Complementary Therapies in Medicine 46 (2019) 9–18

Contents lists available at ScienceDirect

Complementary Therapies in Medicine

journal homepage: www.elsevier.com/locate/ctim

Effect of yoga on the quality of life of patients with rheumatic diseases: Systematic review with meta-analysis

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ARTICLE INFO

Keywords:
Musculoskeletal diseases
Alternative medicine
Exercise
Mental health
Physical health

ABSTRACT

Aim: To analyze the effects of yoga on the quality of life of patients with rheumatic diseases through a systematic review with meta-analysis.

Methods: This systematic review with meta-analysis was conducted following the recommendations of the Declaration of PRISMA. The searches were carried out on the databases PubMed, Web of Science, EBSCO, Scopus, and Cochrane until August 2018. Experimental studies evaluating the effect of yoga on the quality of life in patients with rheumatic diseases were included.

Results: After data searches, 483 studies were found, 23 of which were included in our analysis. We found that yoga improves the overall quality of life ($d = -0.64$; 95% CI: −0.91 to 0.038) of patients with rheumatic diseases, as well as the following domains: functional capacity (d = 16.43; 95% CI: 13.37–19.49), physical aspects (d = 27.11; 95% CI: 19.40–34.83), emotional aspects (d = 26.00; 95% CI: 18.87–33.13), general health (d = 16.61; 95% CI: 12.66–20.55), and social aspects (d = 7.01 ; 95% CI: 5.57–9.45).

Conclusion: Evidence suggests weak recommendations can be made for the use of yoga in the management of RD patients.

1. Introduction

Rheumatic diseases (RD) represent a critical public health problem, recognized as the leading cause of disability in the USA and worldwide.[1–3] The prevalence of these diseases is growing[2,4] due to the influence of environmental factors, such as obesity, sedentary behavior, and food consumption.[5–7] These diseases have high health costs, and in the specific case of osteoarthritis, for example, the annual incremental health costs varies from €705 to €19,715.[8–11]

These patients also have reduced functional capacity, lower muscular strength, and lower aerobic capacity.[12–14] They are also susceptible to greater emotional problems, such as depression and anxiety, reflecting a lower quality of life (QOL), generating a vicious cycle.[15,16] For these reasons, RD has a major impact on the public health and productivity of patients affected by the disease. [17–19] For this reason, different strategies to treat the symptoms of these patients have been suggested, such as cognitive behavioral therapy, physical exercise, and complementary/integrative health approaches.[20–22]

Within complementary/ integrative health approaches, the effects of yoga have been analyzed in several populations.[23–25] Yoga is a philosophical and practical discipline, thought to have originated in India around 5000 years ago,[26] that aims to balance and develop individuals in the physical, mental, and spiritual dimensions. According to one of the classical texts, the Yoga *Sutra of Patânjali*, Yoga is based on personal development through eight steps: *Yama* (universal ethics), *Niyama* (individual ethics), *Asana* (psychophysical postures), *Pranayama* (breath control), *Pratyahara* (abstraction of the senses), *Dharana* (concentration), *Dyana* (meditation), which should lead the individual to *Samadhi* (happiness/contemplation).[27]

Interest in this practice has been highlighted in the literature, and a recent systematic review study with bibliometric analysis revealed that the number of publications on yoga in the world has increased almost three times in the last ten years. Today, articles focusing on yoga have been published in journals from 29 countries. Moreover, there is evidence citing the use of this practice as an interest of the scientific community as a form of prevention, maintenance, and recovery of health.[28] Although there is evidence on the positive effects of yoga on depression, sleep, anxiety, and pain[25,29–32] in patients with rheumatic diseases, studies on the effects of the quality of life of this population are still controversial.

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https://doi.org/10.1016/j.ctim.2019.07.006
Received 4 April 2019; Received in revised form 16 June 2019; Accepted 8 July 2019
Available online 12 July 2019
0965-2299/

In a published systematic review that analyzed experimental studies on the effects of yoga in patients with rheumatic diseases, only eight studies were found.[33] In addition, the review presented limitations in relation to the search strategy and the number of analyses used, which precludes an in-depth view of the studies found. The conduction of a new review studies with more methodological rigor and with more detailed analyses could contribute to a better understanding of the effects of yoga in patients with RD. Thus, the aim of this study is to analyze the effects of yoga on QOL in patients with RD, through a systematic review with meta-analysis.

2. Methods

This systematic review was registered (PROSPERO CRD42018109240) and in accordance with the recommendations of PRISMA (*Preferred Reporting Items for Systematic Reviews and Meta-Analyses*).[34,35]

2.1. Data source and search strategy

A systematic search of the literature was conducted using the following databases: PubMed, Web of Science, EBSCO, Scopus, and Cochrane for studies published up to and including August 2018. It was used descriptors related to disease (*i.e., "Rheumatic Diseases" OR Fibromyalgia OR Osteoarthritis OR "Chronic Fatigue Syndrome" OR "Arthritis Rheumatoid" OR "Systemic Lupus Erythematosus"*) and descriptors related to yoga (*i.e., yoga OR asana OR pranayama OR "yoga nidra" OR "hatha yoga" OR "iyengar yoga" OR "ashtanga yoga"*). These diseases were chosen based on previous articles in the literature[33,36,37] and their impact on patients' quality of life.[38–42]

An email alert was created in PubMed. A manual search of the references of selected studies was performed to identify studies that could be part of the review. The entire search process was conducted by two independent researchers (SMS and POC). No temporal criterion was established, and the studies included were published in English, Spanish, or Portuguese.

2.2. Eligibility

The eligibility for the selection of the studies was determined through the PICOS process (Table 1).

2.3. Data extraction

The extraction was performed by two authors, separately. Data was extracted regarding the patients (n sample, age group, gender, rheumatic disease), intervention (type of yoga, duration of the intervention, weekly frequency, interventional time, and comparison group), and outcome (instrument used to evaluate the QOL). For the meta-analysis, the reported mean and standard deviation of the QOL in the moment post intervention were extracted, as recommend in the Cochrane handbook for systematic review.[43] When the required values were not reported in the studies, an e-mail was sent to the corresponding author requesting the missing data. Studies that did not report the missing data and the authors did not send it via e-mail were excluded from the meta-analysis.

