

## Effectiveness of Psychological Interventions in Endometriosis: a Systematic Review with Meta-analysis

Tasmania Del Pino-Sedeño<sup>1, 2, 3, 4\*</sup>, María Cabrera-Maroto<sup>4</sup>,  
Alejandra Abrante-Luis<sup>1, 2</sup>, Yadira González-Hernández<sup>1, 2</sup>, M<sup>a</sup>  
Caridad Ortiz Herrera<sup>5</sup>

<sup>1</sup> Canary Islands Health Research Institute Foundation (FIISC), Spain, <sup>2</sup> Evaluation Service of the Canary Islands Health Service (SESCS), Spain, <sup>3</sup> Research Network on Chronicity, Primary Care and Health Promotion (RICAPPS), Spain, <sup>4</sup> Faculty of Health Sciences, European University of the Canary Islands, Spain, <sup>5</sup> Agencia Sanitaria Costa del Sol, Spain

**Submitted to Journal:**  
Frontiers in Psychology

**Specialty Section:**  
Health Psychology

**ISSN:**  
1664-1078

**Article type:**  
Systematic Review Article

**Received on:**  
01 Jul 2024

**Accepted on:**  
30 Sep 2024

**Provisional PDF published on:**  
30 Sep 2024

**Frontiers website link:**  
[www.frontiersin.org](http://www.frontiersin.org)

**Citation:**

Del\_pino-sedeño T, Cabrera-maroto M, Abrante-luis A, González-hernández Y and Ortiz\_herrera M(2024) Effectiveness of Psychological Interventions in Endometriosis: a Systematic Review with Meta-analysis. *Front. Psychol.* 15:1457842. doi:10.3389/fpsyg.2024.1457842

**Copyright statement:**

© 2024 Del\_pino-sedeño, Cabrera-maroto, Abrante-luis, González-hernández and Ortiz\_herrera. This is an open-access article distributed under the terms of the [Creative Commons Attribution License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). The use, distribution and reproduction in other forums is permitted, provided the original author(s) or licensor are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

This Provisional PDF corresponds to the article as it appeared upon acceptance, after peer-review. Fully formatted PDF and full text (HTML) versions will be made available soon.

---

Frontiers in Psychology | [www.frontiersin.org](http://www.frontiersin.org)

Provisional

## Effectiveness of Psychological Interventions in Endometriosis: a Systematic Review with Meta-analysis

1 **Tasmania del Pino-Sedeño<sup>1 2 3 4\*†</sup>, María Cabrera-Maroto<sup>4†</sup>, Alejandra Abrante-Luis<sup>1 2</sup>,**  
2 **Yadira González-Hernández<sup>1 2</sup>, M<sup>a</sup> Caridad Ortíz Herrera<sup>5</sup>**

3 <sup>1</sup>Canary Islands Health Research Institute Foundation (FIISC), Tenerife, Spain

4 <sup>2</sup>Evaluation Unit (SESCS), Canary Islands Health Service (SCS), Tenerife, Spain

5 <sup>3</sup>Network for Research on Chronicity, Primary Care, and Health Promotion (RICAPPS), Tenerife,  
6 Spain

7 <sup>4</sup>Faculty of Health Sciences, Universidad Europea de Canarias, Tenerife, Spain

8 <sup>5</sup>Costa del Sol Health Agency

9 **\* Correspondence:**

10 Tasmania del Pino-Sedeño

11 [tasmania.delpino@sescs.es](mailto:tasmania.delpino@sescs.es)

12 †These authors share first authorship

13

14 **Number of words:** 6319

15 **Number of figures:** 7

16 **Number of tables:** 3

17

18 **Keywords:** Endometriosis, chronic pain, psychological interventions, quality of life, anxiety,  
19 depression

20

21 **1 Abstract**

22 **Introduction:** Endometriosis is a chronic gynecological disease associated with chronic  
23 debilitating pain, poor mental health and quality of life. The objective of this paper is to evaluate the  
24 effectiveness of psychological interventions aimed at improving the pain, quality of life and mental  
25 health of women with endometriosis.

26 **Methods:** A systematic review (SR) of the literature with meta-analysis (MA) was carried out.  
27 MEDLINE, Embase, PsycINFO and CENTRAL were searched to locate Randomized Controlled  
28 Trials (RCTs). The risk of bias assessment of each study was conducted using the Cochrane  
29 Collaboration's RoB 2.0 tool.

30 **Results:** Seven RCTs were included (N = 757). The data obtained suggest that psychological  
31 interventions reduce dyspareunia (standardized mean difference [SMD]: -0.54, 95% CI: -0.86, -0.22)  
32 and dyschezia (mean difference [MD]: -2.90, 95% CI: -4.55, -1.26) and increase mental health levels  
33 (SMD: 0.70, 95% CI: 0.42, 0.99); they also point to a large reduction in levels of trait anxiety (MD: -  
34 6.63, 95% CI: -8.27, -4.99) and depression (MD: -2.49, 95% CI: -3.20, -1.79), and a likely reduction  
35 in state anxiety (MD: -9.72, 95% CI: -13.11, -6.33) experienced by women with endometriosis. It  
36 was also identified that psychological interventions probably slightly reduce pelvic pain and may  
37 increase physical health. However, most of the included studies have a high overall risk of bias or  
38 have certain concerns, which limit conclusions about the certainty of the evidence.

39 **Discussion:** The available evidence indicates that psychological interventions are effective in  
40 improving the pain, quality of life and mental health variables of women with endometriosis.

41 **Keywords:** Endometriosis, chronic pain, psychological interventions, quality of life, anxiety,  
42 depression.

43 **International Prospective Register for Systematic Reviews (PROSPERO) number:**  
44 CRD42024516100.

45

## 46 2 Introduction

47 Endometriosis is a gynecological disease in which endometrium-like tissue grows outside its  
48 normal anatomical location , causing a chronic inflammatory reaction (Leyland et al., 2010) that is  
49 associated with chronic debilitating pain and poor mental health (Evans et al., 2019). The causes of  
50 endometriosis are not fully understood. Although there are many theories about its origin, none of  
51 them can fully explain all aspects of the disease (Lamceva et al., 2023). It is estimated that  
52 endometriosis affects around 10% of women and girls of reproductive age worldwide, and it is  
53 observed in all social classes and ethnic groups (World Health Organization, 2023).

