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Psychological Interventions in Fibromyalgia: An Updated Systematic Review

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Abstract

Background: There is a growing development of psychological approaches for fibromyalgia. Current scientific community advocates a biopsychosocial approach to pain management programme. Psychological interventions seem to contribute to an overall health improvement; however, the reason of their success is still unclear. The aim of this review is to analyze which direction psychological interventions are taking in fibromyalgia and whether there is any intervention proved to be more effective than others.

Method: We conducted an updated search of a previous review, from 2013 to 2019 using web of science (all data base). Overall, according to the inclusion/exclusion criteria 72 original studies were identified. This review encompasses an exhaustive analysis of fundamental characteristics (participants' and interventions' characteristics, control group, target variables, quality of studies and outcome measures) and compares results with the intention of evaluating effectiveness of different interventions.

Results: CBT remain as the most common treatment for fibromyalgia, both as a stand-alone treatment or included in a multicomponent program. Other interventions show promising results, such as ACT, mindfulness, relaxation and guided imagery approaches, and educational procedures. Also, encouraging outcomes for specific variables have been found in new emerging approaches. For instance, Emotional Expression Acknowledgment and Exposure (EEAE), Body Basic Awareness Therapy (BBAT), Group Music Imagery, Best Possible Self, Time In, Group Solving Therapy, Forgiveness Education and psychotherapy along with spiritual care. However, there is no evidence of superior techniques. All treatments seem to be beneficial when compared with control groups in at least one variable. Relaxation and education seem to be transversal elements across several treatments that might act as mediator variables.

Conclusions: More studies regarding pain-related psychological variables and emphasising on transversal factors might contribute to unify different perspectives.

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1. Introduction

Fibromyalgia (FM) is a chronic and complex nondegenerative syndrome associated with three main characteristics: pain, fatigue and sleep disorders (Bellato et al., 2012). Patients affected by FM can present a wide range of other symptoms, such as psychological distress. Comorbidity in fibromyalgia is high; that is, patients affected by fibromyalgia have more probability of suffering from other conditions than healthy subjects (Walitt et al., 2015). Furthermore, fibromyalgia affects emotions, family and society. It even affects economic systems due to medical cost and work disability.

It is difficult to describe fibromyalgia in specific terms due its symptom complexity and comorbidity. For this reason, diagnosis can be difficult (Walitt et al., 2015). In the same way, aetiology and treatment can be equally complicated. The medical approach does not establish the aetiology of FM and, therefore, specific medical treatments do not show effectiveness (Belenguer et al., 2009).

The understanding of pain and particularly fibromyalgia needs to be approached from wider models such as the gate control theory (Dickenson, 2002). This model entirely changed the approach to and the complexity of pain management. Not only did it give rise to a more advanced understanding of physiological patterns, but also it incorporated the crucial meaning of subjective components in pain (Miró, 2003).

Currently, the scientific community advocates a biopsychosocial approach for pain management, considering pharmacological and nonpharmacological treatments in a multidisciplinary programme. Indeed, the 2016 revised EULAR1 (European League of Association for Rheumatology) recommendations suggest that management should involve graduated and sequentially added therapies, emphasising education and nonpharmacological techniques (Macfarlane et al., 2017; Okifuji & Hare, 2010).

An increasing interest for a biopsychosocial approach and for the integration of clinical psychology, not only in chronic pain but also in overall chronic conditions (Conversano et al., 2021; Merlo, 2019), is reflected on recent scientific research. For instance, clinical psychological factors have been studied among patients with several medical conditions: type 2 diabetes mellitus (Martino et al., 2020a); inflammatory bowel disease (Martino et al., 2020b); cancer progression and survival probability (Di Giuseppe et al., 2020) and hyperthyroidism (Vita et al., 2020).

Similarly, the evidence of the influence of psychosocial aspects on chronic pain (Wilson et al., 2020) and concretely in FM has been demonstrated: psychological interdependence between FM and Menopause (Conversano et al., 2019); overlap of FM and somatic symptom disorder

and bodily distress syndrome (Häuser el al., 2020) and FM impact on depressive symptoms (Hirsch et al., 2019).

Although there is plenty of evidence supporting the involvement of psychological elements in a holistic approach for pain disorders (Miró, 2003), there is inconsistent evidence regarding psychological treatment effectiveness. According to an evidence-based review regarding psychological interventions in chronic pain (APS, 2018), there is level II evidence for CBT (group-delivered), and for ACT (group-delivered and online delivery) for the treatment of pain disorder in adults. However, in this review (APS, 2018) there was insufficient evidence to indicate the effectiveness of any other intervention.

According to the review by Glombiewski et al. (2010), psychological interventions for fibromyalgia are effective in reducing sleep problems, depression, functional status, and catrastrophising. The authors conclude that cognitive-behavioural treatment is significantly better. However, these results do not concur with other research that controverted the effectiveness of CBT in comparison with other treatments (Bennet & Nelson, 2006; Van Koulil et al., 2007). Gómez-de-Regil and Estrella-Castillo (2020) carried out a systematic review of studies analyzing the effect of psychotherapy on physical pain in patients with FM and found that even though all studies showed a reduction in pain, only in half of them the differences were significant.

Lami et al. (2013) carried out the last systematic review of psychological interventions that might be of greater clinical benefit. The authors presented a quantitative description of 58 studies that contributed to psychological management of FM. The study's quality analysis of the 58 papers showed high score variability of internal and external validity among studies, due to the inclusion of experimental, quasi-experimental and single-case design studies. Regarding the variables studied, it was detected that most studies focused on direct symptoms of the disease, such as pain and fatigue. Some studies also implemented interventions aimed at enhancing symptoms related to sleep disturbances and psychological variables, such as depression, anxiety, general psychopathology and impact of disease. According to the authors, mediating variables were poorly evaluated in most studies, such as pain catastrophising, self-efficacy, pain anxiety and pain coping styles. Regarding types of intervention, CBT was indicated as the most implemented and studied treatment and was aimed at training patients to manage pain. However, as previously mentioned, this review is completely descriptive; therefore, the authors did not compare treatment effectiveness.

Thus, the present review attempts to carry out an update of psychological interventions in FM management, making further progress to compare treatment effectiveness. The research

conducted by Lami et al. includes studies carried out until 2013; therefore, we aim to update this review. We intend to perform a systematic review from 2013 to 2019, trying to bring light to the following questions: 1) Which direction are psychological interventions taking in FM? and 2) What are the most effective interventions?

2. Method

2.1 Search Strategy

The systematic review is an update of the previous review carried out by Lami et al. (2013) and was performed according to the PRISMA-statement (Preferred Reporting Items for Systematic reviews and Meta-Analyses) (Moher et al., 2009). Reproducing the review by Lami et al. (2013), the exhaustive bibliographic search through the Web of Science (complete database), was as follows: fibromyalgia (Title) AND intervention OR treatment OR therapy (Title). The search applied from January 2013 – the year after the review by Lami et al. (2013) - to December 2019.

The search identified 1033 articles; however, a vast amount of articles, due to the keyword combination, was perceived. Several scientific articles regarding psychological technique titles did not respond to the keywords (e.g., *Mindfulness Meditation Alleviates Fibromyalgia Symptoms in Women: Results of a Randomized Clinical Trial* (Cash et al., 2015)). A second search was therefore executed, broadening the spectrum. It enlarged the quest from *Title* to *Topic* in the Web of Science and was described as follows: fibromyalgia (Topic) AND intervention OR treatment OR therapy (Topic). This second search identified 4,274 articles. As a result of the unmanageable number of articles, the research was restrained to psychological-related interventions. Therefore, the search was as follows: fibromyalgia (Topic) AND psychological intervention OR psychological treatment OR psychological therapy OR psychotherapy (Topic). This last search identified 759 articles. After a complete review of all titles, 450 articles were excluded on presenting overall diagnoses including other syndromes or conditions besides FM. The 83 articles considered after this were fully analysed and some were excluded due to a lack of proper psychological intervention description. Therefore, 72 articles were included in the present review (Fig. 1).

2.2 Eligibility Criteria

The subsequent inclusion criteria were set to select the studies: (1) empirical articles (experimental, quasi-experimental, or single-case design studies) published in scientific journals; (2) written in English or Spanish; and (3) adult samples (18 years or over) with FM diagnosis according to the American College of Rheumatology (ACR) criteria (Wolfe et al., 2010).

2.3 Study Evaluation

Qualitative information was captured in a table to attain specific characteristics related to the treatment, to the studied outcomes and to methodology. Studies were examined and interpreted according to a quality evaluation tool developed by Berra and colleagues (2008) for critically appraising research articles or to evaluate evidence during the development of systematic reviews. This tool assesses by means of 27 items related to: study question or objective, participants, comparability between groups, definition and measure of main variables; analysis and confusion, results, conclusions, external validity and applicability, and conflict of interest.