2.4. Study quality

The quality of included studies and risk of bias was analyzed by Cochrane Collaboration's Risk of Bias.[44] The analysis was divided into six categories: generation of random sequence, concealment of allocation, blinding of participants, blinding of evaluators, incomplete outcomes, and report of selective outcomes (the studies that did not report all domains of quality of life were considered high bias). Regarding criterion bias, studies that did not undergo intent to treat and or did not describe the intervention protocol in detail were considered high risk of bias. The analysis of the description was based on the recommendations of Sherman.[45] The evaluation of the risk of bias was performed by two researchers (SMS and POC), and a third was consulted in case of disagreement (GTV). For reliability analysis, the Kappa statistical test was performed to determine the consistency between evaluators.

2.5. Data analysis

For the meta-analysis, recommendations were taken from the *Cochrane Handbook for Systematic Reviews of Interventions*.[43] The absolute changes were reported as a difference between the arithmetic averages before and after the interventions, and evaluation of the effect size of the difference between the experimental groups and the control groups in the post-intervention was performed. Calculations were performed using a random effects model when the heterogeneity was higher than 50%. The results of the intervention groups were compared with those of the control groups or comparison groups (conventional intervention or other exercise modalities). To evaluate the statistical heterogeneity of the treatment effect between the studies, the *Cochran Q* test was used, a p-value of 0.1 was considered to be statistically significant and inconsistency test I^2 values greater than 50% were considered to be indicative of high heterogeneity.[43] The funnel plots were analyzed to determine publication bias. Sensitivity analysis was performed by taking out the studies with a higher risk of bias.

3. Results

3.1. The search results

The first stage of the database search resulted in 483 studies. After the initial search, 217 duplicate articles were excluded. A further 174 studies were excluded because the titles that did not address the subject. In the third stage, 92 abstracts were read, and 52 studies were excluded (reasons: congress abstract, outcomes, and others [population, type of study, and intervention]). In the fourth stage, the complete texts of 40 studies were read, 17 studies were excluded as they did not meet the inclusion criteria (reasons in supplementary file). This resulted in

Table 1
Criteria for inclusion and exclusion of studies selected for review.

		Inclusion Criteria	Exclusion Criteria
P	Participate	Patients with rheumatic diseases (FM, OA, RA, SLE and CFS), with no age and sex criteria being established.	Healthy subjects, patients with other hematological disorders or metabolic mixed comparisons.
I	Intervention	All type of Yoga practice (i.e., Iyengar Yoga, meditation, breath, Hatha Yoga, Isometric)	Massage, manual therapies, alternative therapies (hot baths, clay), yoga combined with other interventions.
C	Comparison	With sedentary control, with healthy subjects, other modalities	–
O	Outcome	Quality of life	–
S	Study	Randomized Control Trial, Non Randomized Clinical Trial	Systematic review, cross-sectional, case reports, observational study, review, protocol study, qualitative study

FM - Fibromyalgia; OA - Osteoarthritis; RA - Rheumatoid Arthritis, SLE - Systemic Lupus Erythematosus; CFS - Chronic Fatigue Syndrome.

