Information and Communication Technologies for chronic pain: A survey to explore the perception of people diagnosed with fibromyalgia

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Abstract

Background: Chronic pain is prevalent in our society, with conditions like fibromyalgia being notably widespread. The gold standard in aiding individuals dealing with chronic pain involves interdisciplinary approaches rooted from a biopsychosocial perspective. Regrettably, access to such care is difficult for most of the people in need. Information and Communication Technologies (ICT) have been used as a way of overcoming access barriers (among other advantages).

Objective: Despite the potential benefits of ICT, there's a scarcity of research on how individuals with fibromyalgia utilize ICT for pain management, along with their perceptions of these technologies. With this study we aim to fill this gap by conducting a cross-sectional study to gather uses of ICT and views of a sample of individuals coping with fibromyalgia.

Methods: 265 individuals with fibromyalgia participated. A survey was created to assess the use of different ICT tools for pain management, satisfaction with used tools, and perceived advantages and disadvantages. Alongside this, data collection encompassed sociodemographic factors and pain-related variables, pain intensity, the impact of pain on daily life activities, and fear-avoidance beliefs.

Results: Only 0.75% of respondents reported not having used any ICT tool for pain management. Among those who have used ICT tools, an average of 10.94 out of 14 different tools were used, with the most used options being instant messaging applications, websites dedicated to managing fibromyalgia, phone consultations with professionals, and online multimedia resources. Satisfaction rates were relatively modest (mean=2.09, in a scale from 0 to 5) being the ones with higher satisfaction: instant messaging applications, phone calls with health professionals, fibromyalgia management websites, and online multimedia resources. Participants appreciated the ability to receive treatment from home, access to specialized treatment, and using ICTs as a supplement to in-person interventions. However, they also highlighted drawbacks such as lack of close contact with health professionals, difficulty expressing emotions, and lack of knowledge or resources to use ICTs. The use of ICTs is found to also be influenced by age and educational background. Additionally, there was a negative correlation between satisfaction with ICT tools and levels of fear avoidance.

Conclusions: People with fibromyalgia specially value ICTs that enable communication with healthcare professionals and provide access to online resources. Remote treatment was a significant advantage due to mobility issues. However, concerns about the ability to use ICTs due to lack of knowledge or resources were noted. Age-related digital divide and education level influenced ICT usage and satisfaction. Higher fear-avoidance levels correlated with lower satisfaction with ICTs, possibly due to general avoidance tendencies, including exposure to treatments. The findings highlight the need to improve ICTs tools and design strategies aimed at bolstering self-efficacy among users.

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Information and Communication Technologies for chronic pain: A survey to explore the perception of people diagnosed with fibromyalgia

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ABSTRACT

Background:

Chronic pain is prevalent in our society, with conditions like fibromyalgia being notably widespread. The gold standard in aiding individuals dealing with chronic pain involves interdisciplinary approaches rooted from a biopsychosocial perspective. Regrettably, access to such care is difficult for most of the people in need. Information and Communication Technologies (ICT) have been used as a way of overcoming access barriers (among other advantages).

Objective:

This study addresses the very little explored area of how individuals with fibromyalgia use and perceive different types of ICT for pain management.

Methods:

A cross-sectional study was conducted by using an online survey. This was created to assess the use of different ICT tools for pain management, satisfaction with used tools, and perceived advantages and disadvantages. Alongside this, data collection encompassed sociodemographic variables and pain-related variables, pain intensity, the impact of pain on daily life activities, and fear of movement/injury beliefs. 265 individuals diagnosed with fibromyalgia completed the survey.

Results:

Only 0.75% of participants reported not having used any ICT tool for pain management. Among those who have used ICT tools, an average of 10.94 out of 14 different tools were used, with the most used options being instant messaging applications, websites dedicated to managing fibromyalgia, phone calls with health professionals, and online multimedia resources. Satisfaction rates were relatively modest (mean=2.09, in a scale from 0 to 5) being the ones with higher satisfaction: instant messaging applications, phone calls with health professionals, fibromyalgia management websites, and online multimedia resources. Participants appreciated the ability to receive treatment from home, access to specialized treatment, and using ICTs as a supplement to in-person interventions. However, they also highlighted drawbacks such as lack of close contact with health professionals, difficulty expressing emotions, and lack of knowledge or resources to use ICTs. The use of ICTs was influenced by age and educational background. Additionally, there was a

negative correlation between satisfaction with ICT tools and scores of fear of movement/injury.

