001

follow-up. Most participants in the CG reported feeling the same as baseline after 6 months (94.3%) and after 12 months (86.1%).

In the FIQ questionnaire, the above results were confirmed. In the dimension relating to anxiety and nervousness, the mean for patients in the IG evolved positively, progressing from 7.64 (SD = 1.71) at the beginning of the study to 5.36 (SD = 1.71). In the CG, this measure remained practically constant, with the difference in the evolution of this variable being significant ($p < .001$). With relation to depression and sadness, the mean for patients in the IG evolved positively, progressing from 7.72 (SD = 2.05) at the beginning of the study to 5.33 (SD = 1.65) at the end of follow-up. Some worsening occurred within the CG, the difference in the solution of this variable being likewise significant ($p < .001$).

Discussion

The purpose of this study was to investigate whether a nurse-led internet platform could help people with fibromyalgia improve their quality of life. The results showed that the patients benefited from online consultations in the dimensions related to their welfare and emotional state. The online consultations had a significant effect on depression and anxiety over the 12 months of the study, which was of special interest because it is associated with disability and psychological suffering (Consoli et al., 2012).

The characteristics of the population in this study are similar to those found in other studies conducted on chronic pain and fibromyalgia patients involving ICT. With regard to sex, the larger proportion of the group was female, at 98.6% as opposed to 2.5% male participants. As for the age range, it was established among the inclusion criteria for selecting our sample that patients should be over 18 years of age. The age of patients in our sample ranges from 18 to 66 years, giving an average age of 54.43 years that coincides with those found in the literature (Buhrman et al., 2013; Carpenter et al., 2012; Najm, Lempp, Gossec, Berenbaum, & Nikiphorou, 2020). With regard to the medication taken, 100% of the people in our study took medication to control their pain and 90% were treated with antidepressants or anxiolytics, very similar with other studies on patients with FM (Ruehlman et al., 2012; Williams et al., 2010), whereas in studies on pain and quality of life with different aetiologies, such as osteomuscular or neuropathic pain, therapeutic regimes vary (Dear et al., 2013; Lorig, Ritter, Laurent, & Plant, 2008).

The learning process for the use of monitoring platform is simple and consists of registering in the system and receiving a username and password, and a code card to authorize professionals to access personal reports. Some systematic reviews, such as those by Macea or Bender (Bender, Radhakrishnan, Diorio, Englesakis, &

Jadad, 2011; Macea et al., 2010) found these systems to be highly cost-effective. In addition, some studies have pointed out the savings in costs deriving from conducting online consultations for patients with impaired mobility or who live at a distance from the medical center, such as in the case of surveys conducted in populations with a wide geographic dispersion that are not easily accessed by assistance teams (Kulcsar, Albert, Ercolano, & Mecchella, 2016; Leveille et al., 2009), or during the COVID-19 pandemic (Foti et al., 2020). This is not the case in our study, in which the population is located within the metropolitan environment and has ease of access to health services. Furthermore, in our study, no decline is detected in face-to-face consultations, and indeed up to 35% of patients are redirected by nurses to physicians for consultations. Instead, a direct positive effect is seen in the enhanced understanding of their health-related process in general (proper use of medication, available activities that are within their ability, healthy lifestyle habits, etc.), which contributes to lessening patients' fears and doubts regarding the everyday implications of their disorder.

Differences are likewise appreciated in the reviews in relation to the follow-up period. This study has had a timespan of 12 months, with measurement data collected through follow-up questionnaires at the outset, 6 months, and 12 months of using the platform for each participant. The reviews present follow-up cadences of 6-8-12 weeks (Andersson et al., 2011; Riva, Camerini, Allam, & Schulz, 2014; Salaffi et al., 2015) from 7-14 weeks (Ruehlman et al., 2012), 3 months (Collinge, Soltysik, & Yarnold, 2010; Leveille et al., 2009), 5 and 11 months (Kristjánsdóttir et al., 2013a), and 6 months (Bromberg et al., 2012). However, we found only 1 study in which monitoring spanned a full year as in the case in hand (Lorig, Ritter, Laurent, & Plant, 2008). As we have said, fibromyalgia is a complex disorder that is refractory to medical treatment where it is most needed. In this study, therefore, we expound the need to extend the follow-up period in order to evaluate the effectiveness of the interventions applied.