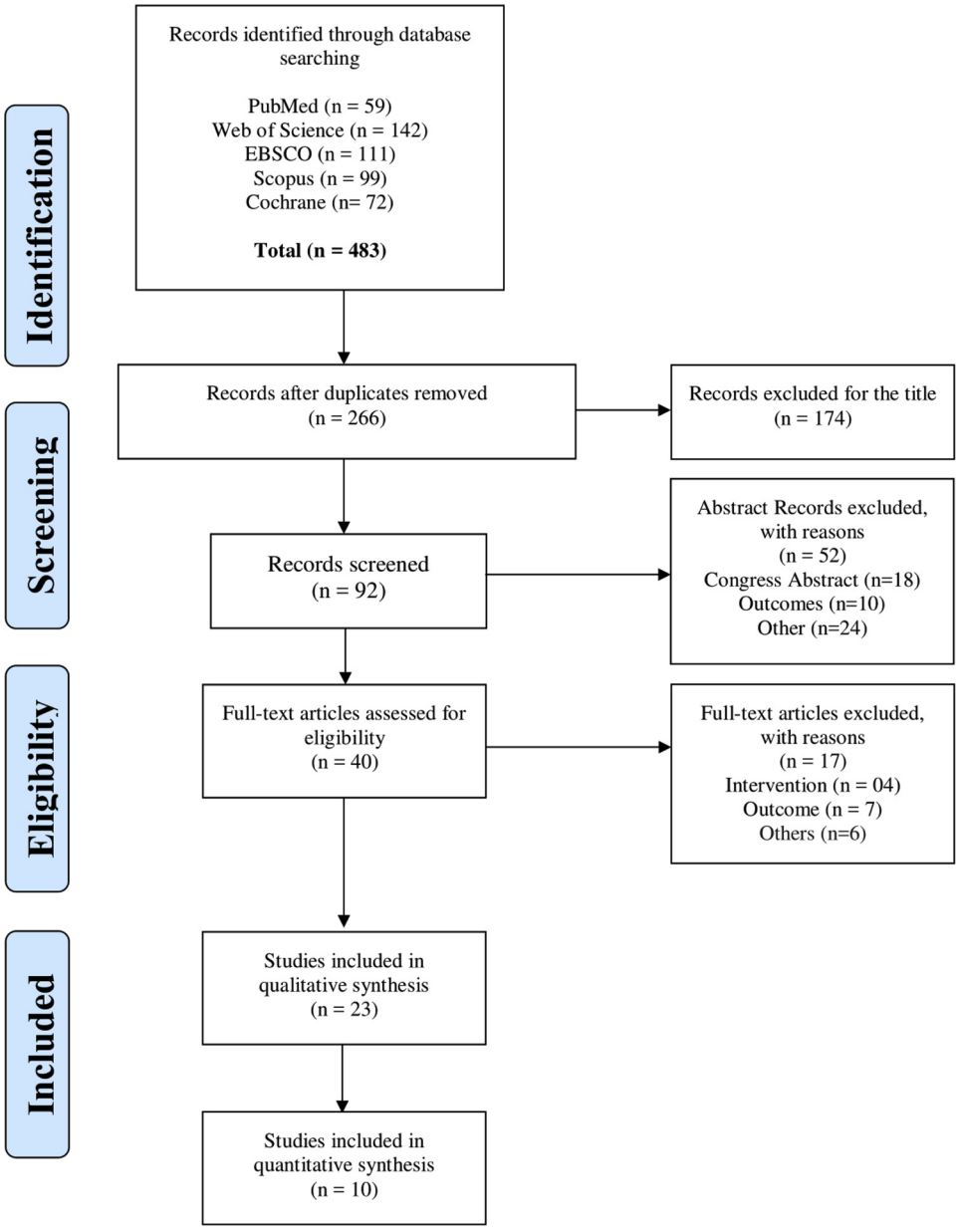

Fig. 1. Flowchart of the selection process of studies on the effects of Yoga on the quality of life of patients with rheumatic diseases.

23 studies selected for the analysis, as presented in Fig. 1. In the quantitative analysis, 13 studies were excluded due to the following reasons: studies with only one group and studies that did not report the mean values of outcomes.

3.2. Overview of included studies

Of the 23 studies included, 1430 patients with RD were analyzed, and 56.5% (n = 13) of the studies included patients with OA, 17.4% (n = 4) with RA, 17.4% (n = 4) with FM, 4.3% (n = 1) with chronic fatigue syndrome (CFS), and 4.3% (n = 1) with RA and OA. No studies were found with patients with systemic lupus erythematosus (SLE). A number of the studies evaluated only women (43.5%), and the same amount of studies evaluated men and women (43.5%). The age of patients ranged from 27.1 to 75.9 years (Table 2).

3.2.1. Intervention characteristics

Regarding the interventions, many studies did not specify the style of yoga used (30.4%, n = 7). Of those which specified the styles of yoga, 37.5% (n = 6) used Hatha Yoga, 18.8% (n = 3) Iyengar Yoga, 18.8% (n = 3) Chair Yoga, 12.5% (n = 2) Yoga of Awareness, 6.3% (n = 1) of studies performed isometric yoga, and 6.3% (n = 1) relaxing yoga (*Gharotes Method*, created by Dr. Manmath Gharote). Regarding the dosage of the interventions, the duration of the interventions ranged from six weeks to twelve weeks, the median duration was eight weeks. The weekly frequency ranged from once a week to six times a week. The duration of each session ranged from 45 min to 120 min, and 30.4% of the studies used a session duration of 60 min (Table 2). Regarding the comparisons, thirteen studies had a control group (two studies with an educational group and one with a Reiki group) and three had other modalities group (two with resistance training, one with aerobic training, and one with another modality of yoga).

3.2.2. Outcomes measures

As for the instruments used for assessing QOL, the most commonly used was the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC; n = 08), which is specific for patients with OA, followed by the Health Assessment Questionnaire (HAQ; n = 05), which

Table 2
Characteristics of the participants and of the interventions with Yoga practice of included studies.