Conclusions:

People with fibromyalgia are prone to use ICTs for pain management, especially those that allow them to be in contact with professionals and have access to online resources. But there is still a need to improve ICT tools since satisfaction ratings were modest. Moreover, strategies aimed at older people, those with lower levels of education and higher levels of fear of movement/injury can be useful to potentiate the use of ICTs among them.

Keywords: Fibromyalgia; Chronic Pain; Pain Management; Information and Communication Technologies; Use and Satisfaction.

Introduction

Chronic pain is a prevalent issue in our society. These figures infringe an enormous cost at societal level, and suffering to people with chronic pain and their relatives [28, 29]. To help people with chronic pain, multidisciplinary interventions, viewed through a biopsychosocial lens, stand as the gold standard for addressing chronic pain. Unfortunately, access to these interventions is often challenging due to limited availability of multidisciplinary units and insufficient training in pain management among healthcare professionals [4, 5, 6]. Information and Communication Technologies (ICT) represent an opportunity for facilitating access to evidence-based interventions at an affordable cost. Furthermore, ICT can increase autonomy and empower individuals to become more actively involved in their own care [7]. For these reasons, their use is increasing in the health field in general [8, 9] but also for people with chronic pain [10, 11]. COVID-19 pandemic has increased the awareness and potential of ICT [12].

Despite the considerable potential, little research has explored to what extent people with pain use ICT and their perceptions about that. To approach how they are using available solutions and what their impressions are, can help in advancing in the area by designing better solutions or improving the access to the ones available that are not used by people besides having shown to be effective.

Along these lines, Ledel et al. (2020) [13] conducted a qualitative study to examine experiences of patients with chronic pain with regard to ICT, and identify possible facilitators and barriers for patients' use of eHealth for pain management. They were in general in favor of using ICT for pain (Apps were the preferred tool). They also emphasized the necessity of having access to technological tools under any circumstance as a facilitator for utilizing ICT in general, as well as being able to use them appropriately regardless of their level of pain or ability to concentrate.

Schneider and Hadjistavropoulos (2014) [14] conducted a survey study to investigate the impressions of 129 participants with chronic pain about Internet-based Cognitive Behavioral Therapy (ICBT), and to identify factors that were associated with a willingness to consider ICBT. Participants generally agreed that ICBT is beneficial, especially for patients in rural areas, those with mobility issues, and those who have difficulty attending appointments.

Cranen et al. (2011) [16] explored chronic pain patients' perspectives on potential telerehabilitation services through semi-structured interviews involving 25 participants. In general terms, they found that factors influencing patients' perceptions for telerehabilitation were complex and different among users. For example, patients saw benefits in telerehabilitation, but were hesitant to consider it as a standalone treatment due to concerns about performance expectancy. The preference for face-to-face

interaction with therapists was highlighted as crucial for receiving effective feedback and exercise guidance, particularly during the initial stages of treatment. In a subsequent study, in which they explored various treatment characteristics, Cranen et al.'s (2017) [15] discovered that the most favored treatment approach was an "intermediate" scenario. This scenario combined conventional clinic-based rehabilitation and a telerehabilitation program focused on self-management. The study underscores the potential of remote feedback and monitoring technology in chronic pain telerehabilitation and highlights the need for patient-centered treatment design.

In addition to these preliminary findings, further research is needed to investigate the use and satisfaction of a wide variety of ICTs for pain treatment or management. Much of the existing literature is limited to specific ICT solutions, and larger sample studies focusing on specific pain problems are warranted, as needs and impressions may vary among different groups [27]. Therefore, this study aims to fill this gap by comprehensively exploring the potential use and satisfaction of a broad range of ICTs for the management of pain in individuals dealing with fibromyalgia.

This is one of the most prevalent conditions contributing to recurring pain [30]. It is a chronic and complex condition that causes widespread pain and profound exhaustion, as well as a variety of other accompanying symptoms such as fatigue, stiffness, and sleep disturbances. Moreover, individuals with fibromyalgia often experience altered pain perception and processing, making them often more sensitive to pain compared to the general population. The prevalence of fibromyalgia worldwide is between 0.2% and 6.6% [2], with a greater rate in women, whose prevalence values are placed around 3.4%; while, for men, the prevalence is around 0.5% [3]. These numbers, and the specificity of this condition, merit a study focused on them.