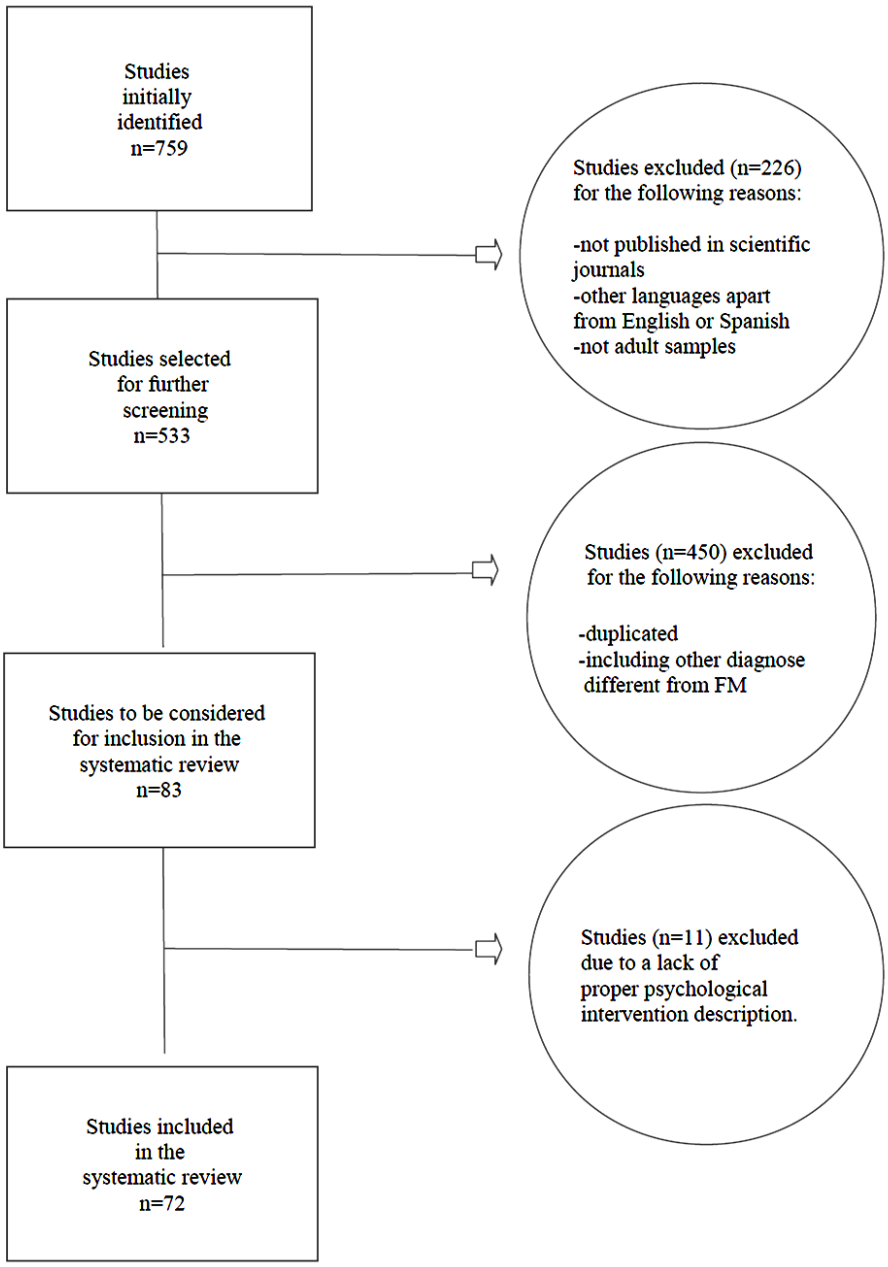

Figure 1. Flowchart of the study selection process

3. Results

Table 1 displays the 72 articles examined in this review. The studies are catalogued in alphabetical order under the name of the first author. The table also shows the characteristics of the study samples, interventions along with co-interventions, target variables, study quality analysis and results. Regarding results, short- and long-term assessments have been briefly described. In the event of presenting several long-term assessments, the table displays the longest available follow-up.

3.1 Participants

The number of participants of the records' samples in the present review, vary between n=1 and n=583, 88.6 being the mean. However, 80% of the articles present samples between n=10 and n=190. From among all the papers included, 49.3% consisted of mixed samples and 44.4% were only female samples. However, the majority of mixed samples include less than 20% of males. Only one study includes a proportional amount of males and females (13 and 15, respectively) intending to study gender differences for CBT in FM. The remaining 6.3% of all studies did not report the gender of the sample. The mean age of participants was 50.6 years and 25% incorporated a sample from 18 to approximately 65 years old.

3.2 Design

In relation to assessment, all studies carried out an evaluation before and immediately after intervention. Follow-up evaluations 6 months after intervention were performed in 20.8% of the studies. Moreover, 12-month follow-ups were included in 19.4% of the studies. In relation to control groups, 77% of the studies include a control group, of which 60.7% comprised a passive, waiting list or non-treatment control group, and 39.3% included an active control group.

3.3 Interventions

The review selected 72 studies, of which 24 evaluated Cognitive Behavioural Therapy (CBT) as a main treatment, 1 of them together with Biofeedback, and 11 included CBT in a multidisciplinary approach. Out of the 72 articles, 8 conducted mindfulness interventions, 6 performed Acceptance and Commitment Therapy (ACT), 1 compared and studied ACT and CBT in the same study, 5 were education-related approaches (together with psychological support), 1 psychodynamic psychotherapy, 1 constructivist therapy, 2 guided imagery, 1 relaxation intervention, and 1 training in autohypnosis. Another two multicomponent studies were incorporated. One encompassed Rational Emotive Therapy together with Transactional

Analysis as a main intervention, whereas the other one was described overall as a psychological therapy. The remaining 9 studies were specifically designed interventions. They included Emotional Expression Acknowledgment and Exposure (EEAE), Body Basic Awareness Therapy (BBAT), Group Music Imagery, Best Possible Self, Time In, Group Solving Therapy (2 studies), Forgiveness Education and psychotherapy together with spiritual care.

Relaxation training was performed as a stand-alone and primary treatment in 1 study; however, relaxation strategies seem to be present in a vast amount of studies (55%). Likewise, education was studied as a stand-alone treatment, but it is also broadly used as a part of other treatments. In particular, it was cited in 37 studies (51.4%) and it was mainly geared toward the descriptors of the biopsychosocial model of chronic pain and FM. These are psychological, biological and social factors influencing the experience of pain and other symptoms. Psychoeducation (education related to psychological aspects) was carried out by psychologists in 16 studies. Other healthcare professionals (physicians, nurses, occupational therapists and physiotherapists) are referenced in 5 studies.

Again, despite the fact that guided imagery was used as a main treatment to enhance coping skills and self-efficacy in 2 studies, it also emerges as part of other interventions in 2 other studies. This is described as the path to modify pain-related elements and to induce relaxing states of consciousness.

Specific treatment modalities have been analysed, such as smart-telephone intervention and internet-delivery. Telephone treatment was observed in 2.7% of the studies and 13.9% of interventions were performed and conducted on line. The remaining studies (83.4%) carried out standard on-site treatments. Also, virtual reality was used as a treatment modality in 6 studies (8.3%), half of which were implemented with an internet-delivery format and half with an on-site format. Finally, 6% of studies combined interventions with more than one format, such as group therapy and online techniques.

Treatment frequency varies among all selected studies; however, the majority of interventions implemented weekly sessions (52.2%). Mean treatment duration was 23 hours; however, these might be estimated data since some studies did not report this, and in another it depended on the patients' availability. The number of sessions of most interventions varied between 9 and 20. Mean duration of each session was 1.8 hours, being from 1h to 3 hours.

3.4 Outcome measures

Outcome measures among the studies are pain, pain-related variables, pain-related psychological variables, fatigue, quality of life, depression, anxiety, sleep variables, physiological variables and global score of some questionnaires. The questionnaires used to measure these outcomes are Visual Analogue Scale (VAS), Numeric Rating Scale (NRS), Brief Pain Inventory (BPI), Multidimensional Pain Inventory (MPI), McGill Pain Questionnaire (MPQ), Fibromyalgia Impact Questionnaire (FIQ), Widespread Pain Index (WPI), Multidimensional Fatigue Inventory (MFI), Brief Fatigue Inventory (BFI), Fatigue Severity Scale (FSS), Multidimensional Assessment of Fatigue (MAF), 36-Item Short Form Health Survey (SF-36), 12-Item Short Form Health Survey (SF-12), EuroQoL, COOP/WONCA Functional Assessment Charts, Hospital Anxiety and Depression Scale (HADS), State-Trait Anxiety Inventory (STAY), Beck Depression Inventory (BDI), Psychological Inflexibility in Pain Scale (PIPS), Acceptance and Action Questionnaire (AAQ-II), Chronic Pain Coping Inventory (CPCI), Coping Strategies Questionnaire (CSQ), Pain Catastrophising Scale (PCS), Chronic Pain Self-efficacy Scale (CPSS), Pittsburgh Sleep Quality Index (PSQI), Medical Outcomes Study (MOS), Chronic Pain Sleep Inventory (CPSI), Stanford Sleep Questionnaire, Epworth Sleepiness Scale (ESS), Prefrontal Symptoms Inventory (PSI), SCOPA, Patient Global Impression of Change (PGIC) and Perceived Stress Scale (PSS). The validation studies of all instruments are referenced in the papers included in the table.

Pain arises as the most evaluated outcome. Pain-related variables included pain perception, pain severity, pain symptoms, pain threshold and subjective pain. Approximately 65% of the papers studied pain as a primary outcome and approximately 41% of them studied pain outcomes in the long term. Pain was measured with the Visual Analogue Scale (VAS), the Numeric Rating Scale (NRS), the Brief Pain Inventory (BPI), the Multidimensional Pain Inventory (MPI), the McGill Pain Questionnaire (MPQ), the Fibromyalgia Impact Questionnaire (FIQ) and the Widespread Pain Index (WPI).

Fatigue was a primary outcome in 14 studies (19.4%) and was measured by the Multidimensional Fatigue Inventory (MFI), the Brief Fatigue Inventory (BFI), the Fatigue Severity Scale (FSS), and the Multidimensional Assessment of Fatigue (MAF).

Also, quality of life was often assessed as both primary and secondary outcome. This has included both quality of life and health-related quality of life. Although these terms are not equivalent, in some cases they have been used interchangeably in the literature being assessed with the same scale. There are 20 studies assessing (health-related) quality of life (27.7% of total

studies). The questionnaires used for this variable were SF-36, the reduced version SF-12, EuroQoL and COOP/WONCA.

Depression and anxiety are the two most evaluated psychological variables, mostly with HADS, STAY and/or BDI. In some cases, the terms depression and anxiety were referred to as psychological or emotional distress. From among all of the studies, 33 (45.8%) evaluated depression and 25 (34.7%) studies evaluated anxiety. Another psychological variable measured is psychological flexibility, which was reported in 4 studies (5.5%). This was measured with the Psychological Inflexibility in Pain Scale (PIPS), or with the Acceptance and Action Questionnaire (AAQ-II).

Regarding pain-related psychological variables, such as pain catastrophising, pain self-efficacy, pain anxiety and pain coping style variables, these are undervalued compared to other variables such as depression, anxiety or quality of life. Catastrophising was assessed in 11 (15.27%) studies, and coping skills and self-efficacy were assessed in 17 studies (23.6%). These variables were assessed mainly with the Chronic Pain Coping Inventory (CPCI), the Coping Strategies Questionnaire (CSQ), the Pain Catastrophising Scale (PCS), and the Chronic Pain Self-Efficacy Scale (CPSS).

Sleep variables were particularly studied after specific cognitive-behavioural treatments aimed at treating pain-related insomnia in several studies. Furthermore, some used sleep parameters and polysomnography measures. Overall, sleep-related variables were assessed in 21 studies (29.9%) and in several formats. The most common of these, included sleep quality, sleep latency, sleep duration, sleep efficiency, and sleep disturbance. The questionnaires most frequently used are PSQI, MOS, CPSI, Stanford Sleep Questionnaire, ESS, PSI, SCOPA, and VAS.

Some physiological variables were also measured after treatment. These included heart rate variability, pro-inflammatory cytokine levels and plasma SP level, each evaluated in one study.

In addition to assessing specific variables, the global score of some questionnaires was used as primary outcome measurement. The most common tool is the Fibromyalgia Impact Questionnaire (FIQ), which evaluates the impact of the disease on several variables (physical capacity, work, fatigue and others) and was evaluated in 28 (38.8%) studies. Also, the Patient Global Impression of Change (PGIC) and Perceived Stress Scale (PSS) were found in 4 (5.5%) studies each.

3.5 Effectiveness

Overall, 98.6% of the studies showed effectiveness of the treatment studied in at least 1 dependent variable. However, in order to draw more specific conclusions, an analysis of intervention effectiveness on each variable is presented.