Author (date), Design	N	Groups	Age ($\bar{x}$ ± SD/min.-max.)	Sex	Disease	Type of Yoga practice	Duration (weeks)	Frequency	Time*	Comparison Group	Measures of QOL
Kuntz et al. (2018), RCT	31	Yoga: 10 TEG: 11 CG: 10	Yoga: 65.5 ± 5.6 TEG: 63.7 ± 8.9 CG: 71.1 ± 9.3	♀	Osteoarthritis	Yoga (NS)	12	1	60	Traditional exercise / Control group	KOOS
Buchanan et al. (2017), B-AT	111	Individual Yoga: 8 Group Yoga: 10	Individual Yoga: 56 (50-72) Group Yoga: 54(50-68)	♀♂	Osteoarthritis	Individual Yoga and group Yoga (NS)	12	1	75	–	WOMAC
Cheung et al. (2017), RCT	83	Yoga: 32 TEG: 28 EP: 23	Yoga: 68.9 ± 7.7 TEG: 74.4 ± 7.5 EP: 71.8 ± 8.0	NS	Osteoarthritis	Yoga	8	1	45	Resistance training + aerobic exercise	WOMAC
McCaffrey et al. (2016), RCT	112	Yoga: 63 CG: 49	Yoga: 75.9 ± 8.2 CG: 74.5 ± 6.5	♀♂	Osteoarthritis	Chair Yoga	8	2	45	Educational Group	WOMAC
Park et al.(2016), RCT	131	Yoga: 66 EP: 65	Participants#: 75.3 ± 7.5	♀♂	Osteoarthritis	Hatha Yoga	8	2	45	Educational Group	WOMAC
Moonaz et al (2015), RCT	53	Yoga: 63 CG: 49	Yoga: 49.2 ± 13.2 CG: 55.9 ± 8.9	♀♂	Rheumatoid arthritis and Osteoarthritis	Hatha Yoga	8	2	60	Control group (*wait list*)	SF-36
Brenneman et al. (2015), B-AT	45	Yoga:45	Yoga: 60.3 ± 6.5	♀	Osteoarthritis	Yoga (NS)	12	3	60	–	KOOS
Oka et al. (2014), RCT	30	Yoga: 15 CG: 15	Yoga: 38 ± 11.1 CG: 39.1 ± 14.2	♀♂	Chronic Fatigue Syndrome	Isometric Yoga	One session	–	20	–	SF-8
Cheung et al. (2014), RCT	36	Yoga: 18 CG: 18	Yoga: 71.9 ± 5.3 CG: 71.9 ± 8.52	♀	Osteoarthritis	Hatha Yoga	8	1	60	Control group (*wait list*)	WOMAC and SF-12
Ghasemi, Golkar and Marandi.(2013), RCT	30	Yoga: 15 CG: 15	Yoga: 51 ± 8.9 CG: 53.11 ± 10.9	♀	Osteoarthritis	Hatha Yoga	8	3	60	Control group	KOOS
Evans et al. (2013), RCT	26	Yoga: 11 CG: 15	Yoga: 29.9 ± 2.9 CG: 27.1 ± 4.2	NS	Rheumatoid arthritis	Iyengar Yoga	6	2	45	Control group (*wait list*)	HAQ
Carson et al. (2012), B-AT	21	Yoga: 21	Yoga: 53.3 ± 13	♀	Fibromyalgia	Yoga of Awareness	12	1	120	–	FIQR
Ebnezar et al. (2012), RCT	250	Yoga: 125 TENS: 125	Yoga: 59.56 ± 8.18 TENS: 59.42 ± 10.66	♀♂	Osteoarthritis	Yoga (NS)	12 (+2 presential)	6	40	Control group (*wait list*)	WOMAC
Ebnezar et al. (2011), RCT	250	Yoga: 125 TENS: 125	Yoga: 59.56 ± 8.18 TENS: 59.42 ± 10.66	♀♂	Osteoarthritis	Yoga (NS)	12 (+2 presential)	6	40	Control group (*wait list*)	SF-36
Park et al. (2011), B-AT	29	Yoga: 10 Reiki: 9 CG: 10	Participants *: 80 ± 8.3	♀♂	Osteoarthritis	Chair Yoga	8	2	45	Reiki/Control group	WOMAC
Taibi and Vitiello. (2011), B-AT	13	Yoga: 13	Yoga: 65.02 ± 6.9	♀	Osteoarthritis	Hatha Yoga	8	1 (+ 7 HB)	60	–	HAQ
Hennard (2011), B-AT	11	Yoga: 11	Yoga: 51 (27-70)	♀♂	Fibromyagia	Yoga (NS)	8	1	75	–	FIQ
Carson et al. (2010), RCT	53	Yoga: 25 CG: 28	Yoga: 51.4 ± 13.7 CG: 55.8 ± 8.9	♀	Fibromyalgia	Yoga of Awareness	8	1	120	Control group (*wait list*)	FIQR
Evans et al. (2010), B-AT	8	Yoga: 8	Yoga: 28.0 ± 2.7	♀♂	Rheumatoid arthritis	Iyengar Yoga	6	2	90	–	HAQ and SF-36
Bosch et al.(2009), B-AT	16	Yoga: 9 CG: 7	Yoga: 56.3 ± 7.6 CG: 66.7 ± 5.8	♀	Rheumatoid arthritis	Hatha Yoga	10	3	75	Control group (*wait list*)	HAQ
Badsha et al. (2009), B-AT	47	Yoga: 26 CG: 21	Yoga: 44.0 ± 10 CG: 46.2 ± 10.7	NS	Rheumatoid arthritis	Chair Raj Yoga	6	2	60	Control group (*wait list*)	HAQ and SF-36
Silva et al (2007), RT	33	Yoga: 17 Yoga T: 21	Yoga: 46.3 ± 8.9 Yoga T: 44.4 ± 11.0	♀	Fibromyalgia	Yoga Gharotes Method	8	1	50	Yoga Tui Na	FIQ
Kolasinski et al. (2005), B-AT	11	Yoga: 11	Yoga: 58.6 (50-68)	♀	Osteoarthritis	Iyengar Yoga	8	1	90	–	WOMAC

Subtitle: $\bar{x}$ - average; SD - standard deviation; * - session time in minutes; *RCT - Randomized Controlled Trial; RT - Randomized Trial* B-AT - *Before-After Trial;* CG - Control Group; TEG - Traditional Exercise Group; TENS - Transcutaneous electrical nerve stimulation group; EP - education program; NS - not specified; # - when there is no age per subgroup informed; ♀♂ - women and men; ♀ - Only Women; QOL - quality of life; HB - home based; WOMAC - *Western Ontario and McMaster Universities Osteoarthritis Index ; SF-36 - Short Form Medical Outcomes Survey 36SF-12 - Short Form Medical Outcomes Survey 12; SF-8 - Short Form Health Survey 8; KOOS - Knee Injury and Osteoarthritis Outcome Score; FIQ - Fibromyalgia Impact Questionnaire; FIQR - Fibromyalgia Impact Questionnaire Revised; HAQ - Health Assessment Questionnaire.*

was used in patients with RA. The following instruments were also used, the Short Form Medical Outcomes Survey (SF) with 36 items (n = 4), 12 items (n = 1) and 8 items (n = 01); Knee Injury and Osteoarthritis Outcome Score (KOOS; n = 3), also specific for OA patients; and the Fibromyalgia Impact Questionnaire (FIQ/FIQR; n = 4), for patients with FM used in the original and revised form.

3.3. Risk of bias

In the analysis of the risk of bias, the Cochrane tool was used, and the agreement index between the evaluators was 98.1% in the studies. As of the criterion generation of adequate sequence, 47.8% of the studies presented a low risk of bias. In the concealment criterion of the allocation, 43.5% of the studies were those with a high risk of bias. In the blinding criterion of the participants, 60.9% had an unclear risk. In the criterion of blinding evaluators, 39.1% of the studies presented a low risk and 34.1% presented an unclear risk.

Regarding the criterion data of incomplete results, most of the studies reported the reasons for sample loss, for this reason, 78.3% of the studies presented a low risk of bias in this criterion. Regarding the criterion of selective results, it was considered a high risk of bias if the studies did not report all domains of the QOL questionnaires used, for this reason, 65.2% of the studies were classified as high risk of bias. In relation to the criterion of other biases, 65.2% of the studies had a high risk of bias.

3.4. Analyses of overall effects

Fig. 2 depicts the verified effects of yoga in patients with RD. A sensitivity analysis was performed based on the risk of bias and in the studies that appeared outside the funnel plot (supplementary file). In Image A, when comparing the overall QOL among the patients who underwent yoga (221 patients) and the participants in the control group (224 patients), a significant improvement was observed in the yoga group [SMD = -0.69 (95% CI: −1.26 to −0.12; I^2: 83%; P for heterogeneity: < 0.001)]. However, when comparing yoga (78 patients) with other modalities (81 patients), there was no difference between the interventions [SMD = 0.09 (95% CI: −0.81 to 1.00; I^2: 85%; P for heterogeneity: < 0.001)]. After the sensitivity analysis (Image B), we observed that the difference was favorable for yoga in both the subanalyses and overall effect [SMD = −0.64 (95% CI: −0.91 to −038; I^2: 0%; P for heterogeneity: 0.68)] (Fig. 3).