More specifically, we want to provide evidence about the most frequently used ICT tools by people who suffer from fibromyalgia, the most valuable for them, and the most important advantages and disadvantages. We also want to test if their use and perceptions vary taking into account sociodemographic variables and pain-related variables. This is because we hypothesize that besides having similar health problems, their uses and perceptions about different ICT tools can vary depending on their specific situation.

Methods

Procedure

The study was conducted between December 1st and December 14th 2022. An online survey was designed to gather cross-sectional data. Completing the survey requires approximately 30 minutes.

Ethical considerations

The study was approved by the ethics committee of the Universitat Oberta de Catalunya (UOC), being then asked to sign an informed consent implemented inside the online survey. Their participation was completely voluntary, with any reward, and anonymous.

Study population

Participants were recruited by disseminating the study to lists of individuals who self-reported having been diagnosed of fibromyalgia, and had attended a multidisciplinary intervention for pain management or were awaiting such treatment in Barcelona (Spain). 265 participants who confirmed that they have been diagnosed with fibromyalgia, signed the informed consent and completed the survey.

Data collection

A specific survey was created to achieve the study objectives. Moreover, sociodemographic variables, and pain-related variables (intensity of pain, the impact/interference in the activities of daily life and fear of movement/injury beliefs) were assessed to study correlations and relations with the use of ICT.

Survey

It was designed taking into account the study purposes to evaluate sociodemographic variables, fibromyalgia characteristics (time since the onset of symptoms/diagnosis) and specially uses and perceptions of ICT for fibromyalgia. More specifically, they were asked about:

- *ICT tools used for pain management and their associated satisfaction*: a list of 14 potential types of ICT were presented, and they were asked to rate each of them in a scale from 0 (not used) to 5. The 14 types of ICT were: Instant Messaging Apps; Websites; Telephone calls with health professionals; Multimedia online resources; Social networks; Video Conferences with health professionals; Technologies for tracking activity; Digital sensors; e-mail; Mobile phone applications; Camera; Platforms for following symptoms or schedules; Virtual reality; Video games. An attempt was made to create an exhaustive list of all those technological

tools that could be potentially useful for the management of pain and fibromyalgia.

- *Advantages and disadvantages of the use of ICT tools*: participants were provided with a predefined list of advantages and disadvantages, through which they could select all the ones they considered appropriate. Additionally, they could provide new advantages/disadvantages not included in the list presented. Advantages included: possibility of receiving treatment from home; access to specialized treatment; complement to face-to-face interventions; reduction in economic cost; anonymity. Disadvantages offered were: not having close contact with the health professional; not being able to express emotions and feelings; lack of knowledge or resources to use ICT; difficulty for the health professional to understand non-verbal language; difficulty for the patient to understand non-verbal language from the health professional; lack of data confidentiality; lack of evidence about the use of ICT for fibromyalgia; network band or connection problems; lack of legal regulations. These were defined by taking into account the study by Sora el al. (2021) [17]. The survey was designed in Spanish language and implemented online using the Google Forms © software.

Chronic Pain Grade Questionnaire (CPGS)

It is a 7-item self-administered questionnaire that was developed by Von Korff and his collaborators in 1992 [18]. It was designed to measure two important factors related to chronic pain: the level of pain intensity (Characteristic Pain Intensity index) and the degree of pain-related disability (Disability Score index). The scores of both subscales are combined to obtain a degree of chronic pain, which is divided into four different categories and can range from Grade I (minimal pain and disability) to Grade IV (high degree of pain and highly limiting disability). The Spanish version, which has shown appropriated psychometric properties, was used for the study [19].

Tampa Scale of Kinesiophobia (TSK-11)

The Tampa Scale for Kinesiophobia (TSK-11) is a self-administered 11-item questionnaire that was developed by Woby et al. in 2005 [20] The TSK-11 is commonly used to assess the degree of fear of movement/injury, being higher scores indicative of greater fear. The Spanish version, used in this study, was validated with two different pain samples (a heterogeneous chronic pain sample and a musculoskeletal acute pain sample) and demonstrated to have good psychometric properties [21].

Fibromyalgia Impact Questionnaire-Revised (FIQ-R)

It is a revised version of the Fibromyalgia Impact Questionnaire (FIQ), a fibromyalgia assessment instrument commonly used to analyze the impact of this condition on patients' activities of daily living, updated by Bennett and collaborators in 2009 [22]. It consists of a total of 21 items, which are divided among the three subscales of function, overall impact and symptoms. A higher score is indicative of a greater impact of fibromyalgia on the patient's activities of daily living. The Spanish version was used for the present study, which demonstrated to have a good internal consistency and its validity was proven to adequately evaluate patients with fibromyalgia [23].