Considering the 44 studies evaluating short-term outcomes in pain, approximately 59% showed positive results. Among studies with long-term pain-related assessments, 50% showed positive outcomes. Considering most common interventions in this review followed by pain assessment, the most pain-related successful interventions were ACT and CBT. Out of the 7 ACT studies, 4 carried out pain assessment after treatment and 3 (75%) provided beneficial reports. From among the 36 CBT studies, 25 assessed pain after treatment and 13 (52%) had positive outcomes. Mindfulness interventions were followed by pain assessment in 4 studies and only 1 (25%) reported positive outcomes. Although there are 5 studies related to educational approaches, only 1 assessed pain after treatment, reporting beneficial results. The 3 studies with relaxation and guided imagery interventions showed improvements in pain-related variables (100%).

Out of 14 articles that studied fatigue, 10 (71.4%) presented an improvement in the short term. From among studies assessing long-term effects on fatigue, 50% had positive results. Specifically, 60% of CBT interventions studying fatigue showed improvements. Another 4 interventions, ACT, mindfulness, relaxation and guided imagery, evaluated fatigue once each and all showed improvements.

Sixty-nine per cent of the 20 studies evaluating quality of life in the short term showed improvement after treatment. CBT interventions assessing quality of life (8 studies) demonstrated improvements in 50% of the studies. Four studies with ACT interventions evaluated this variable and all of them (100%) showed positive results.

In relation to psychological variables, from among 33 of the studies that evaluated depression 69.7% showed improvements in the short term. CBT had a 58% success rate; ACT 100%; Mindfulness 66.6% and educational approaches 50%. Some fewer usual interventions also showed positive outcomes in terms of depression, such as constructivist therapy, psychotherapy together with spiritual care, EEAT, Best Possible Self and Forgiveness Education.

Regarding the 25 studies reporting anxiety scores, 60% showed improvement in the short term. CBT interventions had 50% of improvements; ACT 100%; Mindfulness 66.6% and education 50%. Other studies that reported anxiety-related positive outcomes were EEAT and Forgiveness Education.

In relation to psychological flexibility, the 4 studies assessing this outcome suggested benefits in the short and long term after ACT (3 studies) and Mindfulness (1 study).

Regarding pain-related psychological variables, out of the 11 studies that reported catastrophising outcomes, short-term improvements were reported in 72.12% of the studies. These were after CBT, showing a 100% success rate, after mindfulness interventions (50%) and after educational approaches in one study.

Similarly, coping skills were reported in 17 studies, increasing positively in 76.4%. These effects were reported after CBT (75% of studies with positive outcomes), Mindfulness (100% of 2 studies) and after a single study related to ACT, education, relaxation, Best Possible Self and forgiveness education.

In relation to FIQ and PSIG scores, most of the studies showed improvements. Out of the 28 studies that assessed FIQ scores, 67.8% reported improvements in the short term. These were observed predominantly after CBT (80%), Mindfulness (100%) and ACT (66.6%). From among the 4 studies reporting PSIG scores, 75% demonstrated patient global impression of change in the short term. However, these results were found only after 2 studies related to CBT and to education.

In relation to sleep-related variables, 71.4% of the 21 studies assessing short-term effects reported improvement in sleep, these reports being detected after CBT (90.9%), Mindfulness (100%), and after 2 studies related to EEAT and to relaxation.

Summarising, we find that all variables show similar sensibility to overall psychological treatments. Effectiveness fluctuates between 59% and 76%. We also observe a non-existent treatment showing a major effectiveness in all variables. Effectiveness depends on the assessed variable.

Regarding effectiveness related to treatment modality, from among all the studies 46 were carried out with group treatments, 15 with individual treatments and 11 combined both modalities (individual and group interventions). When comparing effectiveness among these different treatment modalities, we found that short- or long-term positive outcomes occurred in 40% of individual treatments, 36.95% of group treatments and 45% of combined treatments. Although combined treatments show a higher percentage of effectiveness, differences among percentages are not relevant, it not therefore being possible to reach a firm conclusion.

In relation to the duration of each treatment, out of the 72 studies, 10 did not accurately report treatment extent. Among the studies reporting treatment duration, 47% conducted an intervention lasting a total of between 10 and 30 hours. Taking into account the studies in this

range of treatment duration, 56.5% showed pain improvement. On the other hand, 17.6% presented interventions with less than 10 hours, of which 11.8% showed success related to pain improvements. Finally, only 3 (4.4%) studies implemented more than 30 hours of treatment and only 1 (33%) revealed pain-related effectiveness.

3.6 Study Quality Analysis

The analysis of the studies encompassed in this review was performed with a quality evaluation tool developed by Berra et al. (2018). Considering the inclusion of experimental, quasi-experimental, single-case studies and abstracts of substantial research, fluctuant scores were predicted.

This tool to evaluate the quality of the studies compounds 27 items related to: research aim, participants, comparability, definition and measurement of variables, analysis and confusion, results, conclusions, internal and external validity, and implementation of the results. The final evaluation of each study can be found in table 1. Study quality analysis is provided according to its internal and external validity. Internal validity considers whether the investigator obtains a compelling difference between the treatment and control conditions, meaning that the study involves well-constructed, controlled and accurately measured experiments (Bernardy et al., 2018). In this review, 42 studies demonstrated high internal validity (from 3.5 to 4), 13 medium-high internal validity (from 3 to 3.5), 2 medium internal validity (from 2 to 3) and low quality (less than 2) was detected in 15 studies.

External validity refers to the generalisability of conclusions, that is the extent to which the findings can be related across different contexts or samples (Druckman et al., 2011). High external validity was found in 42 studies, medium-high internal validity in 13, medium internal validity in 3 and low quality in 14. However, low-quality results were found, in all cases, in studies presented in abstract format; therefore, most items could not be evaluated as a result of a lack of information. Consequently, these articles were qualified as NA (not available) in the table.

Berra et al. (2008) tool, which assesses the quality of the studies, enabled us to analyse strengths and weaknesses of fibromyalgia research by analysing each item. Regarding weaknesses, analysing the results of specific items, a low global score related to effect size and statistical power was identified in 30 studies (41.6%). This means that these studies did not estimate the size of the sample required to assess the frequency measurements with the accuracy (or the reliability or precision) that the investigator had expected. In relation to strengths, 57 (79.2%) studies did statistically estimate the significant differences between groups. Also, a similar number of studies (55) (76.4%) was found to use tool measurements or questionnaires with known and appropriate reliability and validity.

Table 1. Articles examined in the review

Author	Participants (n, age, gender)	Type of treatment	Sessions/ frequency/ total hours	Grou p/In div	Control group	Target variables	Quality (0-4)		Results	
							IV	GV	Short- term	Long-term
Aguilera et al. 2018	n=20 33-60 years mean=50 Female	Constructivist therapy: welcoming and analysis of demand, feedback, construction of the self and future perspectives.	16/weekly/16	I	Group Comparison (Maltreatment group - Non-maltreatment group).	FIQ variables. Anxiety (HAD) Depression (BDI). Cognitive outcomes (Repertory Grid Technique).	2.8	2.5	Improvement in FM impact, anxiety and depression in maltreatment group compared to non-maltreatment group. Significant improvements in some cognitive outcomes in maltreatment group compared to control group.	NA
Amirova et al. 2017	n=191 37-69 years mean=49.1 Mixed (F:93.7%)	Online Self-administered Mitchell Method Relaxation (MMRT): written instructions and short audio recording of guided imagery.	30/daily/≈2	G+I	Attention Control Waiting List	Pain severity (VAS). Sleep (MOS-SS). Fatigue and health-related quality of life (HRQoL). Impact of FM (FIQR). Depression and anxiety (HADS). Coping. Perceived Stress (PSS).	3.7	3.8	Significant dose-effect of MMRT group improvement in pain levels. Significant improvement of MMRT group in fatigue and sleep quality.	(1 month) Maintained improvement of MMRT group in fatigue.

Ang et al. 2013	n=58 18-65 years mean=46.6 Mixed (F:93%)	(1) Telephone CBT: education, relaxation, visual imagery, automatic thoughts and pain, cognitive restructuring, stress management, time-based pacing, pleasant activities, anger management, sleep hygiene and relapse prevention + Milnacipran + Telephone Education (2) Telephone CBT (idem) + Placebo (3) Milnacipran + Telephone education	8/weekly/≈4.6	I	Group Comparison	Weekly average pain intensity (wrist watch pain monitor: ActiWatch). Physical function (SF-36).	3.9	3.9	Significant improvement of group 1 in physical function and weekly average pain compared to group 3. Improvement of group 2 in physical functioning compared to group 3.	NA
Botella et al. 2013	n=6 47-65 years mean=55 Female	CBT with Virtual Reality: Education, relaxation, activity pacing and behavioural therapy, cognitive restructuring, mindfulness, relapse prevention.	10/ biweekly/20	G	None	Functional status, (FIQ). Depression (BDI). Negative and positive affects (PANAS). Coping skills (Chronic Pain Coping Inventory).	NA	NA	Improvement in functional status, positive affect	(6 months) Significant improvement in pain, depression, positive affect, coping strategies.

Bourgault et al. 2015	n=58 ≥18 years mean=49.98 Mixed (F:92%)	Multicomponent interdisciplinary group intervention: PASSAGE Program: psycho-education tools and CBT- related techniques, + Tailored exercise activities	9/biweekly/22.5	G	Waiting list	Pain severity (NRS). FM severity and impact, pain symptoms, functioning (FIQ), pain interference, sleep quality (CPSI), pain coping strategies (CSQ), depression (BDI), quality of life (SF-12v2), patient's global impression of change (PGIC), perceived pain relief (Perceived Relief Scale).	3.9	3.9	Significant improvement in PGIC measures, pain symptoms, functioning, quality of life and perceived pain relief compared to control group.	(12 months) Significant improvement of PGIC scales, perceived pain relief, average pain intensity, impact of FM, pain catastrophizing, some coping strategies.
Bravo et al. 2019	n=39 18-65 years Mixed (F:97.4%)	Basic Body Awareness Therapy (BBAT) group sessions: breathing, awareness, new habits and sharing experiences with the group + BARS-MQ movements and dropsy massage + TAU	12/biweekly/17	G+I	TAU	Pain (VAS). Movement quality (BARS-MQ). Psychological function (BDI, HAD, STAI). Quality of life (SF-36).	3.7	3.7	Significant improvement in pain and movement quality compared to control group.	(6 months) Significant improvement in anxiety.
Bruce et al. 2016	n=100 ≥18 years mean=50 Mixed (F: Majority)	CBT in an interdisciplinary programme: cognitive behavioural therapy, relaxation training, exercise programme and strategies to address functioning and psychological distress + Exercise	NA	G	None	Functioning and distress (Questionnaire Revised).	NA	NA	Improvements in functioning and distress.	NA

Camerini et al. 2013	n=209 25-74 years mean=49 Mixed (F:95%)	Internet-based patient education ONESELF: self-management by increasing information and empowerment through social support.	It depends on the patient	I	None	Online questionnaire (frequency of use of website applications, health-related knowledge, self-management behaviour). Health outcomes (FIQ).	2.7	3.0	Improvement in self-management and health outcomes related to use of website applications.	NA
Cantero-Bajos et al. 2019	n=40 ≥18 years Female	Time In: sensorimotor intervention that combines psychological strategies and other procedures + Biomechanical physiotherapeutic procedures.	5/weekly/15	G	Waiting list	Pain intensity, pain interference (BPI-S) Quality of life (SF-12). Psychological symptoms (SCL-90-R). Wellbeing, problems, functioning, risk and behaviour (CORE-OM).	3.4	3.5	Significant improvement in pain intensity, pain interference, pain zones, quality of life, some psychological symptoms and behavioural changes compared to control group.	(3 months) Significant improvement in pain intensity, pain interference, pain zones, all psychological symptoms and behavioural changes compared to control group.
Cash et al. 2015	n=91 ≥18 years Female	Mindfulness-Based Stress Reduction (MBSR): instruction/discussion, attention-focusing technique, sitting meditation and relaxed and focused movement.	8/weekly/20	G	Waiting list	Perceived stress (PSS). Pain (VAS). Sleep quality (Stanford Sleep Questionnaire). Fatigue (Fatigue Symptom Inventory). Symptom severity (FIQ). Salivary cortisol.	3.9	3.9	Significant improvement in perceived stress, sleep quality, fatigue and severity of fibromyalgia symptoms.	(2 months) Maintained perceived stress, fatigue and severity of fibromyalgia symptoms.