For the other analyses, the comparison with other modalities was not possible due to the absence of studies (or the presence of only one study). No significant difference was found in the analysis of the mental component domains [SMD = 0.13 (95% CI: −2.40 to 2.65; I^2: 49%; P for heterogeneity: 0.14)] and physical component domain [SMD = 2.96 (95% CI: −2.27 to 8.18; I^2: 75%; P for heterogeneity: 0.02)]. (Fig. 4).

In Fig. 5, the domains related to general health and mental health were analyzed. A significant difference was found favorable to yoga in the domains of emotional aspects [SMD = 26.00 (95% CI: 18.87–33.13; I^2: 14%; P for heterogeneity: 0.28)], social aspects [SMD = 7.01 (95% CI: 5.57–9.45; I^2: 0%; P for heterogeneity: 0.60)], and general health [SMD = 16.61 (95% CI: 12.66–20.55; I^2: 0%; P for heterogeneity: 0.76)]. In respect to mental health, no significant difference was found [SMD = 0.62 (95% CI: −21.98 to 3.22; I^2: 97%; P for heterogeneity: < 0.001)].

In Fig. 6 the domains related to the physical component were analyzed. A significant difference was found in the physical function [SMD = 16.43 (95% CI: 13.37–19.49; I^2: 0%; P for heterogeneity: 0.71)] and physical aspects [SMD = 27.11 (95% CI: 19.40–34.83; I^2: 0%; P for heterogeneity: 0.61)]. No significant differences were found in vitality [SMD = 6.33 (95% CI: −21.36 to 34.02; I^2: 97%; P for heterogeneity: < 0.001)] or bodily pain [SMD = 4.04 (95% CI: −5.05 to 13.14; I2: 54%; P for heterogeneity: 0.12)].

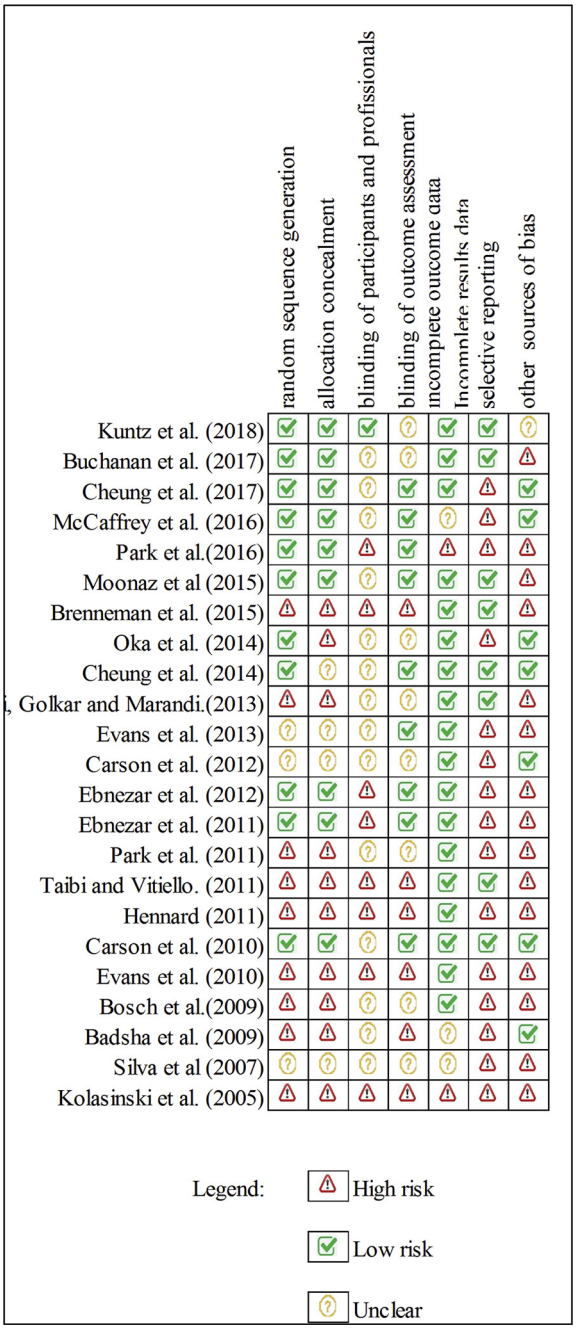

Fig. 2. Risk of bias analyzes.

4. Discussion

The objective of the present review was to verify the effects of yoga on the QOL of patients with RD. After the analysis of the 23 studies found, a total 1430 patients with RD were evaluated, and most of the studies were conducted in patients with OA,[24,25,32,46–54] followed by studies with RA patients,[30,31,55,56] and FM (17.4%).[57–60] The RD with the lowest number of studies was CFS,[61] and no studies were found in patients with SLE.

Regarding the interventions, most of the studies did not specify the modality of yoga that was performed, but of those which specified, the most performed was Hatha yoga, Iyengar yoga, or Chair yoga. These results corroborate with findings in the literature which point out that the first two styles are the most used in experimental studies involving yoga.[62,63] Cramer et al[62] verified that research has been conducted