Data analysis

All the data analyses were performed by using the SPSS (version 25) statistical package. Descriptive statistics were computed for sociodemographic, pain related variables, ICT tools used for pain management, Satisfaction, Advantages and Disadvantages. After that, bivariate correlations were computed to test potential relationships between study variables. These include the number of ICT used, number of advantages/disadvantages of ICT, the degree of satisfaction for each ICT listed, age, education level, time elapsed since diagnosis, as well as the results of the TSK-11, FIQ-R and CPGS questionnaires. Paired t-tests were used to study differences in the number of ICT used, and number of advantages/disadvantages, by some sociodemographic variables (gender, living alone or accompanied, having relatives in charge, and employment status).

Results

Sociodemographic and diagnosis variables

The study comprised predominantly women, constituting 92.1% of the participants, with a mean age 53.81 (SD 8.44). 71.7% of the participants had completed at least secondary school, and 44.1% were either unemployed or disabled for work. Finally, 84.5% of the participants resided with someone else, and nearly a half have dependents in charge.

Considering fibromyalgia, 83.3% of them have had symptoms of fibromyalgia for more than five years, and 62.5% had been diagnosed more than 5 years ago (see Table 1).

Table 1. Sociodemographic and diagnosis variables

	N (%)

Education	No Education: 2 (0.8%) Primary Education: 73 (27.5%) Secondary Education: 136 (51.3%) University Education: 39 (14.7%) Postgraduate Education: 15 (5.7%)
Employment situation	Employed: 109 (41.1%) Unemployed: 35 (13.2%) Retired: 30 (11.3%) Disabled for work: 82 (30.9%) Student: 2 (0.8%) Housewife: 3 (1.1%) Others: 4 (1.5%)
Live alone or accompanied	Alone: 41 (15.5%) Accompanied: 224 (84.5%)
Relatives in charge	Yes: 127 (47.9%) Children: 108 (40.8%) 1 child: 46.3% 2 children: 47.2% 3 children: 6.5% Adults: 59 (22.3%) 1 adult: 59.3% 2 adults: 30.5% 3 adults: 8.5% 4 adults: 1.7% No: 138 (52.1%)
Time since first symptoms	Less than 6 months: 0 (0%) Between 6 months and 1 year: 1 (0.4%) Between 1 and 2 years: 9 (3.4%) Between 2 and 5 years: 33 (12.5%) More than 5 years: 222 (83.8%)
Time since diagnosis	Less than 6 months: 1 (0.4%) Between 6 months and 1 year: 4 (1.5%) Between 1 and 2 years: 34 (12.8%) Between 2 and 5 years: 60 (22.6%) More than 5 years: 166 (62.6%)

Pain-related variables

Mean scores in Characteristic Pain Intensity, Disability Score, Fear of movement/injury and Disability were high. Considering grades computed by the CPGS, participants could be classified as: 2.5% Grade I, 10.6% Grade II, 16.1% Grade III and 70.8% Grade IV (see Table 2).

Table 2. Pain-related variables

	Mean (SD); min-max
Pain severity (CPGQ)	
Characteristic Pain Intensity	76.31 (12.90); 23.33 - 100.00
Disability Score	74.83 (16.71); 10.00 - 100.00

Fear of movement/injury (TSK-11)	23.43 (8.11); 11 - 44
Disability (FIQ-R)	67.85 (18.95); 10.67 - 100.00

ICT Tools Use and Satisfaction

Participants reported having used a mean of 10.94 tools (SD: 4.48) from a total of 14. 0.75% of the participants (N = 2) reported not having used any of the ICT listed (see Table 3). Most commonly utilized tools were: Instant messaging applications (89.4%); Websites aimed to improve the management of fibromyalgia (88.3%); Phone calls with professionals (86.0%); Online multimedia resources (83.8%). On the other hand, the less frequently used were: Camera to assess the posture and movement progress (72.5%); Platforms for following symptoms or schedules (71.3%); Virtual reality (70.2%); Video games (70.2%). The specific percentages for the other ICT alternatives are presented in Table 3.