Castel et al. 2015	n=130 18-60 years Female	Multidisciplinary FM treatment related to baseline body mass index (BMI): education, CBT. + TAU + Physical therapy.	24/biweekly/24	G	TAU	Pain intensity (NRS). Impact of FM (FIQ). Catastrophizing (CSQ). Psychological distress (HADS). Health-related quality of life (COOP-WONCA). Sleep problems index, sleep quantity (MOS).	3.7	3.8	Significant improvement in catastrophizing, psychological distress, FIQ, sleep quantity, sleep index problems and health-related quality of life regarding pre and post-treatment only in the intervention group.	(12 months) Maintained improvement in psychological distress, sleep quantity, sleep index problems, number of hours slept and health-related quality of life.
Castel et al. 2013	n=150 18-60 years mean=48.9 Female	Multidisciplinary treatment. CBT: education, cognitive restructuring, skills training, life values and relapse prevention + TAU + Physical exercise.	24/biweekly/24	G	TAU	Pain intensity (NRS). Impact of FM (FIQ). Catastrophizing (CSQ). Psychological distress (HADS). Health-related quality of life (COOP-WONCA). Sleep disturbances (MOS).	3.6	3.7	Significant improvement in pain intensity, catastrophizing, psychological distress, FIQ, sleep disturbances.	(12 months) Maintained improvement in sleep disturbances, catastrophizing and psychological distress.
Castro et al. 2013	n=44 mean age=49.9 Female	Multidisciplinary treatment: CBT + Pharmacological treatment + Physiotherapy.	NA	G	Conventional pharmacological treatment (CphT).	Pain intensity (NRS). Functionality (FIQ). Psychological distress (HADS). Quality of life and sleep problems (COOP-WONCA).	NA	NA	Significant improvement in pain intensity, functionality, quality of life and sleep problems.	(12 months) Maintained improvements in pain intensity, functionality, quality of life and sleep problems.

Chouchou et al. 2018	n=22 ≥18 years	1. CBT focused on pain. 2. CBT focused on sleep complaints	NA	I	Group Comparison	Parasympathetic activity (high frequency power). Sympathetic activity (low frequency power). Subjective sleep quality (Sleep Quality Assessment Index).	NA	NA	Significant improvement in subjective sleep quality related to an increase in high frequency power (parasympathetic activity).	NA
Davis et al. 2013	n=79 22-81 years mean=46.14 Mixed (F:98%)	Online Mindful Socioemotional Regulation Intervention (MSER): meditation, enhancing awareness and acceptance of emotions, and building strong social bonds.	12/biweekly/≈ 3	I	Healthy lifestyle tips	Social functioning (SF-36). Positive and negative affect (PANAS). Coping efficacy (Likert scale). Functional health (FIQ).	4.0	3.7	Significant improvement in coping efficacy, positive affect and social functioning compared to control group. Significant improvement in negative affect compared to baseline.	NA
Garaigordobil et al. 2016	n=88 26-65 years Mixed (F: 96.5%)	1) CBT (education, sleep hygiene, concept anxiety, relaxation, coping strategies, self-esteem, acceptance of negative emotions) and EMG-FB (learning to control muscle tension and to relax) + EMG-FB. 2) CBT (idem).	10/weekly/12.5	G	No treatment	Hostility, interpersonal sensitivity, global severity index, positive symptom total and other symptoms (SCL-90-R), state-anxiety and trait-anxiety (STAI). Depression (BDI). State-anger, trait-anger and anger expression index (STAXI-2).	3.2	3.4	Improvement of both intervention groups in hostility, interpersonal sensitivity, state-anxiety, trait-anxiety, depressive symptoms, trait-anger, expression of anger.	NA

Garcia Palacios et al. 2015	n=61 23-70 years mean=50.4 Female	CBT (education, activity management and relapse prevention) and Virtual reality (five predefined scenarios aimed at emotions, depending on the goal of the therapy session).	6/biweekly/12	G+ I	TAU	Disability (FIQ). Pain intensity and interference (BPI). Coping (CPCI). Mood (BDI-II). Perceived quality of life (Quality Life Index). Acceptability and satisfaction (Satisfaction and Acceptability Scale).	3.5	3.7	Significant improvement in disability, perceived quality of life, coping strategies in task persistence and exercise.	NA
Garrido-Torres et al. 2016	n=32 ≥18 years	1) Mindfulness sessions, education and advice related to the disease (online). 2) Onsite mindfulness sessions	NA	I	Group Comparison	Pain symptoms, anxiety (NA questionnaire).	NA	NA	Improvements in both groups in pain symptoms and anxiety.	NA
Harpreet et al. 2014	n=22 NA age Mixed (F:86,36%)	CBT: relaxation training, activity regulation, facilitation of emotional awareness, cognitive restructuring, interpersonal communication training + Myofascial release techniques (MFR) and physiotherapy.	20/weekly/NA	G	MFR and physiotherapy	FIQR Score. Anxiety and depression (DASS). Sleep disturbance (Epworth Sleepiness Scale). VAS. Quality of life (FIM).	2.3	2.7	Improvement in all variables studied in both intervention and control groups but no differences between groups.	(12 months) Significant improvement in FM symptoms compared to control group.

Hedman et al. 2019	n=140 14-77 years mean=50.3 Mixed (F:98%)	Internet-delivered exposure therapy (iExp): psychoeducation. Exposure to pain-related stimuli and mindfulness training.	8/—/NA + 175 minutes total mean therapist time.	I	Waiting list	Cost-effectiveness (self-report questionnaire TIC-P). Treatment effectiveness (FIQ). Quality of life (EQ-5D).	3.7	3.7	Significant improvement in FIQ score compared to control group. Significant difference in cost-effectiveness between groups favouring iExp.	(12 months) Nonsignificant improvements.
Herrero et al. 2014	n=40 27-66 years mean=48.8 Female	Virtual reality (predefined scenarios to adjust each treatment and needs of each disorder) and CBT (psychoeducation and behavioural activation).	6/biweekly/12 (CBT) + 20min (Virtual reality)	G + I	None	Mood state (facial expression scale). Pain and fatigue (NRS). Motivation and self-efficacy (NRS). Intensity of emotions (Likert scale).	NA	NA	Significant improvement in mood state, self-efficacy, motivation and intensity of some emotions compared to baseline.	NA
Herrero et al. 2013	n=8 27-57 years mean=45.37 Female	Virtual reality (predefined scenarios to adjust each treatment and needs of each disorder) and CBT (psychoeducation and behavioural activation).	6/biweekly/12 (CBT) + 20min (Virtual reality)	G + I	None	Pain and fatigue (VAS). Mood state (facial expression scale). Motivation and self-efficacy (Likert Scale). Emotions (VAS). Sense of presence (SUS).	NA	NA	Significant improvement in pain intensity, perception of self-efficacy and motivation.	NA

Karlsson et al. 2019	n=48 mean age= 48.5 Female	CBT: knowledge, self-monitoring, behavioural exercises, cognitive restructuring, relaxation techniques and life value issues.	20/weekly/60	G	Waiting list	Stress (VAS), Pain (MPI) (VAS), Vital exhaustion (Maastricht Questionnaire). Stress behaviour (Everyday Life Stress). Depression (MADRS-S). Plasma SP level. Life control, support from spouses or significant others, life values, affective distress, interference (MPI-S).	3.4	3.4	Significant reduction of plasma SP level (33%) in treatment group associated with improved outcomes of "life values" and "support from spouses or significant others". Improvement in pain behaviour, vital exhaustion and everyday life stress.	(12 months) Improvement in pain behaviour, vital exhaustion and everyday life stress.
Karlsson et al. 2015	n=48 18-64 years mean=49 Female	CBT: knowledge, self-monitoring, behavioural skills training, cognitive restructuring, and life value issues.	20/weekly/69	G	Waiting list	Life control, interference, affective distress, support from spouses or significant others and pain severity (MPI-1) General activity level (MPI-2). Vital exhaustion, stress behaviour, depression (MPI-3).	3.8	3.9	Improvements in life control, interference, affective distress, support from spouses or significant others, distracting responses, depression and pain severity compared to control group.	(12 months) Maintained and enhanced improvement in life control, interference, affective distress, support from spouses or significant others, distracting responses, depression, pain severity, vital exhaustion and stress behaviour.

Kohl et al. 2014	n=60 24-65 years mean=51.4 Female	1)Cognitive restructuring instructions and writing exercises 2)Acceptance instructions and writing exercises	1/—/NA	I	Only writing exercises	Pain tolerance and pain intensity (VAS: heat/cold-pain).	3.7	3.7	Significant improvements in both groups in heat pain tolerance compared to control group, but nonsignificant difference between both groups. Significant improvement in cognitive restructuring in cold pain tolerance compared to acceptance group and control group.	NA
Kroenke et al. 2013	n=442 ≥18 years mean=56.2 Mixed (F: 69.5%)	1) Telephone-delivered cognitive-behavioural therapy (TCBT). 2) TCBT + Exercise program.	8/weekly/≈7.5	I	1) TAU 2) Exercise program me	Score of global assessment scale of change. Pain, fatigue, sleep and psychological distress.	NA	NA	Significant improvement in global assessment scale of change in TCBT, TCBT +Exercise programme and Exercise programme compared to TAU group.	(9 months) Maintained benefits.
Lami et al. 2016	n=28 25-60 years Mixed (F:53.6%)	CBT-I for insomnia: psychoeducational information, exercises, and topics to discuss during the session and homework + TAU	9/weekly/13.5	G	None	Sleep quality, sleep efficiency, sleep disturbances (PSQI). Pain intensity, functioning (MPQ-SF, FIQ). Fatigue (MFI). Emotional distress (HADS, PASS-20). Catastrophizing (PCS). Gender differences.	2.9	3.3	Significant improvement in both genders in sleep quality, sleep efficiency, sleep disturbances, daytime functioning, pain intensity, mental fatigue, motivation and activity reduction, and FM impact. Significant improvement in male group in sleep disturbances and pain-related anxiety and catastrophizing. Significant improvement in female group in sleep latency, general fatigue and depression.	(3 months) Maintained improvement in female group in depression.