54 One of the biggest problems for women with the disease is the delay in diagnosis (Ruszała et  
55 al., 2022), which can take around seven years to be identified (Zondervan et al., 2020). This may be  
56 due to the variability of symptoms, their non-specific nature and the difficulty in reaching a definitive  
57 diagnosis which, until recently, could only be made by surgical removal of tissue and pathological  
58 analysis (Kiesel and Sourouni, 2019; World Health Organization, 2023). However, nowadays, it is  
59 common practice to perform an ultrasound or MRI for diagnosis; reserving surgery for those patients  
60 with negative imaging results or in whom empirical treatment is unsuccessful (Lamceva et al., 2023;  
61 World Health Organization, 2023). However, while the diagnosis is being confirmed, women may  
62 experience persistent symptoms that affect their quality of life (QoL) and the disease may progress  
63 (Davenport et al., 2023).

64 Endometriosis can be classified into levels or grades based on the lesions caused, their location and  
65 their severity. The most used classification today is the one recommended by the American Society  
66 for Reproductive Medicine, which identifies four stages (I: minimal; II: mild; III: moderate; and IV:  
67 severe) (Practice Committee of the American Society for Reproductive Medicine, 2012). However,  
68 the stage of endometriosis does not correlate with the presence or severity of symptoms (National  
69 Guideline Alliance, 2017; Practice Committee of the American Society for Reproductive Medicine,  
70 2012).

71 Endometriosis-related symptoms can affect women's physical, psychological, and QoL areas (Van  
72 Niekerk et al., 2019). The physical symptoms of endometriosis vary depending on the person, and  
73 may include pain during menstruation (dysmenorrhea), pain during intercourse (dyspareunia),  
74 difficulty defecating (dyschezia), discomfort when urinating (dysuria), gastrointestinal problems,  
75 fatigue, pain headache, pelvic pain, lower abdominal pain, back pain, infertility, as well as a  
76 multiplicity of symptoms that are not specific (Gruber and Mechsner, 2021; Machairiotis et al., 2021;  
77 Prescott et al., 2016; Zondervan et al., 2020). However, endometriosis can also occur  
78 asymptotically (Nnoaham et al., 2019).

79 Chronic pelvic pain is the main symptom of the disease, present in 80% of patients (Bulletti et  
80 al., 2010). The level of physical disability associated with endometriosis is primarily related to the  
81 impact of persistent pain that limits work, social, and daily living activities (Culley et al., 2013;  
82 Nnoaham et al., 2011).

83 As regards psychological symptoms, patients with endometriosis have a higher risk of  
84 developing depression, anxiety and stress (Donatti et al., 2022), among other conditions related to  
85 mental health (Delanerolle et al., 2021). Women with endometriosis have prevalence rates of 86% for  
86 depression, 29% for moderate to severe anxiety and 68% for mood disorders in general, which are  
87 significantly higher than the prevalence of these disorders in the general population (Chaman-Ara et  
88 al., 2017). Anxiety and depression symptoms are related to experienced chronic pain (Van Barneveld

89 et al., 2022). Other psychological consequences of endometriosis include: feelings of worthlessness,  
90 helplessness, guilt, isolation, impaired interpersonal relationships, sleep problems, and self-directed  
91 violence (Ruszała et al., 2022). Additionally, another problem that contributes to worsening the  
92 emotional state of some patients is infertility which can be caused by the disease (Ruszała et al.,  
93 2022).

94 Women with endometriosis have a significant decrease in QoL compared to women without  
95 endometriosis (Bourdel et al., 2019). These patients are affected in their abilities to perform daily  
96 activities, exercise motherhood, maintain satisfactory sexual relationships, maintain employment and  
97 productivity, study or interact with friends, among others (Aredo et al., 2017; Hansen et al., 2017;  
98 Ruszała et al., 2022).

99 Since no curative treatment is available, care must be directed toward symptom management  
100 (World Health Organization, 2023). Typical interventions include laparoscopic surgery to excise the  
101 lesions and hormonal, anti-inflammatory, and analgesic medication (Becker et al., 2022). However,  
102 many women derive only limited or intermittent benefits from treatment (Becker et al., 2017).  
103 Numerous studies have shown the high possibility of increased pain and relapse when discontinuing  
104 these medications, in addition to the fact that current medical treatments can cause unwanted side  
105 effects, including weight gain, hirsutism, acne, vaginal atrophy, breast atrophy, hot flushes, decreased  
106 libido, fatigue, nausea and vomiting (Samami et al., 2023). Also noteworthy are the drugs from the  
107 gonadotropin-releasing hormone (GnRH) analogue group that cause a suppression of ovarian activity  
108 with significant menopausal symptoms in many patients, which further negatively affects their QoL  
109 (Samami et al., 2023). This is why a large number of women seek other health approaches and non-  
110 pharmacological techniques to address their disease (Evans et al., 2019; Schwartz et al., 2019).

111 In this regard, evidence-based multidisciplinary care is necessary to address endometriosis  
112 (Ruszała et al., 2022). This interdisciplinary management of the disease should reinforce support for  
113 mental health in patient care, beyond pain management (Brasil et al., 2020).

114 The role of psychological interventions in the treatment of symptoms and psychological  
115 distress related to endometriosis has been reported (Chaman-Ara et al., 2017; Chiantera et al., 2017),  
116 which is why their incorporation is proposed in the planning of the treatment offered to these women  
117 (Van Niekerk et al., 2019). **Various psychological interventions, such as progressive muscle  
118 relaxation (PMR), mindfulness, psychotherapy, and cognitive behavioral therapy (CBT),  
119 among others, have shown potential in improving QoL and alleviating clinical symptoms  
120 (Donatti et al., 2022; Samami et al., 2023). However, their efficacy in endometriosis requires  
121 further exploration.**

122 **Cognitive Behavioral Therapy (CBT) is one of the most researched psychological  
123 interventions, combining cognitive and behavioral strategies to modify maladaptive cognitive  
124 misperceptions and maladaptive behaviors (Beck, 1995; Dobson, 2019). Rooted in learning and  
125 cognitive theories (Bandura, 1969; Yates, 1970), CBT aims to modify unhelpful thoughts and  
126 behaviors, using techniques like exposure therapy to reduce avoidance and foster adaptive  
127 responses (Abramowitz, 2013; Carpenter, 2019). Systematic reviews highlighted both the  
128 strengths and limitations of CBT in managing chronic pain. While CBT has been effective in  
129 reducing insomnia and improving social participation and self-efficacy in patients with chronic  
130 low back pain and musculoskeletal conditions, its effects on pain intensity and fatigue are less  
131 pronounced (Liu et al., 2024; Salazar-Méndez et al., 2024; Selvanathan et al., 2021; Yang et al.,  
132 2022; Zhang et al., 2023). Additionally, CBT has proven effective in decreasing headache**

133 frequency and intensity in migraine sufferers, though further research is needed (Bae et al.,  
134 2021).