The mean degree of satisfaction for all the ICT tools used was 2.09 (SD 0.38). Tools that received the highest satisfaction ratings were: Instant messaging applications (2.69; SD 1.41); Telephone calls with health professionals (2.58; SD 1.45); Websites aimed to improve the management of fibromyalgia (2.53; SD 1.30); Multimedia online resources (2.40; SD 1.31). Meanwhile, the lowest satisfaction ratings were attributed to: Video games (1.55; SD 1.08); Virtual reality (1.67; SD 1.12); Camera (1.71; SD 1.12); Digital sensors (1.78; SD 1.23). Specific results for all the ICT alternatives can be seen in Table 3.

Table 3. Percentage of people using each of the ICT tools and satisfaction with them

			% of each satisfaction rating					
	N (%)	**Mean (SD)**	**Never used**	**1**	**2**	**3**	**4**	**5**
Instant Messaging Apps	237 (89.4%)	2.69 (1.41)	10.6%	23.4%	22.6%	16.2%	12.8%	14.3%
Websites	234 (88.3%)	2.53 (1.30)	11.7%	24.2%	24.2%	17.7%	13.6%	8.7%
Telephone calls with health professionals	228 (86.0%)	2.58 (1.45)	14.0%	26.4%	21.9%	13.2%	10.2%	14.3%

Multimedia online resources	222 (83.8%)	2.40 (1.31)	16.2%	26.8%	22.6%	16.6%	9.4%	8.3%
Social networks	211 (79.6%)	2.16 (1.31)	20.4%	33.6%	21.1%	10.9%	6.4%	7.5%
Video Conferences with health professionals	211 (79.6%)	2.35 (1.45)	20.4%	33.2%	15.8%	10.9%	9.1%	10.6%
Technologies for tracking activity	204 (77.0%)	1.83 (1.28)	23.0%	47.9%	11.3%	6.0%	6.4%	5.3%
Digital sensors	203 (76.6%)	1.78 (1.23)	23.4%	47.9%	12.1%	7.2%	4.2%	5.3%
e-mail	203 (76.6%)	2.22 (1.31)	23.4%	30.2%	20.8%	11.3%	7.2%	7.2%
Mobile phone applications	193 (72.8%)	1.95 (1.24)	27.2%	36.6%	18.5%	7.5%	4.9%	5.3%
Camera	192 (72.5%)	1.71 (1.12)	27.5%	45.3%	13.2%	6.4%	4.5%	3.0%
Platforms for following symptoms or schedules	189 (71.3%)	1.84 (1.21)	28.7%	40.0%	16.2%	6.4%	3.8%	4.9%
Virtual reality	186 (70.2%)	1.67 (1.12)	29.8%	44.2%	15.8%	3.0%	3.4%	3.8%
Video games	186 (70.2%)	1.55 (1.08)	29.8%	50.6%	10.2%	3.8%	1.9%	3.8%

Advantages and disadvantages of ICT tools for health

On average, participants selected a total of 1.99 advantages (SD 1.31) and 1.94 disadvantages (SD 1.69). The most frequently selected perceived advantages of ICT for pain management were: Possibility of receiving treatment from home (58.9%); Access to specialized treatment (57.4%); Use as a complement to face-to-face interventions (47.2%). Conversely, the most frequent disadvantages were: Not having close contact with the health professional (49.8%); Not being able to express emotions and feelings (41.5%); Lack of knowledge or resources to use ICT (30.2%). See Table 4 for the complete list of Advantages and disadvantages, including percentages.

Table 4. Advantages and disadvantages of ICT tools

Advantages	
Possibility of receiving treatment from home	156 (58.9%)
Access to specialized treatment	152 (57.4%)
Complement to face to face interventions	125 (47.2%)
Reduction in economic cost	74 (27.9%)

Anonymity	20 (7.5%)
Disadvantages	
Not having close contact with the health professional	132 (49.8%)
Not being able to express emotions and feelings	110 (41.5%)
Lack of knowledge or resources to use ICT	80 (30.2%)
Health professional would not be able to understand non-verbal language	62 (23.4%)
I would not be able to understand non-verbal language from the health professional	44 (16.6%)
I would be concerned about data confidentiality	27 (10.2%)
There is few evidence about the use of ICT for fibromyalgia	25 (9.4%)
I could have not enough network band or connection could be broken	24 (9.1%)
Lack of legal regulations	13 (4.9%)

Relations between study variables

Regarding sociodemographic variables, older age was significantly correlated with higher number of ICT used, lower number of ICT related advantages chosen, and lower satisfaction with a lot of the ICT listed (see Table 5). Higher levels of education were significantly correlated with a lower number of ICT used. However, higher education was significantly correlated with a greater number of advantages, fewer disadvantages and a higher degree of satisfaction in relation to all the ICT listed (see Table 5).