The questionnaires used in this study to measure quality-of-life are those used in reviewed works, namely the SF-36 and the specific questionnaire for measuring the impact of FM, the FIQ. In the reviews, these were also the main questionnaires used (Collinge, Soltysik, & Yarnold, 2010; Kristjánsdóttir et al., 2013b; Williams et al., 2010). Generally speaking, the reviews show a decline in catastrophist attitudes toward pain (Bromberg et al., 2012; Buhrman et al., 2011; Carpenter et al., 2012; Peters et al., 2017; Riva, Camerini, Allam, & Schulz, 2014; Ruehlman et al., 2012; Schultz et al., 2018). Our study population also experienced a significant upturn in perceived state of health, both through the SF-36 and in the FIQ ($p < .001$) and patients likewise display a less catastrophist view of their condition.

Regarding patients' emotional status, the results appreciated in our study on mood changes in patients with FM were seen to be similar to those found in other studies (Andersson et al., 2011; Buhrman et al., 2013; Carpenter et al., 2012; Dear et al., 2013; Lorig, Ritter, Laurent, & Plant, 2008; Peters et al., 2017). In all patients, both through the SF-36 and in the emotional dimensions of the FIQ, improvements are found –significantly– in the levels of stress, anxiety, and depression with respect to the situation at the beginning of follow-up. Eccleston et al. (2014) and Beatty & Lambert (2013) highlight that psychological therapies administered through the Internet strengthen patients' capacity to face their condition, reduce dysfunctional attitudes, enhance mood, reduce the intensity and severity of pain, and lower anxiety and stress levels. Similarly, another review on the impact of computer-based interventions points to enhanced physical and emotional functions in patients with chronic pain and functional somatic syndromes (Vugts, Joosen, van der Geer, Zedlitz, & Vrijhoef, 2018).

This work likewise propounds the need to train health providers to address this complement to clinical management and thus become a real support to self-help health strategies through ICT (Sparks, Kawi, Menzel, & Hartley, 2016).

Limitations

One limitation that must be taken into consideration for this study is having had to establish as a criterion for inclusion that participants must have access to a computer. We gathered data on whether participants had their own computer, shared one with others, or used a computer at their workplace. Across our study, 42.5% of participants shared a computer with other family members, and 26.25% used a computer at their workplace. In the reviewed studies, 100% of participants needed to have access to the Internet to use the web tool they would be piloting. In only 1 of the studies reviewed, patients in the intervention group were given a smartphone with the application they would be using. In another study, the people agreeing to participate in the follow-up scheme were paid 100 dollars (Berman et al., 2009; Kristjánsdóttir et al., 2013b).

The main limitation in this study is the provenance of the people in the sample, all of whom were patients of the Clínica del Dolor in Madrid. The effectiveness of follow-up in a different group of people with the same diagnosis through their family doctor or other specialists has not been studied. Triple-blinded analysis and evaluation was conducted of the data obtained, but other types of blinding were not possible.

In all cases, participants' educational and economic level was medium to high, and they were familiar with the use of IT media. The effect of eHealth literacy–low in general population–has been found positively correlated with younger age and app use (Knitz et al., 2020). Therefore, the results of this study cannot be considered applicable to the general population.

Even if the prevalence is higher in women (4.2%) than in men (0.2%) in Spain, the marginal male participation in this study should also be considered a limitation, as the results may not reflect the reality of male fibromyalgia patients.

Conclusions

Online intervention through the platform Red Sinapsis has been effective, as it has improved patients' initial condition with regard to perception of their health and emotional status. Complementary to face-to-face consultations, patients could benefit from the advantages that online platforms can offer for maintaining healthy lifestyle habits, controlling the evolution of their pain, learning

about their disorder and becoming more committed to their treatment.

Changes in the variables well-being, depression and anxiety continue over the 12 months of the study, with a more pronounced improvement trend toward the end of the follow-up programme. Further research is necessary to understand how these results may be maintained over a longer period of time. Similarly, further study is needed to compare the effectiveness of different platforms.

Nursing Implications

This study has shown that people affected by fibromyalgia may benefit from the use of ITC, through follow-up program provided by nursing professionals who are able to offer assistance and coaching focused on the disorder in a simple and accessible manner. Online nursing consultations conducted for diagnosed fibromyalgia patients over an IT platform (Red Sinapsis) enhanced these patients' perceived quality of life in terms of their well-being and emotional status.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:[10.1016/j.pmn.2021.09.001](https://doi.org/10.1016/j.pmn.2021.09.001).