135 **Jacobson's PMR technique is a systematic method used to achieve a deep state of**  
136 **relaxation. It has proven effective in reducing stress, anxiety, and depression in adults; as well**  
137 **as in improving cancer-related fatigue, anxiety, depression and sleep quality in patients with**  
138 **cancer (Wang, Yang et al., 2024), including those experiencing chronic pain (Muhammad Khir**  
139 **et al., 2024; Steen et al., 2024; Tan et al., 2022).**

140 **Mindfulness is another approach that trains individuals to remain in the present**  
141 **moment and engage with their experiences nonjudgmentally. Mindfulness practices include**  
142 **attention training, body scanning, and sitting meditation, which help patients build awareness**  
143 **and acceptance of their experiences (Kabat-Zinn, 1990). Mindfulness-based interventions**  
144 **(MBIs) have a demonstrated efficacy in improving psychological well-being across diverse**  
145 **clinical populations. For example, MBIs have been shown to have short-term benefits in**  
146 **reducing anxiety and depression and improving quality of life in patients with inflammatory**  
147 **bowel disease (Qian & Zhang, 2024). In breast cancer patients, MBI has led to significant**  
148 **improvements in coping abilities, emotional regulation, and a reduction in adverse emotional**  
149 **states (Wang, Dai et al., 2024; Wu et al., 2022). Furthermore, MBIs have been shown to reduce**  
150 **pain intensity in individuals with chronic pain conditions, such as chronic low back pain, and**  
151 **have been recommended as part of a multidisciplinary approach, including pelvic floor**  
152 **physical therapy, for managing chronic pelvic pain in women (Bittelbrunn et al., 2023; Paschali**  
153 **et al., 2024).**

154 **Acceptance and Commitment Therapy (ACT) is a therapy designed to enhance**  
155 **psychological flexibility by helping individuals connect with and accept their present**  
156 **psychological or emotional experiences while living in alignment with their values (Hayes et al.,**  
157 **2012). This therapy targets six core processes—acceptance, cognitive defusion, being present,**  
158 **self-as-context, values, and committed action—that are relevant across various clinical**  
159 **conditions (Hayes et al., 2012). In the context of chronic pain, ACT has been shown to**  
160 **significantly reduce cognitive fusion, a key factor in the persistence of pain, thereby improving**  
161 **overall psychological well-being and QoL (Sanduvete-Chaves et al., 2024). Meta-analyses**  
162 **further support ACT's effectiveness in alleviating pain-related distress and enhancing**  
163 **functional outcomes across different chronic pain conditions, with particularly significant**  
164 **short-term benefits observed in patients with chronic headaches and fibromyalgia (Lai et al.,**  
165 **2023; Ye et al., 2024).**

166 **While these psychological interventions show promise, their specific effectiveness in**  
167 **managing endometriosis-related symptoms remains uncertain, necessitating further research to**  
168 **assess their impact on pain, QoL, and mental health in this population.**

169 **The objective of the present systematic review (SR) with meta-analysis (MA) is to identify,**  
170 **evaluate and synthesize the available scientific evidence on the effectiveness of psychological**  
171 **interventions aimed at improving the pain, quality of life and mental health variables of women**  
172 **diagnosed with endometriosis. The hypotheses of the present SR are that psychological**  
173 **interventions will help to: 1) alleviate the sensation of pain, 2) enhance the quality of life, and 3)**  
174 **improve the mental health of women affected by this condition.**

175 **3 Methods**

176 An SR with MA was conducted according to the methodology set out in the Cochrane  
177 Handbook (Higgins et al., 2023). This review reports following the guidelines of the PRISMA  
178 statement (Page et al., 2021). The protocol of the present review has been registered in Prospero  
179 (CRD42024516100).

### 180 **3.1 Eligibility Criteria**

181 Studies were selected that evaluated the effectiveness of psychological interventions in  
182 women diagnosed with endometriosis and that met the selection criteria below.

183 Only randomized controlled trials (RCTs) were included.

184 By patient type, women diagnosed with endometriosis were included without age limit.

185 By intervention, those studies that implemented psychological programs or interventions were  
186 included and any type of comparator was considered (no treatment, waiting list or alternative  
187 treatments).

188 Regarding the outcome measures, physical and psychological effects such as pain, QoL, and  
189 symptoms of anxiety or depression were included, which were evaluated through standardized  
190 scales.

191 As regards language, studies published in both Spanish and English (languages mastered by  
192 the authors) were considered.

### 193 **3.2 Information Sources**

194 A search was conducted in the MEDLINE, Embase, PsycINFO and CENTRAL databases  
195 (October 10, 2023). The search was completed with manual examination of the bibliographic list of  
196 the SRs found in the search.

### 197 **3.3 Search Strategy**

198 A search strategy without a date limit was developed around the terms: Endometriosis,  
199 Behavior Therapy, Cognitive Behavioral Therapy, Psychological Techniques, Psychology,  
200 Psychotherapy, Acceptance and Commitment Therapy, Behavioral Disciplines and Activities, Mental  
201 Health Services and Dialectical Behavior Therapy. This search strategy was designed in MEDLINE  
202 and was subsequently adapted to the other consulted databases. The complete strategy can be  
203 consulted in Supplementary Table 1.

### 204 **3.4 Study Selection Process**

205 The bibliographic references obtained in the different databases were imported into RefWork,  
206 where duplicates were automatically eliminated. The unique references were then exported to a  
207 Microsoft Excel 2016 sheet (Microsoft Corporation) for selection. In the first phase, references were  
208 selected by title and abstract. In the second phase, the preselected references were selected in full text  
209 taking into account the selection criteria described above. Both phases were performed by two  
210 reviewers independently. All discrepancies were resolved through discussion.

### 211 **3.5 Data Extraction Process**



212 Data extraction from the included studies was performed using a data extraction sheet in  
213 Excel 2016 format (Microsoft Corporation). Data extraction from the rest of the studies was carried  
214 out by two reviewers independently.

### 215 **3.6 Data List**

216 The extracted data included the identification and design of the study (title, authors, year of  
217 publication, conflict of interest, funding, country, context, objective, design, number of centers,  
218 number of groups and follow-up periods), the characteristics of the participants (clinical condition,  
219 inclusion and exclusion criteria, number of participants and losses, and sociodemographic and  
220 clinical characteristics), the interventions (description, method, provider, number of sessions,  
221 duration and periodicity) and the outcome measures (instruments, evaluation points and conclusion).  
222 The statistical results presented in each study were extracted in detail (means [M], standard  
223 deviations [SD], P-values and sample sizes [N]).