Concerning pain-related variables, it is worth noting a significant correlation between fear of movement/injury (as assessed with the TSK-11 questionnaire) and higher number of ICT used, as well as greater number of disadvantages. There was also a significant negative correlation between TSK-11 scores and satisfaction with several ICT types. Finally, FIQ-R scores were only significantly and positively related with the number of ICT used; along with scores from the CPGS Characteristic Pain Intensity with lower satisfaction in the use of ICT for tracking activity (see Table 5).

Paired t-tests used to compare the number of ICT used and the number of disadvantages reported, were not significant when comparing between men and women. The same happens considering professional status (this variable was dichotomized in “unemployed” and “employed”). However, men pointed out significantly more advantages than women who participated in the survey (see Table 6). Additionally, when observing differences between people living alone vs people living accompanied, it was found that those living alone significantly perceived more disadvantages than those living accompanied. The same happens when comparing those taking care of others vs those who do not: these last ones perceived significantly more disadvantages.

Table 5. Correlations between sociodemographic, pain related variables with the number of ICTs used, advantages/disadvantages, and satisfaction with different types of ICTs

	Age	Education	Time since diagnosis	TSK-11	FIQ-R	CPGS (Characteristic Pain Intensity)	CPGS (Disability Score)
Number ICT used	0.18*	-0.23**	0.008	0.18*	0.14*	0.06	0.04
Number ICT Advantages	-0.22**	0.19*	-0.01	-0.02	-0.07	-0.08	-0.05
Number ICT Disadvantages	0.01	-0.12*	-0.05	0.21**	0.10	0.07	0.07
Satis. Websites	-0.12	0.19*	0.02	-0.16*	-0.09	-0.06	-0.03
Satis. Multimedia online resources	-0.15*	0.19*	-0.02	-0.17*	-0.10	-0.09	-0.03
Satis. e-mail	-0.19*	0.10	0.07	-0.13	-0.01	-0.02	0.02
Satis. Instant Messaging Apps	-0.24**	0.22**	-0.04	-0.15*	-0.1	-0.06	-0.04
Satis. Social networks	-0.23**	0.15*	-0.005	-0.08	-0.002	-0.09	0.02
Satis. Video Conferences with health professionals	-0.25**	0.32**	-0.02	-0.21*	-0.13	0.001	0.04
Satis. Mobile phone applications	-0.03	0.09	0.02	-0.009	0.01	0.06	0.07
Satis. Telephone calls with health professionals	-0.22**	0.13*	0.05	-0.15*	-0.01	0.03	0.09
Satis. Virtual reality	-0.12	0.12	-0.03	-0.004	-0.04	-0.007	0.01
Satis. Video games	-0.15*	0.20*	0.04	-0.13	-0.05	-0.08	-0.02
Satis. Technologies for tracking activity	-0.19*	0.22**	0.04	-0.24**	-0.13	-0.15*	-0.05
Satis. Digital sensors	-0.20*	0.19*	0.04	-0.22*	-0.07	-0.12	-0.04
Satis. Camera	-0.17*	0.10	0.02	-0.09	-0.1	-0.03	-0.04
Satis. Platforms for following symptoms or schedules	-0.17	0.10	0.10	0.001	0.04	-0.05	0.02

*P<.05; **P<.001

Table 6. Paired t-test comparisons

	Number of ICT used	Advantages	Disadvantages
Gender			
Women (mean; SD)	10.92 (4.46)	1.94 (1.30)	1.94 (1.71)
Men (mean; SD)	11.00 (4.87)	2.57 (1.33)	1.90 (1.48)
t (*P* value)	t = -0.076 (*P* = .939)	t = -2.124 **(*P* = .035)**	t = 0.098 (*P* = .922)
Laboral Status			
Unemployed (mean; SD)	11.35 (4.21)	1.93 (1.35)	2.10 (1.80)
Employed (mean; SD)	10.36 (4.80)	2.08 (1.24)	1.72 (1.49)
t (*P* value)	t = 1.774 (*P* = .077)	t = -0.937 (*P* = .350)	t = 1.815 (*P* = .071)
Living alone			
Yes (mean; SD)	11.56 (4.36)	1.90 (1.32)	2.80 (2.05)
No (mean; SD)	10.83 (4.50)	2.01 (1.31)	1.78 (1.57)
t (*P* value)	t = 0.965 (*P* = .335)	t = -0.478 (*P* = .633)	t = 3.655 **(*P* = .000)**
Taking care of others			
Yes (mean; SD)	10.67 (4.43)	2.02 (1.25)	1.71 (1.66)
No (mean; SD)	11.19 (4.54)	1.97 (1.37)	2.15 (1.69)
t (*P* value)	t = 0.942 (*P* = .347)	t = -0.278 (*P* = .782)	t = 2.153 **(*P* = .032)**