Lami et al. 2018	n=113 25-65 years mean=50.19 Mixed	1)CBT- IP (for insomnia and pain): information, sleep hygiene restrictions, relaxation, planning activities, communication and relationships, cognitive therapy. 2)CBT -P (for pain): information, relaxation, identifying unpleasant emotional states, planning activities, cognitive therapy.	9/weekly/13.5	G	TAU	Sleep quality, sleep latency, sleep efficiency (PSQI). Pain experience (MFI). Fatigue variables (MFI). Health status, FM impact (FIQ). Coping pain (CPSS). Subjective distress (Symptom Checklist SCL-90). Catastrophic thoughts (PCS). Acceptance of pain (CPAQ).	3.8	3.9	Significant improvement of CBT-IP in subjective sleep quality, sleep latency, sleep efficiency compared to baseline, CBT-I and control group. Significant improvement in intervention groups in self-efficacy and FM impact. Significant improvement of CBT-P in catastrophizing and pain acceptance compared to baseline.	(3 months) Significant improvements of CBT-IP in pain intensity.
Lazaridou et al. 2015	n=62 NA age NA gender	1) CBT 2) Education	4weeks/NA	G	Group Comparison	Brain circuitry underlying clinical pain and hyperalgesia (FMRI). Pain severity and catastrophizing.	NA	NA	Significant improvement of CBT group in catastrophizing compared to baseline. Significant reduction of CBT group in pain-evoked activation in the medial thalamus.	(6 months) Significant improvement of CBT group in pain severity.
Ling-Jun et al. 2019	n= 1 65 years Female	Psychotherapy and Spiritual Care: Behavioural techniques, relaxation training biofeedback, guided imagery + physician, psychiatrist, physiatrist, pastoral counsel, pharmacist, social worker, nurse, and dietitian interventions.	NA	I	None	Frequency of visits. Pain severity, pain interference (BPI). Depression (Center Epidemiological Studies Depression Scale). Anxiety (Generalized Anxiety Disorder). Sleep (PSQI).	NA	2.1	Improvements in pain interference and depressive mood.	NA

Ljótsson et al. 2014	n=41 >18 years mean=52.0 Female	Internet-delivered ACT (ICBT): acceptance, mindfulness, work with life-values, systematic exposure to FM symptoms and FM-related situations.	NA	I	None	FM aspects (FIQ). Interference (Pain Disability Index). Health-related quality of life (SF-12). Anxiety and depression (HADS). Impact & severity of fatigue (FSS). Psychological flexibility (PIPS). Social cost (Self-report test TIC-P).	3.0	3.3	Significant improvement in FM symptoms and impact, disability, quality of life, anxiety, depression, fatigue and psychological flexibility. Social costs reduction that effectively offset the cost of the treatment intervention.	(6 months) Maintenance of all improvements.
Luciano et al. 2014	n=156 18-65 years mean=48 Female	Group-based Acceptance and Commitment Therapy (GACT): exercises and topics within the context of ACT practice and training.	8/weekly/20	G	1)TAU 2)Waiting list	Functional status (FIQ). Pain catastrophizing (PCS). Pain acceptance. (CPAQ). Anxiety and depression (HADS). Health-related quality of life (EQ-5D).	3.6	3.7	Significant improvements in global functional status, pain catastrophizing, pain acceptance, subjective pain, quality of life, anxiety and depression.	(6 months) Maintained improvement in anxiety, depression and subjective pain.
Luciano et al. 2014	n=168 18-65 years mean=46.8 Mixed (F:94.64%)	CBT: information, negative thoughts, nuclear beliefs, coping strategies, pain catastrophizing and assertive communication.	NA	G	1)TAU 2)Recomm. pharmacological treatment	Quality-Adjusted Life Years (QALYs). Health-related quality of life (EQ-VAS). Costs of health care (Client Service Receipt Inventory). Cost-effectiveness acceptability curves (CEACs).	4.0	4.0	Improvement in health-related quality of life and quality-adjusted life years.	(6 months) Significant reduction in costs compared to control groups. Significant improvement in health-related quality of life compared to control groups.

Luciano et al. 2017	n=156 18-65 years mean=48.8 Mixed (F:96.1%)	Group-based Acceptance and Commitment Therapy (GACT): exercises and topics within the context of ACT practice and training.	8/weekly/20	G	1)TAU 2)Waiting list	Direct and indirect cost differences. Health-related quality of life (EuroQoL). Health care use (Client Service Receipt Inventory).	3.7	3.6	Significant improvement in quality of life and health care (overall) compared to control groups.	(6 months) Significant reduction in costs compared to control groups.
Lumley et al. 2017	n=230 ≥18 years mean=49.13 Female (F:93.9%)	1) Emotion awareness and expression therapy (EAET): experiential, intensive psychodynamic, prolonged exposure, expressive writing, therapeutic rescripting. 2) CBT 3) FM education	8/weekly/12	G	Group Comparison	Pain severity index (BPI). Sleep problems (PSQI). Cognitive dysfunction (MASQ). Depressive symptoms (CES-D). Anxiety symptoms (GAD). Fatigue (PROMIS). Physical functioning (SF-36). Positive and negative affect (PANAS). Life satisfaction SWLS). Number of health profession visits. Patient global change (PGIC).	3.9	3.9	Significant improvements of EAET group in cognitive difficulties compared to CBT group. Significant improvement of EAET group in pain intensity and sleep problems compared to FM education group.	(6 months) Significant improvements of EAET group in FM symptoms, widespread pain and pain reduction compared to CBT group. Significant improvement of EAET group in widespread pain, cognitive difficulties, depression, anxiety, physical functioning, positive affect and life satisfaction compared to FM education group.

Martin et al. 2014	n=153 ≥18 years mean=50.1 Mixed (F: 90.9%)	Interdisciplinary PSYMEPHY. CBT (cognitive, physiological and behavioural components) and education (nature of FM, course, treatments, daily activities, physician-patient relationship, psychology of pain) + Physiotherapeutic and medical interventions.	12/biweekly/12 .75	G	TAU	Physical functioning, pain, impact of FM and HRQoL (FIQ).	3.3	3.5	Improvements in HRQoL, physical functioning and pain levels compared to control group.	(6 months) Significant improvement in physical functioning, pain and impact of FM compared to control group.
Martin et al. 2014	n=93 ≥18 year mean=50.1 Mixed (F:93.4%)	Interdisciplinary PSYMEPHY. CBT (cognitive, physiological and behavioural components) and education (nature of FM, course, treatments, daily activities, physician-patient relationship, psychology of pain) + Physiotherapeutic and medical interventions.	12/biweekly/21	G	TAU	Pain, fatigue, morning tiredness, anxiety and impact of FM (FIQ). Perceived pain coping strategies (VAS).	3.7	3.8	Significant improvement in impact of FM and pain compared to control group.	(12 months) Maintained improvements in impact of FM and pain. Significant improvement in fatigue, anxiety and current pain compared to baseline.

Martínez et al. 2014	n=59 25-60 years mean=47.6 Female	1) CBT- I (for insomnia): information, sleep restrictions and stimulus control, physiological deactivation procedures training, cognitive therapy, preventing relapses + TAU 2) Sleep Hygiene Education	6/weekly/9	G	Group Comparison	Sleep variables (PSQI). Fatigue (MFI). Daily functioning (FIQ). Pain intensity (MPQ-SF). Catastrophizing (PCS). Self-efficacy (CPSS). Anxiety and depression (SCL-90-R).	3.9	3.9	Significant improvement of group 1 in fatigue, daily functioning, pain catastrophizing, anxiety and depression compared to group 2. Significant improvement in both groups in subjective sleep quality compared to baseline. Significant improvement of group 1 in sleep latency, sleep duration, habitual sleep efficiency and sleep disturbance compared to group 2.	(6 months) Significant improvement of group 1 in sleep latency, sleep duration, habitual sleep efficiency and sleep disturbance compared to group 2. Significant improvement in both groups in subjective sleep quality compared to baseline.
Martins et al. 2014	n=27 28-67 years mean=42.5 Mixed (F:64%)	Weekly Interdisciplinary Programme (WIP): educational activities, cognitive behavioural strategies and approaches to psychosocial approaches + Physical therapy, stretching, ergonomics, posture guidance combined and occupational factors.	12/weekly/12	G	Waiting list	FIQ variables (functional capacity, work absenteeism and others). Intensity of pain (VAS). Sleep quality (PSI). Quality of life (SF-12). Anxiety and depression (HADS).	3.1	3.2	Significant improvement in functional capacity and work absenteeism compared to control group.	NA

McCrae et al. 2019	n=130 ≥ 18 years mean=53 Mixed (F:97.7%)	1) CBT-I (insomnia): sleep education, sleep hygiene, relaxation, automatic thoughts and dysfunctional thoughts, recommendation and long-term maintenance skills. 2) CBT-P (for pain): pain education, diaphragmatic breathing, relaxation, autogenic relaxation, visual imagery, automatic and dysfunctional thoughts, balanced thinking, long-term maintenance skills	8/weekly/6.6	G	Waiting list	Self-reported sleep onset latency (SOL). Wake after sleep onset (WASO). Sleep efficiency (SE). Sleep quality (SQ). Pain ratings (VAS). Dysfunctional sleep-related beliefs (DBAS). Pain (PDI, MPQ). Depression (BDI-II). Anxiety (STAI-YI).	3.8	3.9	Significant improvement in insomnia in both intervention groups. Greater improvements of CBT-I group in sleep initiation and sleep maintenance difficulties. Improvement in immediate pain reduction in some patients of intervention groups.	(6 months) Significant improvement in initiation and maintenance difficulties in both intervention groups compared to control groups.
Melin et al. 2018	n=36 27-60 years mean=39 Mixed (F: 81%)	Psychoeducation method The Affect School and Script Analysis (ASSA): increasing emotional awareness and expressiveness.	18/weekly/26	G + I	None	Depression and anxiety (HADS). Alexithymia (TAS-20). Medically unexplained physical symptoms (SCL-93). General health (VAS). Self-affirmation, self-love, self-blame, and self-hate (SASB).	2.5	2.9	Significant improvement in depression, anxiety, alexithymia, medically unexplained physical symptoms, general health, self-affirmation, self-love, self-blame, and self-hate.	(18 months) Significant improvement in depression, alexithymia, medically unexplained physical symptoms, general health, self-affirmation, self-love, and self-hate.