### 224 **3.7 Assessment of the Risk of Bias of Individual Studies**

225 The risk of bias assessment of each study was performed with the RoB 2.0 tool developed by  
226 the Cochrane Collaboration for RCTs (Higgins et al., 2019). A pilot test was conducted with one of  
227 the studies by both reviewers and, subsequently, the rest of the studies were evaluated. The entire  
228 process was carried out independently.

### 229 **3.8 Effect Measures**

230 The outcome measures analyzed were continuous. Therefore, the extent of the effects of the  
231 psychological interventions evaluated in terms of pain, QoL, anxiety and depression were estimated  
232 as mean difference (MD) or standardized mean difference (SMD), with its 95% confidence interval  
233 (95% CI).

234 **In addition, SMDs were computed to standardize results, allowing for comparison**  
235 **across studies regardless of the measurement units used and quantifying the intervention's**  
236 **impact as a standardized measure of effect size. Guidelines for interpreting SMDs are as**  
237 **follows: values of <0.40 are considered small, 0.40 to 0.70 moderate, and >0.70 large (Higgins et**  
238 **al., 2023; Schünemann et al., 2023).**

### 239 **3.9 Synthesis Methods**

240 The information collected was synthesized narratively with tabulation of the results of each  
241 included study. **When pooling was not possible, the effects were described narratively.**  
242 Furthermore, a quantitative synthesis using MA was performed when the reported data were  
243 combinable and the studies were clinically and methodologically homogeneous. The MD or SMD of  
244 the outcome measures evaluated were estimated using the inverse variance method (Egger et al.,  
245 2008; Fleiss, 1993). Heterogeneity in the MA results was evaluated graphically by presenting the  
246 estimated effects and their 95%CI of each study in a forest plot, as well as by Higgins'  $I^2$  statistic  
247 (Higgins, 2003). Following the recommendations, the presence of **substantial** heterogeneity was  
248 considered when the  $I^2$  value was greater than 50% (Deeks et al., 2023). In this case, instead of a  
249 fixed effects model, a random effects model was applied. In the presence of high and unexplained  
250 heterogeneity ( $I^2 \geq 90\%$ ), MA was not performed and evidence synthesis was reported narratively.  
251 Likewise, the individual contribution of each study to the observed heterogeneity was analyzed by  
252 **means of a sensitivity analysis**, excluding one study at a time in cases in which a clinical or

253 methodological basis was found. For all of the aforementioned, the statistical program Review  
254 Manager Version 5.4 was used (RevMan 5) (The Cochrane Collaboration, 2020).

255 The following potential confounders were considered: baseline level of pain, type of  
256 endometriosis, type of intervention, number of sessions **and risk of bias of individual studies.**

257 Subgroup analyses were performed by group when it was possible. **Meta-regression**  
258 **analyses were limited because of the small number of studies evaluated.**

### 259 **3.10 Publication Bias Assessment**

260 Assessment of the risk of publication bias was performed by visual inspection of the funnel  
261 plots of each analysis **and further explored by computing the Egger test (Egger et al., 1997), with**  
262 **a significance level set at 0.05. Funnel plots were performed using RevMan, and the Egger tests**  
263 **were conducted using the metabias command in STATA version 17.**

### 264 **3.11 Certainty of Evidence**

265 Certainty of the evidence was judged for all outcomes using the Grading of  
266 Recommendations Assessment, Development and Evaluation working group methodology (GRADE  
267 Working Group), across the domains of risk of bias, inconsistency, indirectness, imprecision,  
268 publication bias, large effect, dose response and all plausible residual confounding (Balshem et al.,  
269 2011). Certainty was adjudicated as high, moderate, low or very low (Atkins et al., 2004). A  
270 Summary of Findings (SoF) table was prepared to present the main comparisons and outcomes  
271 (Guyatt et al., 2013).

## 272 **4 Results**

273 A total of 757 references were identified by the search in the different databases, of which 46 articles  
274 were selected for full-text evaluation once duplicates were eliminated and the title and abstract  
275 selection was carried out. Finally, after complete evaluation, seven studies were included (Farshi et  
276 al., 2020; Hansen et al., 2023; Meissner et al., 2016; Moreira et al., 2022; Tajik et al., 2022; Zandi et  
277 al., 2023; Zhao et al., 2012). Manual searches did not provide any additional references (see Figure  
278 1). The reasons for exclusion can be found in Supplementary Table 2.

### 279 **4.1 Characteristics of the Included Studies**

280 The seven included studies were published in English between 2012 and 2023 and conducted  
281 in China (Zhao et al., 2012), Germany (Meissner et al., 2016), Denmark (Hansen et al., 2023), Brazil  
282 (Moreira et al., 2022) and Iran (Farshi et al., 2020; Tajik et al., 2022; Zandi et al., 2023). All were  
283 RCTs with simple randomization and two intervention arms, except for Hansen et al. which had three  
284 arms (Hansen et al., 2023). The follow-up periods were variable. The minimum follow-up was  
285 carried out post-intervention (Hansen et al., 2023; Zhao et al., 2012) and the maximum after two  
286 years (Meissner et al., 2016), with the majority being studies that performed at least one evaluation  
287 per month, after completing the intervention (Farshi et al., 2020; Moreira et al., 2022; Tajik et al.,  
288 2022; Zandi et al., 2023). Information on the general characteristics of the studies can be found in  
289 Table 1.

290 Regarding the participants, 520 women were recruited, with an average of 74, a minimum of  
291 58 (Hansen et al., 2023) and a maximum of 100 patients per study (Zhao et al., 2012), and 65 losses

292 (12.50%). The clinical condition of the participants was in all cases a diagnosis of endometriosis,  
293 although in some studies the presence of pain was specified (Hansen et al., 2023; Meissner et al.,  
294 2016), the medical treatment received was specified (Tajik et al., 2022; Zandi et al., 2023; Zhao et  
295 al., 2012) or the level of affectation was specified (Moreira et al., 2022; Tajik et al., 2022). The mean  
296 age was 34.7 years (SD= 1.56). The selected studies included diagnoses by MRI laparoscopy, which  
297 favors the diagnostic accuracy of the included patients. The demographic and clinical characteristics  
298 of the participants in each study are shown in Table 2.