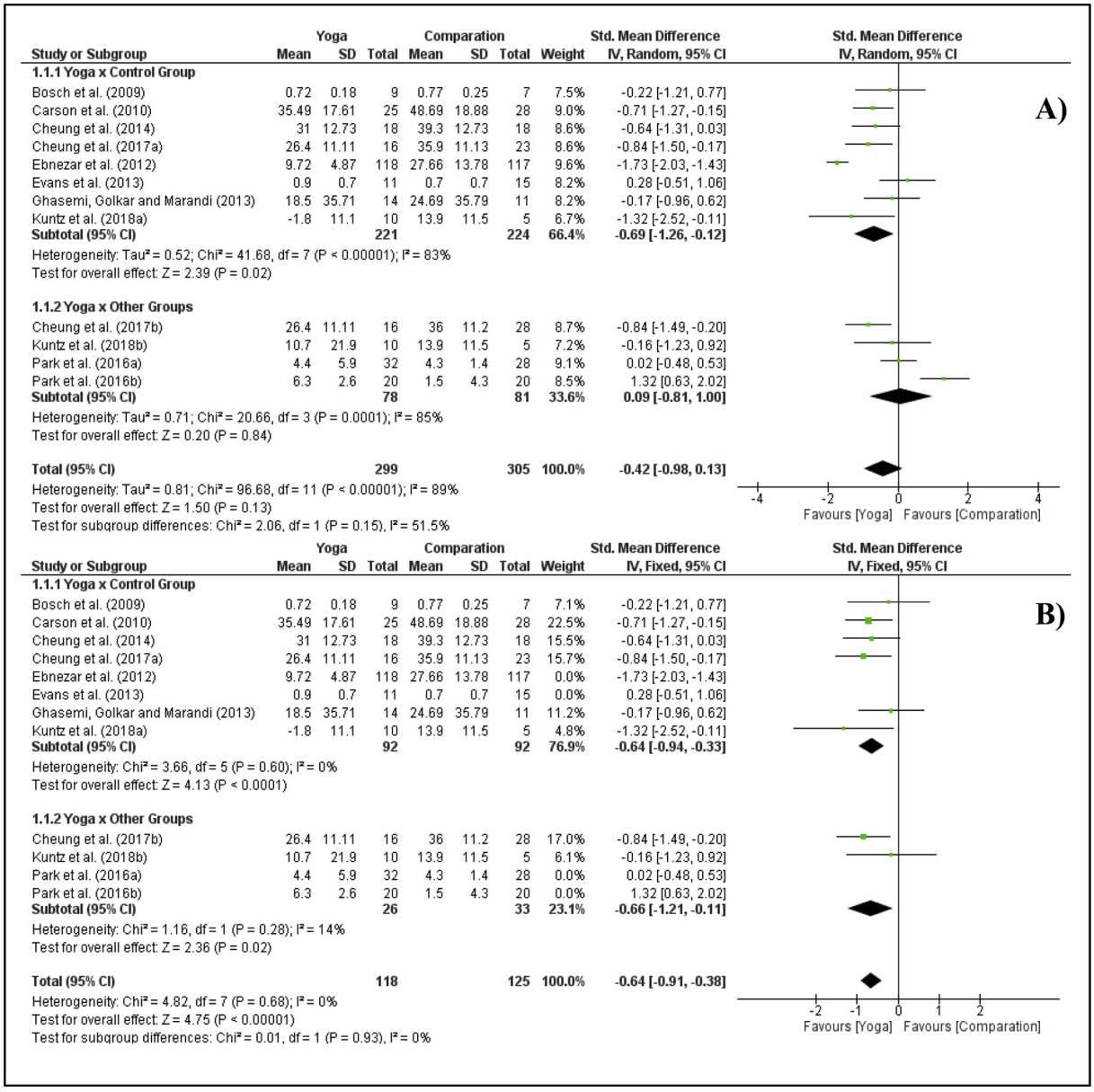

Fig. 3. A Effects of Yoga on General Quality of Life in patients with rheumatic diseases without sensibility analyzes. B Effects of Yoga on General Quality of Life in patients with rheumatic diseases with sensibility analyzes.

involving more than 50 styles of yoga, and indicated that many of the interventions conducted are not the traditional styles of yoga themselves, but isolated components of the yoga practices. For example, Isometric yoga was an adaptation of yoga developed by the need to treat patients with CFS in a hospital setting,[61] whereas Chair yoga was an adaptation of Iyengar yoga.[24,50] Chair yoga is performed sitting on a chair, used especially in elderly adults with osteoarthritis who are not able to stand up or perform other exercise programs due to weakness, fatigue, or fear of falling.[50] It is important to emphasize that the majority of the studies had a duration equal to or greater than eight weeks. Since yoga is a more holistic practice, containing different elements and components to allow for deepening of the practice, it is suggested that a longer intervention period would have better results.[56]

Yoga has been gaining ground in the scientific milieu, and in the analysis of the literature, there is also a growth in the production of knowledge about the effects of complementary therapies in patients with RD.[28,37,64,65] The results of the present study are in agreement with those reported in the literature, showing that research on yoga in patients with RD is growing. In a previous systematic review, eight studies were found investigating the effect of yoga in patients with RD.[33] In the present review, 23 studies were found specifically investigating the effect of Yoga on QOL.

Despite this growth, greater methodological rigor is still necessary to conduct studies on yoga in patients with RD. The studies included in this review present poor methodological quality, especially in the selective bias risk criteria, where for lack of data presentation, some studies were not included in the present meta-analysis. In addition, most of the studies included in the systematic review were not randomized and therefore allocation concealment was not performed. Another aspect that presented a generally high risk of bias in the included studies was blinding. However, interventions with exercise and or complementary therapies are a complex process to conduct, especially when the patient and or practitioner is unfamiliar with the practice being performed. However, it is important to study ways to minimize this type of bias and to implement ways to blind participants and evaluators.[66] One strategy that has been used in physiotherapy is sham therapy (simulated therapy, i.e., inactive therapy that is intended to imitate, as much as possible, therapy in a clinical trial).[67–69]