Discussion

Principal results

The study's findings shed light on how individuals with fibromyalgia engage with a variety of ICT tools and their overall satisfaction regarding these resources. Only 0.75% of our participants reported never having used any of the tools listed, and the average number of ICTs used per person was quite high (10.94 out of 14 presented, although there was a high level of dispersion). Although we asked for their use for pain management, they probably answered thinking about the use they made for health in general; additionally, we do not know the use they give to each tool. For example, they may have tried a specific tool only once. But, in any case, it seems that they are open to using ICTs and trying different alternatives. Among the most used tools, there were Instant messaging applications (89.4%); Websites aimed to improve the management of fibromyalgia (88.3%); Phone calls with professionals (86.0%); Online multimedia resources (83.8%).

Besides their willingness to use different tools, satisfaction rates were low both for each tool, as well as the average satisfaction index (2.09; SD 0.38). This suggests that there is still room for

improvement in the design of ICT tools for pain management, in agreement with prior reports [13]. More specifically, tools which participants were most satisfied with were: Instant messaging applications (2.69; SD 1.41); Telephone calls with health professionals (2.58; SD 1.45); Websites aimed to improve the management of fibromyalgia (2.53; SD 1.30); Multimedia online resources (2.40; SD 1.31). Participants chose an average of 1.99 advantages (SD 1.31), being the most frequent: Possibility of receiving treatment from home (58.9%); Access to specialized treatment (57.4%); Use as a complement to face-to-face interventions (47.2%). But, they also found a mean of 1.94 disadvantages (SD 1.69) being the most frequent: Not having close contact with the health professional (49.8%); Not being able to express emotions and feelings (41.5%); Lack of knowledge or resources to use ICT (30.2%).

Altogether, our results are related to the few available research in the field in several points. First, tools used by the most participants and with the greatest satisfaction in our study are directly related to the possibility of being able to communicate with the healthcare professional, highlighting the need for these patients to maintain close contact with the health professional. In this same line, as commented before, the third most frequently chosen advantage of ICTs in our study is precisely the possibility to receive remote treatments as a complement to face-to-face interventions; on the other hand, the two main perceived disadvantages of ICT are related to losing contact with professionals. These results are consistent with Cranen et al. (2017) [15] since their participants especially valued the possibility of carrying out intermediate treatments, alternating in-person with remote treatment. They also coincide with the findings by Cranen et al. (2011) [16], who pointed out that chronic pain patients appreciate that online interventions, although positively valued, should not be standalone treatments and should be complemented with face-to-face sessions.

Second, we found that among the most used tools there were websites aimed at improving the management of fibromyalgia, and the online multimedia resources. In the same line, Merolli et al. (2022) [17] also make an important allusion to the fact that chronic pain patients positively value those ICTs that allow them to look up information on the Internet (in addition to being able to consult medical test results and receive personalized alerts and reminders). Third, the most commonly highlighted advantage of ICTs in our study is being able to receive treatment remotely, from the comfort of home; which is logical since people who suffer from fibromyalgia often present difficulties to move. This is also reflected in the work of the authors Schneider and Hadjistavropoulos (2014) [14], who point out that the participants in their study considered that ICTs are especially beneficial for those who suffer from mobility difficulties; and which has also been highlighted as a classical advantage in the use of ICTs for health (see for example the classical work

by Griffiths et al. (2006) [25].

Finally, among our participants, the third most commonly cited disadvantage was the apprehension about inadequate ICT usage due to a lack of knowledge or resources. This echoes findings from Schneider and Hadjistavropoulos (2014) [14], emphasizing that individuals demonstrating more interest and a favorable inclination towards ICTs were precisely those with higher perceived technology self-efficacy.