299 The psychological interventions evaluated in the included studies were PMR training (Zhao et  
300 al., 2012); psychotherapy with somatosensory stimulation (Meissner et al., 2016) and training in  
301 sensory focus techniques and sexual position change (Tajik et al., 2022); the MYENDO Program,  
302 based on mindfulness and acceptance-based psychological intervention (Hansen et al., 2023) and a  
303 brief intervention based on mindfulness (Moreira et al., 2022); a non-specific psychological  
304 intervention for endometriosis that included patient education, group therapy, relaxation, and guided  
305 physical training (Hansen et al., 2023); education based on the theory of planned behavior (Zandi et  
306 al., 2023) and a self-care counseling group (Farshi et al., 2020). In most studies, the intervention was  
307 conducted by the researchers (Farshi et al., 2020; Tajik et al., 2022; Zandi et al., 2023; Zhao et al.,  
308 2012), in one study the provider was a psychologist (Hansen et al., 2023) and in two it was conducted  
309 by professionals specialized in the technique used (Meissner et al., 2016; Moreira et al., 2022). For  
310 the most part, the intervention was weekly, with an average duration of eight weeks. The minimum  
311 number of sessions was one (Tajik et al., 2022) and the maximum was 24 (Zhao et al., 2012). The  
312 control group received the usual medical treatment or remained on the waiting list.

313 Regarding the outcome measures, four studies evaluated pain (Hansen et al., 2023; Meissner  
314 et al., 2016; Moreira et al., 2022; Tajik et al., 2022), six QoL (Farshi et al., 2020; Hansen et al., 2023;  
315 Meissner et al., 2016; Moreira et al., 2022; Zandi et al., 2023; Zhao et al., 2012) and three evaluated  
316 anxiety and depression (Farshi et al., 2020; Meissner et al., 2016; Zhao et al., 2012). Detailed  
317 information on the intervention and main outcome measures by study can be found in Table 3.

#### 318 **4.2 Risk of Bias of Individual Studies**

319 Three of the studies present a high risk of bias (Moreira et al., 2022; Tajik et al., 2022; Zhao  
320 et al., 2012), three of them suggest certain concerns, one regarding the risk of selection bias (Hansen  
321 et al., 2023) and the other two regarding the risk of performance bias (Meissner et al., 2016; Moreira  
322 et al., 2022), and only one study presents a low risk of bias in all domains (Farshi et al., 2020).  
323 Detailed judgments for each of the risk of bias domains are shown in Figure 2.

324 **More specifically, three studies raise concerns about the risk of bias in the**  
325 **randomization process. Hansen et al. (2023) did not specify whether the allocation sequence**  
326 **was random, and Tajik et al. (2022) did not report if the allocation sequence was adequately**  
327 **concealed, resulting in an unclear risk for both studies. Furthermore, Moreira et al. (2022) did**  
328 **not clarify whether the allocation sequence was randomized, and baseline differences between**  
329 **intervention groups suggest a high risk of bias in this domain.**

330 **In relation to deviations from the intended interventions, in all studies, participants or**  
331 **carers were aware of the intervention received. Besides which, in some studies, an intention-to-**  
332 **treat analysis was not applied. Consequently, most studies were judged to raise concerns in this**  
333 **domain.**

334 **Finally, Zhao et al. (2012) presents an unclear risk of selective reporting, as no protocol**  
335 **was available to confirm that the results were aligned with a pre-specified analysis.**

### 336 **4.3 Certainty of Evidence**

337 The overall quality of evidence was very low. The evidence profile for psychological  
338 interventions vs. control outcomes showed that the quality of evidence was moderate to very low  
339 (Supplementary Table 3).

### 340 **4.4 Results of Individual Studies and Results of the Synthesis**

341 The results of the individual studies can be consulted in Supplementary Tables 4-7. Of the  
342 total number of studies included, only five could be included in the MA (Farshi et al., 2020; Meissner  
343 et al., 2016; Moreira et al., 2022; Tajik et al., 2022; Zhao et al., 2012). The results are shown below.  
344 The results of all meta-analyses and sensitive analyses performed are available in Supplementary  
345 Table 8.

#### 346 **4.4.1 Pain (certainty of the evidence: moderate ⊕⊕⊕⊖)**

347 Of the four studies that evaluated changes in pain levels (Hansen et al., 2023; Meissner et al.,  
348 2016; Moreira et al., 2022; Tajik et al., 2022), three studied dyspareunia (Meissner et al., 2016;  
349 Moreira et al., 2022; Tajik et al., 2022), two dyschezia (Meissner et al., 2016; Moreira et al., 2022)  
350 and two pelvic pain (Meissner et al., 2016; Moreira et al., 2022), which were meta-analyzed.

351 The analyses showed that psychological interventions reduce the levels of dyspareunia (SMD:  
352 -0.54, 95% CI: -0.86, -0.22; I<sup>2</sup>= 0%; N = 160; **number of studies [K]= 3**; see Figure 3) and the levels  
353 of dyschezia evaluated with the NRS scale (MD: -2.90, 95% CI: -4.55, -1.26; I<sup>2</sup>= 0%; N = 88; K= 2;  
354 see Figure 4) versus usual treatment or the waiting list. In relation to the levels of pelvic pain, the  
355 psychological intervention was found to result in a slight reduction (MD: -1.22, 95% CI: -2.23, -0.22;  
356 I<sup>2</sup>= 0%; N = 107; K= 2; see Figure 5).

#### 357 **4.4.2 Quality of Life (certainty of the evidence: very low ⊕⊖⊖⊖/moderate ⊕⊕⊕⊖)**

358 Of the six studies that evaluated different domains related to QoL (Farshi et al., 2020; Hansen  
359 et al., 2023; Meissner et al., 2016; Moreira et al., 2022; Zandi et al., 2023; Zhao et al., 2012), four  
360 assessed mental health (Farshi et al., 2020; Meissner et al., 2016; Moreira et al., 2022; Zhao et al.,  
361 2012), two physical health (Farshi et al., 2020; Meissner et al., 2016), and two general health,  
362 vitality, social function, emotional role, physical role and physical functioning (Moreira et al., 2022;  
363 Zhao et al., 2012). All of them were initially meta-analyzed.