Menga et al. 2014	n=56 ≥ 18 years mean=55 Mixed (F:88%)	1) Internet-based CBT MoodGYM: cognitive reconstructing, relaxation, pleasant events, assertiveness training, and problem solving. 2) TAU + online educational information about FM.	NA	G	Group Comparison	FIQ score. Changes in tender point (clinical assessment).	3.0	3.2	Significant improvement of group 1 in FIQ score and tender point scores compared to group 2.	(12 weeks) Significant improvement of group 1 in FIQ score and tender point scores compared to group 2.
Menzies et al. 2014	n=72 ≥18 years mean=46.9 Female	Guided imagery: guided relaxation, pleasant scene imagery, imagery journey through their immune system. Daily Written log of the guided imagery.	10/daily/≈23.5	I	TAU	Self-efficacy (ASES). Perceived stress (PSS). Fatigue (BFI). Pain (BPI). Depression (CES-D). Immune biomarkers.	3.7	3.8	Significant improvement in fatigue and pain severity and fatigue.	(10 weeks) Significant improvement in self-efficacy, stress, fatigue, pain and depression.
Miles et al. 2013	n= 47 18-65 years Female	CBT: information, identification of dysfunctional thoughts, engaging in behavioural interventions.	8/weekly/20	G	Yoga	Mood. Fatigue (MAF). Sleep quality (PSIQ). Physical functioning (FHAQ). Pain (VAS, FIA-Pain). Anxiety (AIMS2). Depression (CES-D). Helplessness. Coping (PMI). Self-efficacy (ASES).	3.7	3.7	Significant improvement of yoga group in pain, fatigue, sleep, depression, helplessness, coping, self-efficacy, memory, certain measurements of HRV and respiration compared to intervention group.	NA

Moioli et al. 2017	n=80 ≥ 18 years mean=55.5 Mixed (F:95%)	1)Training in autohypnosis: introduction and induction techniques, deepening techniques, construction of autohypnosis pain management process, practice of autohypnosis process. 2)Psychological coping programme: Chronic pain education, self-esteem, relaxation, emotional regulation, attention skills, assertiveness and social skills, cognitive restructuring, exercise activation, social support.	4/weekly/8	G	Group Comparison	Generalised pain (WPI). Pain intensity, symptom severity (SS). FM impact and interference (FIQ). Health-related outcomes (SF-12). Emotional variables (POMS). Depression (BDI). Pain quality, emotional and total discomfort (SFMPQ). PGIC score.	3.5	3.4	Improvement of autohypnosis group in symptom severity, pain interference, tension, depression, emotional variables, but nonsignificant improvement compared to control group.	(3 months) No maintenance of improvements.
Miro et al. 2017	n=10 31-62 years mean=46.5 Female	Mindfulness-based intervention: information, body exploration, mindfulness around insomnia, acceptance and emotions, self-compassion, mindfulness around thoughts, life values and prevention of relapse.	9/NA/NA	G	None	Sleep quality (PSQI). Pain (MPQ-SF). Fatigue (MFI). Daily functioning (FIQ). Self-efficacy (CPSS). Catastrophizing (PCS). Anxiety and depression (HADS).	NA	NA	Significant improvement in PSQI score, subjective sleep quality, pain catastrophizing, chronic pain self-efficacy, fibromyalgia impact and habitual sleep efficiency compared to baseline.	NA

Molinari et al. 2018	n=71 23-71 years mean=51.1 Mixed	Online Best Possible Self (BPS) intervention: multimedia content related to aspects regarding personal, social, professional and health domains defined by the patient.	It depends on the patient	I	Daily Activities: Active control condition	Depression (BDI-II). Positive and Negative Affect (PANAS). Optimism (LOT-R). Future Expectations (SPT). Self-Efficacy (GSES-12). Quality of Life (QLI-Sp). Interference (FIQ-R). Catastrophizing (PCS).	3.5	3.6	Significant improvement in depression, positive affect, self-efficacy compared to baseline.	(3 months) Significant improvement in negative affect, optimism, pain functioning.
Montero-Marin et al. 2018	n=42 18-65 years mean=51.5 Female	*1.* Attachment-based compassion therapy (ABCT): mindfulness, visualisation and homework assignments + TAU *2.* Relaxation	8/weekly/22	G	Group Comparison	Health status (FIQ). Clinical Severity (CGI-S). Pain Catastrophizing (PCS). Anxiety. and depression (HADS). Quality of life (EQ-5D). Psychological flexibility (AAQ-II).	3.9	4.0	Significant improvement of ABCT group in FIQ variables, clinical severity, anxiety, depression, quality of life and psychological flexibility compared to relaxation group.	(3 months) Significant improvement of ABCT group in FIQ variables, clinical severity, anxiety, depression, quality of life and psychological flexibility compared to relaxation group.
Montes-Curtó et al. 2015	n=66 18-62 years mean=58.9 Mixed (F:96.9%)	1) Group Problem-Solving Therapy (GPST): identifying problems, solutions and negative feelings. 2) GPST + Cervical infiltration with botulinum toxin.	4/weekly/8	G	Cervical infiltration with botulinum toxin.	Health outcomes, anxiety and depression (EQ-5D). Suicidal risk (Plutchik suicide risk scale). Quality of pain experience (VAS). Nocturnal sleep and daytime drowsiness (SCOPA). Satisfaction.	NA	NA	Improvement in health status of all three groups compared to baseline. Significant improvement of group 2 in risk of suicide. Improvements in suicidal thoughts with the combination of the two therapies (infiltration + GPST) compared separately. Improvement in anxiety and depression in group 2.	NA

Montes-Curtó et al. 2018	n=44 mean age =61.1 Mixed (F:97.7%)	Group Problem-Solving Therapy (GPST): identifying problems and solutions, negative feelings and effectiveness of GPST.	24/weekly/48	G	None	Identification of problems and the solutions.	3.2	3.4	Relation to trauma in the past. Identification of the solutions.	NA
Mundt et al. 2016	n=113 mean age=52.7 Mixed (F:97%)	+ CBT-I: cognitive techniques and relaxation strategies to minimize the impact of night-time awakenings. + CBT for pain	NA	G	Waiting list	Actigraphic: Total sleep time (TST); Sleep onset latency (SOL); Wake time after sleep onset (WASO); Lower sleep efficiency (SE). Polisomnography (PSG). Sleep diaries. Questionnaires. Tender point testing.	3.2	3.4	Improvement of CBT-I group in objective measures in sleep were uniformly reflected by the different assessment methods. Significant improvements of CBT-I in all parameters of sleep diaries (subjective experience of poor sleep).	(6 months) Improvement of CBT-I in objective measures in sleep were uniformly reflected by the different assessment methods.
Musekamp et al 2019	n=583 mean age=52 Mixed (F:94%)	Educational manual-based programme: diagnosis and treatments of FMS, coping strategies for pain and stress, promotion of physical exercise, self-management and action planning + medical treatment, exercise therapy, health education, psychological support, relaxation and social counselling.	6/NA/9	G	TAU	Disease and treatment-specific knowledge (self-developed questionnaire). Self-management competencies and satisfaction (heiQ). Psychological distress (PHQ-4). Health impairment (FIQ-G).	3.5	3.7	Improvement in disease and knowledge compared to control group. Significant improvement in self-monitoring and insight, pain-related control, communication about the disease and action planning for physical activity.	(12 months) Significant improvement in knowledge, self-estimated knowledge and satisfaction with knowledge compared to control group.

Parra-Delgado et al. 2013	n=31 30-77 years mean=52.6 Female	Mindfulness-based cognitive therapy (MBCT): meditation and cognitive restructuring techniques.	8/biweekly/20	G	TAU	Dysfunction and total score (FIQ). Depressive symptoms (BDI). Intensity of pain (VAS).	3.8	3.8	Significant improvement in FIQ score and depressive symptoms.	(3 months) Maintained improvements in FIQ score and depressive symptoms.
Perez-Aranda et al. 2019	n=204 18-65 years mean=53.4 Mixed (F:98%)	1) Mindfulness-Based Stress Reduction for Fibromyalgia (MBSR) 1) TAU 2) Multicomponent intervention (FibroQoL).	8/weekly/16	G	TAU	Health-related quality of life (EQ-5D) (QALYs). Direct and indirect costs (CSRI). Incremental cost-effectiveness ratios (ICERS).	3.7	3.8	Nonsignificant differences between groups.	(12 months) Significant improvement in health-related quality of life of both groups MBSR and FibroQoL compared to TAU group. Significant reductions in costs of MBSR compared to FibroQoL and TAU groups.
Pires et al. 2016	n=9 38-64 years mean=53 Female	Pain neuroscience education (PNE) programme: complex contents that do not take into account memory and concentration problems + Individualized exercise programme (aerobic exercise, motor control training and aquatic exercise).	NA	G	None	Global scores of NRS, Tampa Scale of Kinesiophobia, PCS and PGCS.	NA	NA	Improvement in overall PGCS score. Improvement in PCS score in 8 patients. Improvement in pain intensity (NRS) in 7 patients.	(6 months) Improvement in pain intensity (NRS) in 5 patients. Improvement in PGCS in 7 patients.

Racine et al. 2019	n=178 ≥ 18 years Mixed	Activity pacing CBT treatments: 1) Operant Learning: from pain-contingent to goal-directed behaviour + Exercise 2) Energy conservation: accomplishing day-to-day valued activities/goals and resting to reduce pain and fatigue + Exercise	11/weekly/22	G	No treatment	Pain (BPI). Fatigue (BFI). Pain and fatigue interference (BPI). Physical function and psychological function (SF-36). Sleep quality (MOS). Depression and anxiety (HADS).	3.5	3.4	Significant improvement of OL group in depressive symptoms compared to EC group. Significant improvement of both groups in sleep quality and physical function, pacing and overdoing activity patterns.	(3 months) Maintained improvement of OL group in pain interference, fatigue interference, psychological function and depressive symptoms. Maintained improvement of both groups in sleep quality and physical function.
Romeyke et al. 2018	n=1 64 years Female	Interdisciplinary assessment-oriented treatment. Psychotherapy: shifting attention, building up activity levels and providing information about pain. Pain management group: relaxation, cognitive behavioural therapy and management strategies + Physical therapy and physiotherapy, exercise, complementary medicine, detoxifying procedures, holistic massage and nutrition therapy.	17/daily/NA	I + G	None	Impairment of well-being, impairment of the body and sleep (VAS). Pain intensity and pain threshold (VAS average and max). Depression (PHQ-D). Physical function (FFbH). Subjective pain-related impairment (PDI).	NA	NA	Improvement in pain symptoms, sleep quality, pain intensity, impairment by general symptoms, functional capacity.	(18 months) Improvement in pain threshold, VAS average, VAS max and physical function.