References

- Buhrman, M., Nilsson-Ihrfeldt, E., Jannert, M., Ström, L., & Andersson, G. (2011). Guided internet-based cognitive behavioural treatment for chronic back pain reduces pain catastrophizing: A randomized controlled trial. *Journal of Rehabilitation Medicine*, 43(6), 500–505.
- Alioshkin Cheneguín, A., Salvat Salvat, I., Romay Barrero, H., & Torres La-comba, M. (2020). How good is online information on fibromyalgia? an analysis of quality and readability of websites on fibromyalgia in Spanish. *BMJ Open*, 10(7), Article e037065.
- Arnold, L. M., Gebke, K. B., & Choy, E. H. S. (2016). Fibromyalgia: Management strategies for primary care providers. *International Journal of Clinical Practice*, 70(2), 99–112.
- Bailey, S. J., LaChapelle, D. L., LeFort, S. M., Gordon, A., & Hadjistavropoulos, T. (2013). Evaluation of chronic pain-related information available to consumers on the Internet. *Pain Medicine*, 14(6), 855–864.
- Beatty, L., & Lambert, S. (2013). A systematic review of internet-based self-help therapeutic interventions to improve distress and disease-control among adults with chronic health conditions. *Clinical Psychology Review*, 33(4), 609–622.
- Beltran-Alacreu, H., López-de-Uralde-Villanueva, I., Calvo Lobo, C., La-Touche, R., Cano de la Cuerda, R., Gil-Martínez, A., Fernández-Ayuso, D., & Fernández-Carnero, J. (2018). Prediction models of health-related quality of life in different neck pain conditions: A cross-sectional study. *Patient Preference and Adherence*, 12, 657–666.
- Bender, J. L., Radhakrishnan, A., Diorio, C., Englesakis, M., & Jadad, A. R. (2011). Can pain be managed through the Internet? a systematic review of randomized controlled trials. *Pain*, 152(8), 1740–1750.
- Berman, R. L. H., Iris, M. A., Bode, R., & Drengenberg, C. (2009). The effectiveness of an online mind-body intervention for older adults with chronic pain. *Journal of Pain*, 10(1), 68–79.
- Bragazzi, N. L., Amital, H., Adawi, M., Brigo, F., Watad, S., Aljideff, G., ... Watad, A. (2017). What do people search online concerning the “elusive” fibromyalgia? insights from a qualitative and quantitative analysis of Google Trends. *Clinical Rheumatology*, 36(8), 1873–1878.
- Bromberg, J., Wood, M. E., Black, R. A., Surette, D. A., Zacharoff, K. L., & Chiu, E. J. (2012). A randomized trial of a web-based intervention to improve migraine self-management and coping. *Headache*, 52(2), 244–261.
- Buhrman, M., Skoglund, A., Husell, J., Bergström, K., Gordh, T., Hursti, T., ... Andersson, G. (2013). Guided internet-delivered acceptance and commitment therapy for chronic pain patients: a randomized controlled trial. *Behaviour Research and Therapy*, 51(6), 307–315.
- Carpenter, K. M., Stoner, S. A., Mundt, J. M., & Stoelb, B. (2012). An online self-help CBT intervention for chronic lower back pain. *Clinical Journal of Pain*, 28(1), 14–22.