364 High heterogeneity was detected (I<sup>2</sup>= 90%) in the analyses of the mental health component. In  
365 the sensitivity analysis it was observed that the study by Farshi et al. (2020), in which patients in the  
366 intervention group received advice on self-care, provided all of the heterogeneity. However, even  
367 eliminating this study, a moderate effect remains in favor of the **guided** psychological intervention  
368 that resulted in an increase in mental health compared to the waiting list or usual treatment (SMD:  
369 0.70, 95% CI: 0.42, 0.99; I<sup>2</sup>= 0%; N = 201; K= 3; see **Supplementary Figure 1**). **Subgroup analysis**  
370 **confirmed that this heterogeneity was related to the type of treatment received (guided**  
371 **psychological intervention vs. self-care counselling) (P < 0.01).**

372 The analyses showed no statistically significant differences between the intervention and  
373 control groups in the remaining meta-analyzed QoL dimensions. Therefore, evidence suggests that  
374 psychological interventions may result in little or no difference in social functioning (MD: -4.47,  
375 95% CI: -26.29, 17.35;  $I^2 = 84\%$ ;  $N = 141$ ;  $K = 2$ ), the emotional role (MD: -15.98, 95% CI: -35.22,  
376 3.27;  $I^2 = 68\%$ ;  $N = 141$ ;  $K = 2$ ), or physical functioning (MD: 8.11, 95% CI: -5.61, 21.83;  $I^2 = 57\%$ ;  $N$   
377  $= 141$ ;  $K = 2$ ) and probably produces little or no difference in the physical role (MD: 10.98, 95% CI: -  
378 7.52, 29.49;  $I^2 = 40\%$ ;  $N = 141$ ;  $K = 2$ ). **The heterogeneity presented in these outcomes was not**  
379 **related to the intervention received or risk of bias. The forest plots can be consulted in**  
380 **Supplementary Figures 2-5.**

381 **High heterogeneity was detected in the analyses of the physical health component ( $I^2 =$**   
382 **98%), the vitality component ( $I^2 = 92\%$ ), and the general health component evaluated by the**  
383 **SF-36 ( $I^2 = 97\%$ ). This heterogeneity was not attributable to the type of intervention received**  
384 **or to risk of bias, leading to the decision not to present quantitative results for any of these**  
385 **components.**

#### 386 4.4.3 Anxiety (certainty of the evidence: low $\oplus\oplus\ominus\ominus$ /moderate $\oplus\oplus\oplus\ominus$ )

387 Three studies evaluated changes in trait anxiety assessed with the STAI (Farshi et al., 2020;  
388 Meissner et al., 2016; Zhao et al., 2012), which were meta-analyzed.

389 The analyses showed that psychological interventions result in a large reduction (SMD: -1.04)  
390 of trait anxiety scores (MD: -6.63, 95% CI: -8.27, -4.99;  $I^2 = 46\%$ ;  $N = 216$ ;  $K = 3$ ; see  
391 **Supplementary Figure 6**), compared to usual treatment or the waiting list.

392 Two of the three previous studies reported data on changes in state anxiety assessed with the  
393 STAI (Farshi et al., 2020; Zhao et al., 2012). The analyses showed that the psychological intervention  
394 probably reduces state anxiety compared to the control group (MD: -9.72, 95% CI: -13.11, -6.33;  $I^2 =$   
395  $58\%$ ;  $N = 163$ ;  $K = 2$ ; see Figure 6). **The heterogeneity was not associated with the type of**  
396 **intervention received or the risk of bias.**

#### 397 4.4.4 Depression (certainty of the evidence: moderate $\oplus\oplus\oplus\ominus$ )

398 Three studies analyzed changes in depression levels (Farshi et al., 2020; Meissner et al., 2016;  
399 Zhao et al., 2012). However, a high rate of heterogeneity was detected ( $I^2 = 90\%$ ). **The subgroup**  
400 **analysis showed that this was due to the type of treatment received (guided psychological**  
401 **intervention vs. self-care counselling) ( $P < 0.01$ ).** In the sensitivity analysis, the study by Farshi et al.  
402 (2020) was found to be the source of heterogeneity. After eliminating this study from the analysis, a  
403 large reduction (SMD: -1.14) in depression levels was observed in favor of **guided** psychological  
404 intervention (MD: -2.49, 95% CI: -3.20, -1.79;  $I^2 = 0\%$ ;  $N = 144$ ;  $K = 2$ ; see Figure 7).

#### 405 4.5 Publication Bias

406 Visual exploration of the funnel plots **and the results of the Egger tests did not reveal any**  
407 **evidence** of publication bias in the evaluated measures. These can be consulted in Supplementary  
408 Figures 7-17 and Supplementary Table 8, respectively.

#### 409 5 Discussion

410 The present SR evaluates the effectiveness of **various** psychological interventions **on the**  
411 **mental health and pain management** of women diagnosed with endometriosis. **By including a**  
412 **range of approaches, such as mindfulness, acceptance-based psychological intervention, or**  
413 **PMR, the SR provides a comprehensive understanding of their impact. Additionally, by**  
414 **examining both mental health outcomes, like anxiety and depression, alongside physical**  
415 **outcomes, such as pain reduction, it offers an integrated perspective on how these interventions**  
416 **may contribute to the overall well-being of women with endometriosis. The findings underscore**  
417 **the potential role of psychological therapies as part of a broader treatment approach for**  
418 **managing both the mental and physical aspects of the condition.**

419 The data obtained suggest that psychological interventions **probably** reduce pain levels  
420 (dyspareunia and dyschezia) and improve mental health. The data also point to a **likely** large  
421 reduction in levels of trait anxiety and depression, and a likely reduction in state anxiety experienced  
422 by women with endometriosis. It was also found that psychological interventions probably slightly  
423 reduce pelvic pain and may increase physical health. Other results indicate that psychological  
424 interventions probably make little or no difference to the physical role and may result in little or no  
425 difference in social function, emotional role, or physical functioning. The evidence on the effect of  
426 psychological interventions on general health and vitality in women diagnosed with endometriosis is  
427 currently uncertain.