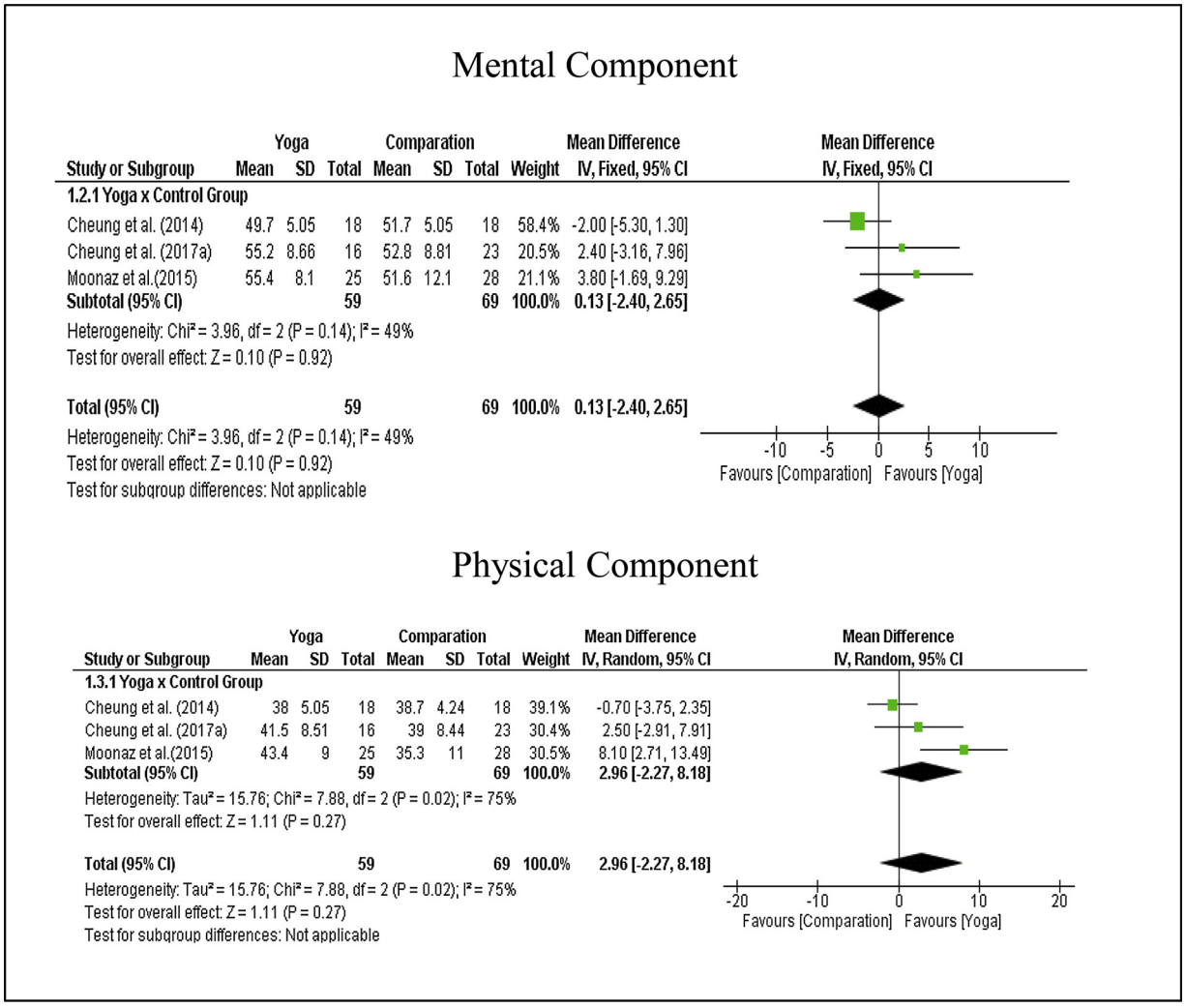

Fig. 4. Effects of yoga on the mental and physical components of quality of life in patients with rheumatic diseases.

The high risk of bias found in some studies also affected the analysis of patients' QOL scores. Prior to the sensitivity analysis, a favorable effect of yoga was found only when compared to the control group. After the sensitivity analysis, the results were favorable to yoga when compared to the subgroups and in the overall effect. Improvement was found in some areas of QOL (i.e., functional capacity, physical aspects, emotional aspects, general health, and limitations due to social aspects).[29,30,53] These results are important, showing that, in general, interventions with Yoga can bring significant improvements in the QOL of the patients, aiding in the treatment and combat of the disease.

Evans et al[30] compared the effects of yoga with a control group in patients with RA, no significant differences in the general QOL measured by HAQ was found, but improvements in the mental health and vitality of participants who performed yoga[30] were detected. Moonaz et al[29] and Ebnezar et al[53] conducted studies that found favorable results for yoga with significant improvements in five domains of QOL. However, Ebnezar et al[53] also found favorable improvements for the control group in two domains (mental health and vitality). Carson et al[58] found improvements in QOL favorable to yoga in patients with FM. The authors further reported that yoga cultivates a healthy acceptance and willingness to learn from pain and other stressful experiences, which may be one of the reasons for the improvement.

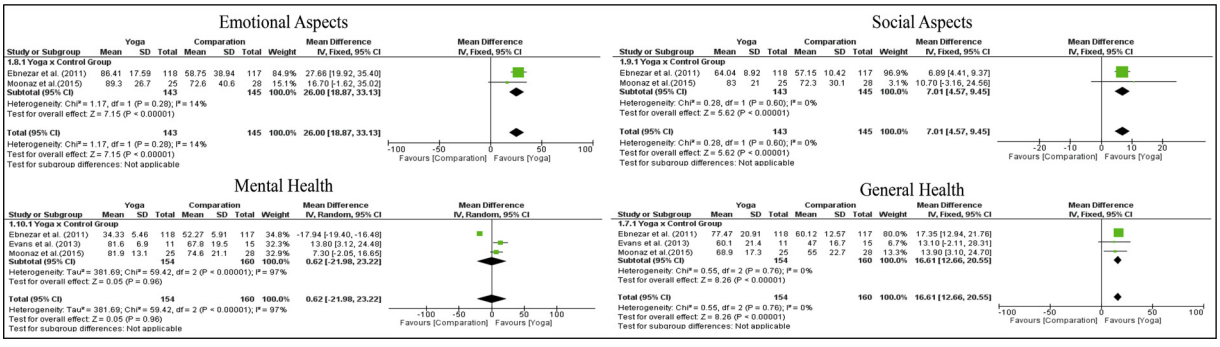

Fig. 5. Effects of yoga on the Emotional and Social Aspects and Mental and General Health components of quality of life in patients with rheumatic diseases.