In our study, we found relationships among some of the studied variables which had not been previously reported in existing literature. Primarily, older participants tended to have used more tools, although they also seem to perceive less advantages and perceive less satisfaction. This might indicate that older people have more difficulties to select the tools that better fit their needs, so they try more alternatives. Also, it may exist a certain digital division related to age, since older participants may not be as familiar with the use of digital technologies as younger participants, and may have some problems using them (due to a lack of knowledge) [26], which could translate into a greater tendency to reject these technologies (and being related with higher dissatisfaction) and/or be inclined towards more “traditional” methods.

The opposite to age occurs when it comes to educational level: a significant negative correlation was found between the degree of studies completed and the number of ICTs used. This phenomenon may be attributed to the enhanced knowledge of individuals who have had access to superior educational levels, possibly resulting in being more selective when choosing between the wide range of ICTs at their disposal. Additionally, it should be noted that a relevant correlation was also found between educational level and the number of advantages/disadvantages selected regarding the use of ICTs; the higher the educational level of the participants, the more advantages and fewer disadvantages mentioned. This could be explained because education could have made it easier for these people to learn to better use technological devices and to know how to get better use of ICTs, in general terms, which would be reflected in their general opinion of ITCs and encourage them to adopt a favorable perspective regarding them. This previous idea would also be reinforced by the significant positive correlation that was found between the level of education and the degree of satisfaction with all the ICTs listed in our study; by making a better use of ICTs, overall satisfaction may have also improved for these participants.

Men reported significantly more advantages than women. This probably indicates a higher predisposition to use ICT tools for pain management. In contrast, results from the study conducted by Schneider and Hadjistavropoulos (2014) [14] revealed a higher level of interest in ICTs among

female participants. Further investigation is needed regarding these findings, because our sample was predominantly formed by women and this result is difficult to interpret without prior studies having reported conclusive data about this subject. Finally, those living alone and those who do not take care of others perceived significantly more disadvantages. The reasons under these differences merit further research since they are difficult to interpret.

Concerning pain-related variables, a negative correlation has also been found between the results of the TSK-11 questionnaire and the mean satisfaction with the different ICTs; the higher the degree of general fear of movement/injury of the participant, the lower satisfaction expressed regarding the use of ICT tools. This could be possibly explained by the general avoidance tendency of people who present higher rates of kinesiophobia and fear-avoidance, including their own exposure to treatments, whether in person or through ICTs.

Limitations

As other studies in our area, we relied on quantitative cross-sectional data, making it difficult to obtain explanations. Qualitative studies could complement these findings by giving voice to participants to explain more in depth their perspectives in such issues. These studies could help provide a more comprehensive understanding of the research problem and contribute to the development of more effective solutions from users' perspective.

Furthermore, since the survey was conducted only once and not longitudinally, the participants provided a brief account of their current perceptions. This does not provide insight into how their views changed over time as they gained more knowledge and experience with them; and we cannot establish causal relationships.

Finally, due to the constraints of the survey, we did not ask users about how much they have used each of the ICTs. Future research should take into account that, and study whether the perceptions change depending on the extent each technology is used.

Conclusions

People with fibromyalgia are in favor of using tools that enable them to communicate with healthcare professionals. They also valued very positively those tools that grant them access to specialized online resources aimed at the management of their pain and general symptomatology.

Moreover, remote treatment has been found to be particularly beneficial for those with mobility issues, which affect many people who suffer from fibromyalgia, as it allows them to receive care without having to leave their homes. However, important concerns about the ability to use ICTs due to lack of knowledge or resources were observed. Age-related digital divide and education level have also been found to influence ICT tools usage and satisfaction. Also, a negative association between satisfaction with ICTs and fear of movement/injury levels has been demonstrated, which may be attributed to general tendencies of avoiding situations that elicit fear, including exposure to treatments that may be conceived as potentially painful, as long as therapeutic exercise patterns, while often effective, can be challenging for individuals with chronic pain, as they require significant effort and may momentarily exacerbate pain symptoms.

Results also indicate that, despite the participants' extensive experience with a large number of ICTs on average, both the satisfaction rates for each ICT tool listed in our study for pain management and the average satisfaction index were low, suggesting that there is ample scope for improvement in the design of ICT tools aimed at pain management, as well as formulate effective strategies aimed at reinforcing perceived self-efficacy of users.

Conflicts of Interest

None declared.

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Data availability

The data sets generated during and/or analyzed during this study are available from the corresponding author on reasonable request.

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Supplementary Files