428 Regarding the pain experienced by women with endometriosis, the analyses conclude that  
429 psychotherapy involving somatosensory stimulation, brief mindfulness-based interventions, and the  
430 techniques of sensory focus and change of sexual position have a positive effect on the levels of  
431 dyspareunia experienced by women with endometriosis. Similarly, levels of dyschezia and pelvic  
432 pain are lower after receiving psychotherapy with somatosensory stimulation and mindfulness-based  
433 interventions. Regarding overall pain, psychotherapy with somatosensory stimulation, the MYENDO  
434 program, based on mindfulness and acceptance, and non-specific psychological intervention  
435 including patient education, group therapy, relaxation and guided physical training seem to have  
436 positive effects. **The results of the individual studies, such as Meissner (2016), showed a**  
437 **statistically significant improvement in overall maximum pain and overall average pain in the**  
438 **psychological intervention group with somatosensory stimulation three months after the**  
439 **intervention, although its effect was less in the follow-ups at 6 and 24 months. In the study by**  
440 **Hansen et al. (2023), a reduction in the levels of pain intensity and unpleasantness was observed**  
441 **after the MYENDO intervention, compared to the non-specific psychological intervention and**  
442 **the group of patients on the waiting list. However, no statistically significant differences were**  
443 **found for other types of endometriosis-related pain outcomes, such as dysmenorrhea, dysuria**  
444 **(Moreira et al., 2022), or vaginal pressure pain threshold (Hansen et al., 2023). In general, these**  
445 findings support that concluded in previous SRs in which MA was not carried out and other designs  
446 were considered, but suggested that cognitive behavioral therapy (Donatti et al., 2022; Samami et al.,  
447 2023; Van Niekerk et al., 2019), acceptance and commitment therapy (Van Niekerk et al., 2019),  
448 mindfulness-based interventions (Hilton et al., 2017; Samami et al., 2023; Van Niekerk et al., 2019),  
449 psychoeducation (Samami et al., 2023) and interventions that include physical components (Evans et  
450 al., 2019; Fernández-Pérez et al., 2023; Gonçalves et al., 2017), improve pain levels in  
451 endometriosis patients.

452 The above is an important implication since pain is one of the main symptoms of the disease,  
453 present in 80% of patients (Bulletti et al., 2010), **which markedly affects their daily life (Della**  
454 **Corte et al., 2020; Dowding et al., 2023; Samami et al., 2023)** and that is also related to other  
455 psychological variables such as depression and anxiety (Van Barneveld et al., 2022), so given its

456 potential benefits and the absence of expected adverse effects compared to pharmacological and  
457 surgical treatments, the psychological interventions carried out should include or contemplate some  
458 of these treatment options.

459 **Concerning QoL, the analyses in the present SR with MA indicate that psychological**  
460 **interventions may result in little or no difference in social functioning, emotional role, physical**  
461 **functioning, and probably produce minimal differences in physical role. Moreover, the**  
462 **evidence remains highly uncertain regarding the effects of psychological interventions on**  
463 **general health and vitality (Moreira et al., 2022; Zhao et al., 2012). However, the analyses also**  
464 **show that self-care counseling, psychotherapy with somatosensory stimulation, intervention based on**  
465 **mindfulness, PMR training, the MYENDO program, based on mindfulness and acceptance-based**  
466 **psychological intervention, and psychological intervention including patient education, group**  
467 **therapy, relaxation and guided physical training, and education based on the theory of planned**  
468 **behavior can have a positive effect on domains related to QoL such as mental health. In addition,**  
469 **the results of the individual studies suggest that psychological interventions can enhance**  
470 **physical health (Farshi et al., 2020; Meissner et al., 2016), as well as improve domains and areas**  
471 **such as control, emotional well-being, and social support (Hansen et al., 2023), reproductive**  
472 **health (Zandi et al., 2023), and overall QoL (Zhao et al., 2012). These results are in line with**  
473 **previous SR conclusions, in which other designs considered therapy (Donatti et al., 2022; Van**  
474 **Niekerk et al., 2019), but which also pointed out aspects such as acceptance of pain and coping**  
475 **strategies as important elements in the intervention (Bullo and Hearn, 2021; González-Echevarría**  
476 **et al., 2019). The fact that QoL can be improved by training pain management and emotional**  
477 **regulation strategies (Barberis et al., 2023; Márki et al., 2017, 2022) is reflected in the overall**  
478 **results of the present work, since in all the studies in which other mental health measures were**  
479 **evaluated, there was an improvement in QoL domains. This suggests that the design of interventions**  
480 **aimed at improving QoL in women with endometriosis should consider and even prioritize among its**  
481 **objectives the improvement of other variables such as emotional state or pain management.**

482 **With respect to anxiety, the present analyses show that self-care counseling, brief**  
483 **interventions based on mindfulness and PMR show benefits in both trait anxiety and state anxiety, as**  
484 **measured by the STAI. Besides which, the findings of Meissner et al. (2016), which evaluated**  
485 **anxiety levels using the Hospital Anxiety and Depression Scale, support these results. This**  
486 **supports the conclusions of previous SRs in which the role of psychoeducation (Van Niekerk et al.,**  
487 **2019) and other psychological techniques (Evans et al., 2019) were highlighted as treatments to**  
488 **improve anxiety in women with endometriosis. The heterogeneity introduced in the analysis of state**  
489 **anxiety by the study of Zhao et al. (2012), who used PMR, reported a greater effect, this could be due**  
490 **to the greater number of sessions in the treatment group compared to the rest of the studies, so this**  
491 **could be a factor to consider in the implementation of psychological intervention programs for these**  
492 **women.**

493 **As regards depression, both psychotherapy with somatosensory stimulation and PMR**  
494 **showed positive effects, unlike the self-care counseling group proposed by Farshi et al. (2020). This**  
495 **contrasts with the conclusions reached by Van Niekerk et al. (2019), in which they highlighted the**  
496 **positive effects of psychoeducation and Evans et al. (2019), in which they recommended support**  
497 **groups to reduce depression, but supports previous SRs in which the role of cognitive behavioral**  
498 **therapy was underlined (Donatti et al., 2022) as well as interventions including physical components**  
499 **(Evans et al., 2019). It would be desirable to have more evidence in SRs that include MA in order to**  
500 **come to more solid conclusions in this regard. In addition to being able to assess, if not dispensing**

501 with surgical or hormonal treatments with significant adverse effects, at least the reduction or delay  
502 of their requirements.

503 The data obtained show, therefore, that therapies combining physical and psychological  
504 aspects are those that deliver the best results (Donatti et al., 2022; Evans et al., 2019; **Kirca and**  
505 **Celik, 2023**), as well as influencing one of the variables of interest, which is pain. These results can  
506 also be observed in other diseases with common characteristics, such as fibromyalgia (Islam et al.,  
507 2022; Leça and Tavares, 2022; Theadom et al., 2015; Williams et al., 2020), **cancer-related pain**  
508 **(Liu et al., 2022) or multiple sclerosis (Hadoush et al., 2022)**, where pain is, in turn, a fundamental  
509 part of the disease and treatment process.

510 **The interrelationship between the pain experienced by women with endometriosis, QoL,**  
511 **and other mental health variables, along with the previously discussed findings, support the**  
512 **effectiveness of psychological interventions in addressing these variables.**

### 513 **5.1 Strengths and Limitations**

514 The present SR has a series of strengths, such as: (1) compared to other SRs, the present SR  
515 included only the best possible evidence for the evaluation of the effectiveness of intervention  
516 programs (RCTs) and incorporated MA in the synthesis of results, which provides robustness to its  
517 conclusions; (2) a rigorous and transparent methodology was used in accordance with the principles  
518 of science and the standards of SRs and MAs; and (3) the steps followed have been detailed,  
519 guaranteeing replicability.