- Collinge, W., Soltysik, R. C., & Yarnold, P. R. (2010). An internet-based intervention for fibromyalgia self-management: initial design and alpha test. *Optimal Data Analysis*, 1(1), 163–175.
- Consoli, G., Marazziti, D., Ciapparelli, A., Bazzichi, L., Massimetti, G., Giacomelli, C., Rossi, A., Bombardieri, S., & Dell'Osso, L. (2012). The impact of mood, anxiety, and sleep disorders on fibromyalgia. *Comprehensive Psychiatry*, 53(7), 962–967.
- Corcoran, T. B., Haigh, F., Seabrook, A., & Schug, S. A. (2010). A survey of patients' use of the internet for chronic pain-related information. *Pain Medicine*, 11(4), 512–517.
- Dear, B. F., Titov, N., Perry, K. N., Johnston, L., Wootton, B. M., Terides, M. D., ... Hudson, J. L. (2013). The pain course: a randomised controlled trial of a clinician-guided Internet-delivered cognitive behaviour therapy program for managing chronic pain and emotional well-being. *Pain*, 154(6), 942–950.
- Eccleston, C., Fisher, E., Brown, R., Craig, L., Duggan, G. B., Rosser, B. A., & Keogh, E. (2014). Psychological therapies (Internet-delivered) for the management of chronic pain in adults. *Cochrane Database of Systematic Reviews*, 2014(2), Article CD010152.
- Esteve-Vives, J., Rivera Redondo, J., Salvat Salvat, M. I., de Gracia Blanco, M., & Alegre de Miguel, C. (2007). Propuesta de una versión de consenso del Fibromyalgia Impact Questionnaire (FIQ) para la población española. [Proposal for a consensus version of the Fibromyalgia Impact Questionnaire (FIQ) for the Spanish population]. *Reumatología Clínica*, 3(1), 21–24.
- Foti, R., Amato, G., Foti, R., & Visalli, E. (2020). Management of patients with inflammatory rheumatic diseases: telemedicine and rheumatologists challenged in the era of COVID-19. *Frontiers in Public Health*, 8, Article 558838.
- Jonsdottir, T., Aspelund, T., Jonsdottir, H., & Gunnarsdottir, S. (2014). The relationship between chronic pain pattern, interference with life and health-related quality of life in a nationwide community sample. *Pain Management Nursing*, 15(3), 641–651.
- Knitz, J., Simon, D., Lambrecht, A., Raab, C., Tascilar, K., Hagen, M., ... Hueber, A. J. (2020). Mobile health usage, preferences, barriers, and ehealth literacy in rheumatology: patient survey study. *Journal of Medical Internet Research MHealth and UHealth*, 8(8), e19661.
- Kristjánsdóttir, O. B., Fors, E. A., Eide, E., Finset, A., Stensrud, T. L., van Dulmen, S., Wigers, S. H., & Eide, H. (2013a). A smartphone-based intervention with diaries and therapist-feedback to reduce catastrophizing and increase functioning in women with chronic widespread pain: randomized controlled trial. *Journal of Medical Internet Research*, 15(1), e5.
- Kristjánsdóttir, O. B., Fors, E. A., Eide, E., Finset, A., Stensrud, T. L., van Dulmen, S., Wigers, S. H., & Eide, H. (2013b). A smartphone-based intervention with diaries and therapist feedback to reduce catastrophizing and increase functioning in women with chronic widespread pain. part 2: 11-month follow-up results of a randomized trial. *Journal of Medical Internet Research*, 15(3), e72.
- Kulcsar, Z., Albert, D., Ercolano, E., & Mecchella, J. N. (2016). Telerheumatology: a technology appropriate for virtually all. *Seminars in Arthritis and Rheumatism*, 46(3), 380–385.
- Leveille, S. G., Huang, A., Tsai, S. B., Allen, M., Weingart, S. N., & Iezzoni, L. I. (2009). Health coaching via an internet portal for primary care patients with chronic conditions. *Medical Care*, 47(1), 41–47.
- Lorig, K. R., Ritter, P. L., Laurent, D. D., & Plant, K. (2008). The internet-based arthritis self-management program: a one-year randomized trial for patients with arthritis or fibromyalgia. *Arthritis & Rheumatism*, 59(7), 1009–1017.
- Macfarlane, G. J., Kronisch, C., Dean, L. E., Atzeni, F., Häuser, W., Fluß, E., Choy, E., Kosek, E., Amris, K., Branco, J., Dincer, F., Leino-Arjas, P., Longley, K., McCarthy, G. M., Makri, S., Perrot, S., Sarzi-Puttini, P., Taylor, A., & Jones, G. T. (2017). EULAR revised recommendations for the management of fibromyalgia. *Annals of the Rheumatic Diseases*, 76(2), 318–328.
- Minnock, P., McKee, G., Kelly, A., Carter, S. C., Menzies, V., O'Sullivan, D., ... van Eijk-Hustings, Y. (2018). Nursing sensitive outcomes in patients with rheumatoid arthritis: a systematic literature review. *International Journal of Nursing Studies*, 77, 115–129.
- Najm, A., Lempp, H., Gossec, L., Berenbaum, F., & Nikiphorou, E. (2020). Needs, experiences, and views of people with rheumatic and musculoskeletal diseases on self-management mobile health apps: mixed methods study. *Journal of Medical Internet Research MHealth and UHealth*, 8(4), e14351.