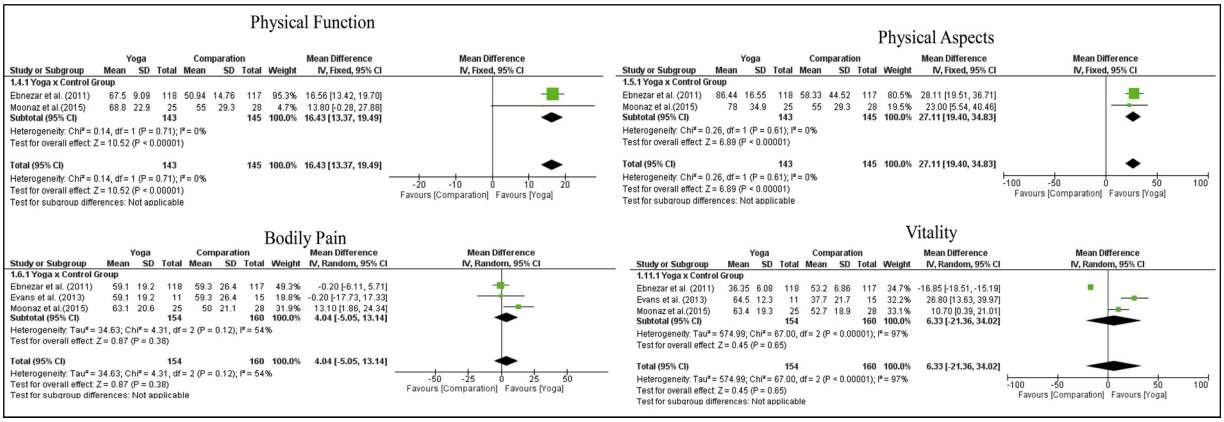

Fig. 6. Effects of yoga on Physical Function, Physical Aspects, Bodily Pain, and Vitality components of quality of life in patients with rheumatic diseases.

Another study obtained an unexpected result when analyzing the effects of yoga compared with an educational group. This study found favorable improvements in QOL for one of the educational groups and with a large effect size.[24] However, this was one of the studies that were identified in the sensitivity analysis and the funnel plot analysis as having a high risk of bias. The different instruments used must also be taken into account in those analyses and results may be conflicted for this reason. Ghasemi, Golkar, and Marandi,[70] for example, used a specific questionnaire for patients with OA called KOOS, which analyze the effects of yoga compared with a control group, but found no favorable differences for any of the groups. However, when comparing the pre and post moments, the group that practiced yoga had significant improvements. Bosh et al[55] analyzed the effects of yoga in patients with RA with HAQ, and also did not find favorable results in any of the groups.

Another point to be considered is the presence of supervision in these yoga protocols. Cheung et al[71] found no difference in QOL in any of the domains analyzed when comparing yoga interventions with a home-based protocol comparing with a control group in patients with OA. This leads one to think that at first, it is vital to understand the effects of practice with face-to-face protocols since it is a practice that involves contents of meditation and connection of both the body and mind.

Cheung et al[32] compared yoga with a group that underwent resistance training combined with low-intensity aerobic exercises and a group that performed only patient education. Yoga had a favorable improvement in the general QOL of RA patients when compared to the other two groups with a moderate effect size.[32] Other studies also showed favorable results for yoga in the meta-analysis, such as Ebnezar et al[54]finding a significant improvement favorable to yoga.

However, not all studies reported differences. In the study of Kuntz et al[48], for example, no significant difference was found in general QOL when compared to the effects of yoga with resistance training exercises in patients with OA. On the contrast, the yoga group had a significant improvement in general QOL when compared to pre and post moments. The description of the study's protocol was not clear and did not specify which postures were made and which other yoga components were used.

Of the 13 studies not considered in the present meta-analysis, six were excluded because they had only one intervention group. This is a high bias since it is not possible to state that the effect is of the intervention when one does not have a comparison group. However, there are strategies to minimize this bias.[72] From these studies, two studies reported no significant differences at the end of the intervention.[25,46] One of them, despite having performed randomization (i.e., one group performed Yoga alone and the other group performed Yoga with its partners), the authors only reported the average between the two groups.[25] The other study reported that eight participants experienced adverse effects, which were attributable to the intervention (i.e., shoulder pain, muscle cramps, low back pain, numbness in hands, and dizziness in poses); this factor can be linked to the absence of QOL results.[46] The other studies that did not enter the meta-analysis, reported finding significant differences in the QOL of the participants after interventions with yoga.[31,47,49,50,52,59]

4.1. Limitations

Some limitations should be noted. The subgroup analysis was limited due to missing data related to QOL in the studies included in the systematic review, which made it impossible to include them in the meta-analysis. For example, the comparison between yoga and other modalities was not possible in the analysis of the domains of QOL. Furthermore, it was necessary to perform a general QOL sensitivity analysis, due to the high heterogeneity found and the methodological quality of the studies being low.

4.2. Implications for clinical practice

We noticed a low number of studies with patients with chronic fatigue and an absence of studies with lupus patients, as well as an absence of studies only with men and children under 18 years of age. Therefore, it reinforces the need for further studies, which also take into consideration these populations. Moreover, more studies with better methodological designs are required to understand the effects of yoga in patients with RD, as well as the difference in outcomes compared with other exercise modalities.

5. Conclusion

The results show that weak recommendations can be made for the use of yoga in the management of RD patients. Based on current evidence, yoga may be effective in improving QOL in the following domains: functional capacity, physical aspects, emotional aspects, general health, and social aspects.

Funding

This study was funded by Foundation for Research and Innovation Support of the State of Santa Catarina (FAPESC) (grant number 01/2016) and Coordination of Improvement of Higher Level Personnel (CAPES).

Transparency document

The Transparency document associated with this article can be found in the online version.

Acknowledgments

The authors thank the Foundation for Research and Innovation Support of the State of Santa Catarina (FAPESC) for the financial support through a research grant (grant number 01/2016), Coordination of Improvement of Higher Level Personnel (CAPES) for financial support (code 001) and for a Masters scholarship (grant No. 02/2018), and Santa Catarina State University for a UDESC study opportunity.

Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.ctim.2019.07.006.

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