Saral et al. 2016	n=66 25-60 years mean=41.7 Female	Interdisciplinary treatments: 1) Long-term (LG) treatment: short CBT, education, exercise training. 2) Short-term (SG) treatment: long CBT, education, exercise training.	1) LG: 10/weekly/30 + 1 educational day 2) SG: 2/once/NA (intensive)	G	TAU	Pain, fatigue and sleep (VAS). Number of tender points, pressure pain threshold, physical functioning and general health assessment (FIQ). Depression (BDI). Health-related quality of life (SF-36).	3.9	3.9	Significant improvement in pain intensity, tender point numbers, increasing pressure pain threshold levels, controlling disease activity. Significant improvement of LG group in fatigue and physical components (HRQoL).	NA
Scheidt et al. 2013	n=46 18-70 years mean=48.7 Female	Individual short-term psychodynamic psychotherapy (ASTPP): dysregulation model of psychosomatic illness, attachment styles and affect regulation in somatoform disorder.	25/weekly/≈25	I	TAU	FIQ score. Depression (HADS). Psychological distress (SCL-27-plus). General symptom score (GSI). Pain Disability Index (PDI). Health-related Qol (SF-36).	3.9	3.9	Improvements in FIQ score, depression, anxiety, pain-related quality of life and somatoform symptoms compared to baseline.	(12 months) Improvement in FIQ score.

Simister et al. 2018	n=67 18-64 years mean=39.7 Mixed (F:95%)	Online ACT: written unit reading, mp3 audio recordings, videos and experimental homework exercises + TAU	7/NA/NA	I	TAU	FM impact (FIQ). Depression (CES-D). Pain experience (SF-MPQ). Sleep (PSQI). Pain-related acceptance (CPAQ). Mindfulness measures (FFMQ). Cognitive fusion (CFQ). Importance of life domains (VLQ). Fear of movement/(re)injury (TSK-11). Pain catastrophizing (PCS). 6-minute walk. Sit to stand.	3.8	3.8	Significant improvement in FM impact compared to control group. Significant improvement in pain interference, pain-related psychological inflexibility, pain acceptance, depression, pain and kinesiophobia.	(3 months) Significant improvement in FM impact and cognitive fusion compared to control group. Maintained improvement in pain acceptance.
Steiner et al. 2013	n=28 18-65 years mean=49.4 Female	1) ACT: conceptualisation, unwanted emotions, cognitive defusion, values and commitment. 2) FM education	8/weekly/8	G	Group Comparison	Effects of chronic pain on person's values (CPVI).	3.3	3.2	Significant improvements of both groups in family compared to baseline. Significant improvement of ACT group in intimate relations compared to baseline.	(12 weeks) Significant improvement of both groups in family compared to baseline.

Thieme et al. 2016	n=145 21-67 years mean=47 Female	1)OBT: Operant behavioural therapy: video feedback and contingent positive reinforcement of pain behaviours. 2)CBT: patient's thinking, problem-solving, stress, coping strategies and spouse response.	15/weekly/30	G+I	1)Whole-body infrared heat (IH). 2)Pain-free controls.	Surface electromyogram (EMG). Diastolic blood pressure (DBP). Systolic blood pressure (SBP). Heart rate (HR). Skin conductance levels (SCL).	3.8	3.8	Significant improvement of OBT and CBT groups in EMG compared to control groups. Significant improvement of CBT group in HR and SCL compared to all the other groups. Significant improvement of OBT group in DBP.	(12 months) Significant improvement of OBT and CBT groups in EMG compared to control groups and post-treatment results. Significant improvement of CBT group in HR and SCL compared to all the other groups. Significant improvement of OBT group in DBP.
Torres et al. 2018	n=56 35-65 years mean=51.3 Female	Group Music and Imagery Intervention GrpMI: verbal dialogue, relaxation and induction, active music listening, creative drawing, verbal reflection.	12/weekly/24	G	No treatment	Psychological well-being (PWS). Functional capacity and health (FIQ). Pain (MPQ). Anxiety (STAI). Depression (ST/DEP).	3.9	3.9	Significant improvement in psychological well-being, functional capacity, health, pain perception, anxiety and depression compared to baseline.	(3 months) Maintained improvement in functional capacity, health, pain perception, anxiety and depression. compared to baseline and control group.
Toussaint et al. 2014	n=13 30-55 years mean=47 Female	Forgiveness education: definition and discussion of forgiveness, emotion-focused coping strategy, brief exercises of letting go, deeper breathing, feeling gratitude and a question-and-answer session.	2/NA/2,5	G	None	Psychological distress, participant engagement, observed emotion (tearfulness, use of facial tissues), and overall energy in the room (sense of passivity participating) (Observational Scale).	NA	NA	Beneficial behavioural observations in relation to psychological distress. Comfort, satisfaction and benefit of learned coping strategies and information related to chronic pain (reported by the patients).	NA

Vallejo et al. 2015	n=60 ≥ 18 years mean=55.5 Female	1) Internet-delivered CBT (iCBT): written and graphic content, suggested activities, relaxation exercises, individual and feedback messages 1)TAU 2) Conventional face-to-face CBT.	10/weekly/NA	I	Waiting List	Daily functioning (FIQ). Psychological distress and cognitive variables (PCS). Depression. Self-efficacy and coping strategies (CPSS).	3.9	3.9	Significant improvement of CBT group in FM impact compared to all the other groups. Significant improvement of iCBT and CBT groups in psychological distress, depression, catastrophizing, relaxation coping strategies compared to waiting list. Significant improvement of iCBT group in self-efficacy compared to control groups.	(12 months) Improvement of iCBT group in FM impact and catastrophizing compared to post-treatment scores.
Van Den Houte et al. 2017	n=153 Mixed (F:88.2%)	Multidisciplinary group programme: psychoeducation (interactions between psychological and social factors and physical complaints) and psychomotor therapy (regaining trust in the body) + Physiotherapy and occupational therapy.	12/3-weekly/92	G	None	Pain disability (PDI). Physical functioning (SF-36). Pain severity and functional interference (MDI-DLV). Anxiety and depression (HADS). Kinesiophobia (Tampa Scale of Kinesiophobia).	2.8	3.1	Moderate improvement in pain disability, physical function, pain severity and functional interference.	(12 weeks) Maintained moderate improvement in pain disability, physical functioning, pain severity and functional interference.
Van Ejik-Hustings et al. 2013	n=203 18-65 years Mixed (F:86.29%)	Multidisciplinary Intervention. Information, rational emotive therapy, transactional analysis + Sociotherapy, physiotherapy and arts therapy.	48/—/≈122.5	G + I	1) Aerobic exercise 2) TAU	Health-related quality of life (EQ-5D). Impact of fibromyalgia (FIQ).	3.6	3.6	Significant improvement in health-related quality of life.	(24 months) Nonsignificant group differences.

Van Gordon et al. 2017	n=128 18-65 years mean=46.8 Mixed (F:62%)	1) Second generation mindfulness-based intervention (SG-MBI): taught presentations, guided meditations, group discussions, guided meditation and/or mindfulness exercises, and one-to-one sessions. 2) Cognitive Behavioural Theory for groups (CBTG).	8/weekly/16	G+I	Group Comparison	Overall impact (FIQ). Pain (SF-MQP). Psychological distress (DASS). Sleep quality (PSQI). Attachment to experiences (NAS).	3.7	3.7	Significant improvement of SG-MBI group in pain perception, sleep quality, psychological distress, non-attachment, civic engagement.	(6 months) Maintained results (and in some cases slightly augmented).
Verkaik et al. 2014	n=65 22-76 years mean=47.4 Mixed (F:98.5%)	1) Guided Imagery: relaxation techniques, music, positive imagery and specific pain-related elements. 2) Only group discussion	2//NA/≈3.5	G	Group Comparison	Pain (VAS). Functional status (FIQ). Self-efficacy (CPSS).	3.9	3.9	Nonsignificant improvements.	(6 weeks) Nonsignificant improvements.
Vincent et al. 2013	n=7 38-72 years mean=55.5 Mixed (F:85.7%)	Multidisciplinary fibromyalgia clinical programme: cognitive behavioural therapy, activity pacing, graded exercise therapy.	NA	G	None	Pain (FIQ, SF-36). Mental and physical components (SF-36). Fatigue (MFSI-SF). Self-efficacy (CPSS).	2.6	2.9	Improvements of 6 patients in self-efficacy, fatigue and physical component.	Improvement in 6 patients in self-efficacy, fatigue and physical component. Improvement in all patients in mental component.

Wicksell et al. 2013	n=40 18-55 years mean=45.1 Female	ACT: discussing and preparing for behavioural change, shifting perspective from personal values, values-oriented behaviour activation, activation and cognitive defusion.	12/weekly/18	G	Waiting List	Pain disability (PDI). FM impact (FIQ). Health-related quality of life (SF-36). Self-efficacy (SES). Depression (BDI). Anxiety (STAI). Pain intensity (NRS). Psychological inflexibility (PIPS).	3.6	3.8	Significant improvement in pain disability, FM impact, mental health, quality of life, self-efficacy, depression, psychological inflexibility and anxiety.	(3 months) Significant improvement in pain disability, FM impact, mental health, quality of life, self-efficacy, depression, psychological inflexibility and anxiety.
Zabihiyeganeh et al. 2019	n=33 18-64 years mean=46.4 Female	CBT: identification of troublesome situations, interactions, thoughts, emotions and behaviours, identification of irrational beliefs and patterns, restructuring irrational beliefs.	20/biweekly/40	G	Waiting list	Pro-inflammatory cytokine levels (circulating IL-6, IL-8, and TNF-α level). FM impact (FIQ). Widespread pain (WPI). Depression (BDI-II). Anxiety (BAI-II).	3.7	3.8	Significant changes of pro-inflammatory cytokine levels (serum concentration of IL-6, and IL-8). Improvements in FM impact, widespread pain.	NA

4. Discussion

This work allowed us to know in detail the characteristics of the research aimed at verifying the effectiveness of different psychological techniques in patients with fibromyalgia carried out from 2013 to 2019 inclusive.

These new data allow us to shed light on strengths and weaknesses regarding research methodology. This also provides evidence in relation to applied techniques and how they are implemented. Finally, it contributes to knowing the effectiveness of the interventions. Likewise, when comparing our results with those of the last review, our results allow us to observe whether there is any change in research topic trends.

4.1 Participants

Samples of the review studied present a majority of females and a mean age of 50.6 years, all of them being between 18 and 65 years old. This tendency coincided with similar characteristics included in other reviews regarding psychological treatments and FM (Glombiewski et al., 2010; Lami et al., 2013). In particular, Glombiewski et al. (2010) found that 92% of the sample was female. FM is more common in women and frequently appears to start between 32 and 55 years old. Overall, FM characteristics endure over time. Therefore, the studies presented in this review considered samples representative of the study population.

4.2 Design

This review presents a higher number of experimental designs compared to the previous review (Lami et al., 2013) (78.8% and 46.4%, respectively). This therefore seems to be an improvement in terms of methodology.

In relation to follow-up frequency and duration, we found that approximately 20.8% of the studies included 6-month follow-up, whilst Lami et al. (2013) found 6-month follow-up in 28% of the studies. Long-term evaluations (12-month follow-up) remain similar in comparison to Lami et al. (2013) review (19% and 18%, respectively). More long-term assessments are required in order to obtain substantial results.