- Peters, M. L., Smeets, E., Feijge, M., van Breukelen, G., Andersson, G., Buhrman, M., & Linton, S. J. (2017). Happy despite pain: a randomized controlled trial of an 8-week Internet-delivered positive psychology intervention for enhancing well-being in patients with chronic pain. *Clinical Journal of Pain*, 33(11), 962–975.
- Plinsinga, M. L., Besomi, M., Maclachlan, L., Melo, L., Robbins, S., Lawford, B. J., ... Bennell, K. (2019). Exploring the characteristics and preferences for online support groups: mixed method study. *Journal of Medical Internet Research*, 21(12), e15987.
- Queiroz, L. P. (2013). Worldwide epidemiology of fibromyalgia. *Current Pain and Headache Reports*, 17(8), 356.
- Riva, S., Camerini, A.-L., Allam, A., & Schulz, P. J. (2014). Interactive sections of an internet-based intervention increase empowerment of chronic back pain patients: randomized controlled trial. *Journal of Medical Internet Research*, 16(8), e180.
- Ruehlman, L. S., Karoly, P., & Enders, C. (2012). A randomized controlled evaluation of an online chronic pain self management program. *Pain*, 153(2), 319–330.
- Salaffi, F., Ciapetti, A., Gasparini, S., Atzeni, F., Sarzi-Puttini, P., & Baroni, M. (2015). Web/Internet-based telemonitoring of a randomised controlled trial evaluating the time-integrated effects of a 24-week multicomponent intervention on key health outcomes in patients with fibromyalgia. *Clinical and Experimental Rheumatology*, 33(1), S93–S101.
- Schultz, R., Smith, J., Newby, J. M., Gardner, T., Shiner, C. T., Andrews, G., & Faux, S. G. (2018). Pilot trial of the reboot online program: an Internet-delivered, multidisciplinary pain management program for chronic pain. *Pain Research and Management*, 2018, Article 9634727.
- Seoane-Mato, D., Sánchez-Piedra, C., Silva-Fernández, L., Sivera, F., Blanco, F. J., Pérez Ruiz, F., Juan-Mas, A., Pego-Reigosa, J. M., Narváez, J., Quilis Martí, N., Cortés Verdú, R., Antón-Pagés, F., Quevedo Vila, V., Garrido Courel, L., del Amo, N., del V., Paniagua Zudaire, I., Añez Sturchio, G., Medina Varo, F., Ruiz Tudela, M. del M., ... & Bustabad, S. (2019). Prevalencia de enfermedades reumáticas en población adulta en España (estudio EPISER 2016). Objetivos y metodología. *Reumatología Clínica*, 15(2), 90–96.
- Skúladóttir, H., Gunnarsdóttir, T. J., Halldórsdóttir, S., Sveinsdóttir, H., Holden, J. E., & Björnsdóttir, A. (2020). Breaking the vicious circle: experiences of people in chronic pain on the pain rehabilitation journey. *Nursing Open*, 7(5), 1412–1423.
- Sparks, T., Kawi, J., Menzel, N. N., & Hartley, K. (2016). Implementation of health information technology in routine care for fibromyalgia: pilot study. *Pain Management Nursing*, 17(1), 54–62.
- Tornero-Molina, J., Sánchez-Alonso, F., Fernández-Prada, M., Bris-Ochaita, M.-L., Si-fuentes-Giraldo, A., & Vidal-Fuentes, J. (2020). Tele-rheumatology during the COVID-19 pandemic [online ahead of print]. (Telerreumatología en tiempos de crisis durante la pandemia por COVID-19). *Reumatología Clínica Oct* 29, S1699-258X(20)30240-0.
- Van Eijk-Hustings, Y., Van Tubergen, A., Boström, C., Braychenko, E., Buss, B., Felix, J., Firth, J., Hammond, A., Harston, B., Hernandez, C., Huzjak, M., Korandová, J., Kukkurainen, M. L., Landewé, R., Mezieres, M., Milincovic, M., Moretti, A., Oliver, S., Primdahl, J., ... & Hill, J. (2012). EULAR recommendations for the role of the nurse in the management of chronic inflammatory arthritis. *Annals of the Rheumatic Diseases*, 71(1), 13–19.
- Vázquez, R., & Martínez, M. (2016). Los ciudadanos ante la e-Sanidad. Opiniones y expectativas de los ciudadanos sobre el uso y aplicación de las TIC en el ámbito sanitario. [Study on the opinions and expectations of citizens about the use and application of IT in the health sector]. *Ministry of Industry, Energy and Tourism (Spain)*. https://www.ontsi.es/sites/ontsi/files/los_ciudadanos_ante_la_e-sanidad.pdf.
- Vilagut, G., Ferrer, M., Rajmil, L., Rebollo, P., Permanyer-Miralda, G., Quintana, J. M., Santed, R., Valderas, J. M., Ribera, A., Domingo-Salvany, A., & Alonso, J. (2005). El Cuestionario de Salud SF-36 español: una década de experiencia y nuevos desarrollos. *Gaceta Sanitaria*, 19(2), 135–150.
- Vugt, M. A. P., Joosen, M. C. W., van der Geer, J. E., Zedlitz, A. M. E. E., & Vrijhoef, H. J. M. (2018). The effectiveness of various computer-based interventions for patients with chronic pain or functional somatic syndromes: a systematic review and meta-analysis. *PLoS One*, 13(5), Article e0196467.
- Williams, D. A., Kuper, D., Segar, M., Mohan, N., Sheth, M., & Clauw, D. J. (2010). Internet-enhanced management of fibromyalgia: a randomized controlled trial. *Pain*, 151(3), 694–702.