4.3 Outcome measures

Our results seem to be in line with Lami et al. (2013) conclusions. Most interventions in the present review focused on pain outcomes (65%), concurring with Lami et al. (63.8%). Depression (45.8%) and anxiety (34.7%) also seem to be the most analysed psychological variables, similar to depression (41.4%) and anxiety (25.9%) in the previous review. In relation to pain-related psychological variables, catastrophising was assessed in 15.3% of the studies

(compared to 10%), and both coping skills and self-efficacy in 23.6% (compared to 13.8% and 5.17%). Lami et al. (2013) reported that assessment of these variables was insufficient. According to our findings, it seems that assessment of pain-related psychological variables is steadily increasing, albeit at a slow pace. Taking into account the influence of these variables on chronic pain recovery (Söderlund et al., 2017) further research regarding pain-related psychological variables is required.

4.4 Interventions

CBT was the most implemented treatment (50%), equivalent to the previous review which found that 48% of the studies implemented CBT interventions (Lami et al., 2013). Multicomponent programmes also remain similar in our review: 18% of the studies compared to 19% of the studies with multimodal interventions found in Lami et al. (2013). ACT and mindfulness-based interventions significantly increased in number. ACT was found in 8.3% of the studies compared to 1.7% in the previous review. Likewise, Mindfulness-based interventions were found in 11% of the studies compared to 5.17% in the previous review. Therefore, while there is no significant increasing tendency in CBT and multicomponent programmes, it does appear to be a rising trend in ACT and mindfulness-based interventions.

Relaxation interventions as the main intervention were found in 1 study. However, relaxation was part of the intervention in 55% of the studies. This high percentage is similar to Lami et al. (2013) review in which relaxation techniques can be found in 53.4% of the studies. These numbers show the importance attributed to relaxation procedures since long ago and the continued use over the last few years, probably due to their effectiveness.

Another 13 studies were conducted with other types of interventions. For instance, a psychodynamic intervention was carried out in one study but was not present in Lami et al. (2013). Also, the present review found 5 studies described as psycho-education interventions, whilst Lami et al. (2013) cite 3. On the other hand, the past review included 7 studies with Biofeedback, whereas the present review presented one only biofeedback intervention together with CBT.

Finally, when comparing our review with Lami et al. (2013) review, alternative approaches for FM treatment related to emotional aspects seem to have emerged over the past six years. These include Emotional Expression Acknowledgment and Exposure (EEAE), Best Possible Self, Time In, Rational Emotive Therapy together with Transactional Analysis, Forgiveness Education and psychotherapy together with spiritual care.

In the present review, education was cited in 37 studies. This differs from the past review which indicates the specific presence of psychoeducation in almost all studies. This could be due to a

lack of citation and description rather than to a lack of education-related aspects in the current studies.

In relation to the modality of the interventions, 79% of the studies presented in the review involve a group treatment, of which a few were combined with individual intervention. When comparing this with Lami et al. (2013) review, which presented 65.5% of the interventions with a group modality, the growing trend of group interventions can be observed. This past review does not describe mixed modalities, with individual and group treatments, whereas we found some studies which presented mixed interventions (13.9%).

In relation to mean total treatment duration, this is 20.30 hours and is similar to Lami et al. (2013), who estimated 24.61 hours in their review. Regarding frequency of treatment, 52.28% of the studies performed weekly sessions, also a very similar percentage to Lami et al. (2013), who counted 55.17% of studies performing weekly sessions.

Regarding intervention setup, 4 studies administered virtual reality together with group therapy or online configuration. On the other hand, Lami et al. (2013) do not describe any study using virtual reality. This review found that 1.4% of studies described telephone treatments and 9.7% of the studies implemented online interventions, while Lami et al. (2013) found telephone treatment in 1.7% and online interventions in 5.1% of the studies. Online treatment seems to target the population with logistic barriers, such as timing, travel or access inconveniences in rural areas, and it is steadily increasing with encouraging results. Bernardy et al. (2018) carried out a systematic review and meta-analysis of internet-based cognitive behavioural therapies for FM patients and concluded that these therapies could be useful in graded implementation for mild to moderately affected patients.

4.5 Effectiveness

In this review, we found that CBT was followed with a high percentage of beneficial outcomes related to pain, similarly to Lami et al. (2013). Also, our results are in line with other recent systematic reviews related to CBT in FM, which conclude that CBTs were superior to controls (treatment as usual, other active non-pharmacological treatments, waiting list) in pain relief (Bernardy et al., 2018).

There were 7 studies related to mindfulness interventions; however, several variables were not frequently measured. This makes the task of comparing results complicated. Pain-related psychological variables (coping skills and catastrophising) were assessed in 2 studies. Despite an overall lack of values for a conclusive verdict, our results suggest that mindfulness might be beneficial in sleep-related problems, improving the impact of the disease, depression and anxiety

symptoms, and quality of life. Lakhan & Schofield (2013) carried out a meta-analysis regarding somatisation disorders (included FM), in which they concluded that mindfulness interventions showed a small to moderate positive effect on pain, depression, anxiety and quality of life. Our results also agree with Lauche et al. (2013) who highlighted the need for further high-quality RTCs for a compelling conclusion. The authors also pointed out the need to select custom outcomes such as awareness, acceptance or coping.

Concerning guided imagery therapies, Meeus et al. (2015) carried out a systematic review which found that most of these techniques demonstrated moderate evidence for pain effects. This differs from our results from two guided imagery studies which indicated successful pain outcomes. However, the authors pointed out the need for re-evaluation of relaxation formats and visualisation content.

We found ACT to be a promising intervention for several variables such as fatigue, quality of life, depression, anxiety and psychological flexibility. Pain improved in 75% of the studies assessing the variable (4 studies). In accordance with our results, other recent reviews such as Simpson et al. (2017) also concluded that ACT was promising as a therapeutic treatment for non-malignant chronic pain.

In accordance with Merlo (2019), all this data represents a significant progress in the role of psychological approaches in the integration of clinical practice. However, it seems difficult to state that one intervention is more effective than others. In fact, among the studies included in this review, when comparing outcome differences between two different psychological interventions, most studies do not conclude the superiority of one over another (Chouchou et al., 2018; Kohl et al., 2014; Lumley et al., 2017; Miles, 2013; Moioli, 2017).

Difficulties in determining the effectiveness of each therapy are also due to the fact that the composition of each intervention presented in this review does not seem to be entirely independent from the others. For instance, CBT incorporated a variety of elements (mindfulness techniques, or life and values components, among others), mindfulness generally involved acceptance among other exercises, and most multidisciplinary programmes are commonly made up of several other types of interventions besides CBT (e.g., stress management). Therefore, we think that attributing the effectiveness to one intervention model might be inaccurate.

4.6 Common factors and mediator variables

The present review allowed us to carry out a panoramic overview of the type of psychological interventions implemented in fibromyalgia and the benefits obtained from them. This panoramic view displays a greater amount of heterogeneity. That is to say that diverse

psychological interventions are implemented and the results do not seem to depend directly on the type of intervention. In other words, it does not seem to be a superior technique in terms of effectiveness. This is along the same lines as the APA conclusions (2013) after comparing different psychotherapeutic models. "*In contrast to large differences in outcome between those treated with psychotherapy and those not treated, different forms of psychotherapy typically produce relatively similar outcomes*".

When trying to bring order, it is perceivable that overall intervention groups achieve greater improvements than passive control groups, regardless of the intervention implemented. This leads us to conclude that different therapies, although coming from different theoretical frameworks, share factors in common and that these are closely related to patient improvement. As a matter of a fact, there is an increasing amount of evidence analysing these common factors (Laska et al., 2014). Therapeutic alliance, expectations and empathy are possible variables that can be found transversely in any technique analysed in our review and might be responsible for effectiveness. Unfortunately, due to the difficulty in operating and quantifying these variables, they are not usually studied.

A similar concept to common factor is mediator variable. As we know, this refers to those variables that act as a "bridge" and lead to benefits. In this case, they would be variables manipulated through the intervention that leads to pain relief. There are therefore more hypotheses than results. Several authors point to behavioural and/or cognitive variables as important mediators in pain management (Söderlund et al., 2017). Karlson et al. (2015) identified developing individual coping strategies as an essential part of pain improvement with CBT. Cash et al. (2015) suggested that mindfulness may improve perception of symptom control. Montesó-Curto et al. (2018) highlighted the importance of enhancing adaptive behaviours leading to improvements in self-management through a group problem-solving therapy. However, these hypothetical mediator variables depend on a specific theoretical frame which prevents a common theory from being reached explaining how therapies obtain their benefits.

When analysing the interventions from the present review, we found two transversal elements across several treatments: relaxation and education. This led us to think that, beyond the specific theoretical frame, there are two mediator variables: relaxation as a state, and patients' pain-related knowledge. In other words, relaxation and pain-related knowledge might induce cognitive and behavioural changes.

With regard to relaxation, this seems to be associated with different labels. Several authors state that they implement relaxation techniques; however, these are described with different, specific terms. Regardless of the label, as mentioned above, relaxation strategies seem to be present in a

vast amount of studies in our review (55%). Also, Lami et al. (2013) pointed out that 53.4% of the studies included in their review incorporated relaxation components. The fact that relaxation is one of the most frequently used techniques led us to corroborate that relaxation as a state might be a possible mediator variable.

Regarding education, Lami et al. (2013) mentioned psychoeducation as one of the main common components in all interventions, being present in almost all treatments. In the present review, psychoeducation is present in a large proportion of interventions, but was not described in all treatments. Overall, psychoeducation aimed to inform the patient regarding psychological processes implicated in maintaining or aggravating pain experiences.

In terms of general patient education, 51.4% of the studies included some type of educational component. Some studies focused the research on specific educational barriers. These showed that cognitive aspects might lead to difficulties in understanding parts of the treatment and, consequently, might lead to impeding improvements in health outcomes. For instance, Castel et al. (2013) implemented an adapted multidisciplinary programme for low educational levels and demonstrated a reduction in key FM symptoms. Pires et al. (2016) pointed out memory and concentration problems as possible barriers for significant health changes in FM patients. In this last research, after implementing an adapted programme for patients with cognitive deficits, results proved the need for and success of an adjusted educational programme.

Other studies highlight the importance of pain-related educational aspects in order to achieve health improvements. These include not only educational components related to psychological processes (psychoeducation), but also education related to the syndrome's characteristics and physiology. Camerini et al. (2013) associated self-management and health outcomes with increased knowledge acquisition through a personalised, especially designed internet-based treatment. The authors found that increased knowledge about FM modified patients' amount of exercise; at the same time, it increased self-management and positively impacted patients' health status. Along the same lines, Butler & Moseley (2003) pointed out that learning about pain physiology reduces the threat value of pain, and consequently decreases the activation of protective systems diminishing pain triggers.

The divergent approaches and therapies that we analysed in our review are a mere reflection of the complexity of both the pain phenomenon and FM syndrome. We believe that emphasising transversal factors might help us to unify different perspectives.

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