520 Regarding the weaknesses, the following can be highlighted: (1) since it was carried out in a  
521 limited number of databases and without analysis of the possible gray literature, the bibliographic  
522 search could not identify other relevant studies, however, the manual searches performed in the SR  
523 suggest the possibility of having located all the available published evidence; (2) only studies  
524 published in English and/or Spanish were taken into account, so some studies were left out of this  
525 SR; (3) the scarcity of evidence, **small sample sizes, and heterogeneity between the selected**  
526 **studies** for some of the outcomes studied, which sometimes leads to inconsistent and imprecise  
527 results and limits the possibility of **conducting meta-regression analyses and exploring the effect of**  
528 **potential confounders such as baseline pain level, type of endometriosis, or the number of**  
529 **intervention sessions.**

### 530 **5.2 Conclusion**

531 In conclusion, the evidence currently available indicates that psychological interventions have  
532 moderate positive effects on pain levels (dyspareunia and dyschezia), and moderate to strong positive  
533 effects on the anxiety and depression experienced by women with endometriosis, as well as on  
534 different components of QoL such as mental health or physical health, plus a small positive effect on  
535 pelvic pain. Therefore, the treatment of these women needs to go beyond medical and surgical  
536 management and include validated psychological treatments. However, although some  
537 recommendations have been highlighted to guide interventions in this regard, a greater number of  
538 studies are needed to reach more solid conclusions.

## 539 **6 Conflict of Interest**

540 The authors declare that the research was conducted in the absence of any commercial or  
541 financial relationships that could be construed as a potential conflict of interest.



## 542 7 Author Contributions

543 Tasmania del Pino-Sedeño and María Cabrera-Maroto participated in the conceptualization,  
544 data curation, formal analysis, and methodology, as well as drafting the work. These authors share  
545 first authorship. Alejandra Abrante-Luis and Yadira González-Hernández participated in the  
546 conceptualization, data curation, formal analysis, and methodology, and reviewed the work. M<sup>a</sup>  
547 Caridad Ortíz Herrera participated in the conceptualization, methodology and critically reviewed the  
548 work. All authors read and approved the final manuscript.

## 549 8 Funding

550 This research did not receive any specific grant from funding agencies in the public,  
551 commercial, or not-for-profit sectors.

## 552 9 Acknowledgments

553 The authors would like to thank Patrick Dennis for English language editing support with the  
554 final manuscript.

## 555 10 References

- 556 Abramowitz J. S. (2013). The practice of exposure therapy: relevance of cognitive-behavioral theory  
557 and extinction theory. *Behavior therapy*, 44(4), 548–558.  
558 <https://doi.org/10.1016/j.beth.2013.03.003>
- 559 Aredo, J., Heyrana, K., Karp, B., Shah, J., and Stratton, P. (2017). Relating Chronic Pelvic Pain and  
560 Endometriosis to Signs of Sensitization and Myofascial Pain and Dysfunction. *Semin Reprod*  
561 *Med* 35, 088–097. doi: 10.1055/s-0036-1597123
- 562 Atkins, D., Best, D., Briss, P. A., Eccles, M., Falck-Ytter, Y., Flottorp, S., et al. (2004). Grading quality  
563 of evidence and strength of recommendations. *BMJ* 328, 1490. doi: 10.1136/bmj.328.7454.1490
- 564 Bae, J. Y., Sung, H. K., Kwon, N. Y., Go, H. Y., Kim, T. J., Shin, S. M., & Lee, S. (2021). Cognitive  
565 Behavioral Therapy for Migraine Headache: A Systematic Review and Meta-  
566 Analysis. *Medicina (Kaunas, Lithuania)*, 58(1), 44. <https://doi.org/10.3390/medicina58010044>
- 567 Balshem, H., Helfand, M., Schünemann, H. J., Oxman, A. D., Kunz, R., Brozek, J., et al. (2011).  
568 GRADE guidelines: 3. Rating the quality of evidence. *Journal of Clinical Epidemiology* 64,  
569 401–406. doi: 10.1016/j.jclinepi.2010.07.015
- 570 Bandura, A. (1969). *Principles of behavior modification*. New York: Holt, Rinehart and Winston.
- 571 Barberis, N., Cannavò, M., Cuzzocrea, F., Saladino, V., & Verrastro, V. (2023). "Illness perceptions  
572 and factors of distress as mediators between trait emotional intelligence and quality of life in  
573 endometriosis". *Psychology, health & medicine*, 28(7), 1818–1830.  
574 <https://doi.org/10.1080/13548506.2023.2175878>
- 575 Beck, J. S. (1995). *Cognitive Therapy: basics and beyond*. New York: The Guilford Press.

- 576 Becker, C. M., Bokor, A., Heikinheimo, O., Horne, A., Jansen, F., Kiesel, L., et al. (2022). ESHRE  
577 guideline: endometriosis. *Human Reproduction Open* 2022, hoac009. doi:  
578 10.1093/hropen/hoac009
- 579 Becker, C. M., Gattrell, W. T., Gude, K., and Singh, S. S. (2017). Reevaluating response and failure of  
580 medical treatment of endometriosis: a systematic review. *Fertility and Sterility* 108, 125–136.  
581 doi: 10.1016/j.fertnstert.2017.05.004
- 582 Bittelbrunn, C. C., de Fraga, R., Martins, C., Romano, R., Massaneiro, T., Mello, G. V. P., &  
583 Canciglieri, M. (2023). Pelvic floor physical therapy and mindfulness: approaches for chronic  
584 pelvic pain in women—a systematic review and meta-analysis. *Archives of gynecology and*  
585 *obstetrics*, 307(3), 663–672. <https://doi.org/10.1007/s00404-022-06514-3>
- 586 Bourdel, N., Chauvet, P., Billone, V., Douridas, G., Fauconnier, A., Gerbaud, L., et al. (2019).  
587 Systematic review of quality of life measures in patients with endometriosis. *PLoS ONE* 14,  
588 e0208464. doi: 10.1371/journal.pone.0208464
- 589 Brasil, D. L., Montagna, E., Trevisan, C. M., La Rosa, V. L., Laganà, A. S., Barbosa, C. P., et al. (2020).  
590 Psychological stress levels in women with endometriosis: systematic review and meta-analysis  
591 of observational studies. *Minerva Med* 111. doi: 10.23736/S0026-4806.19.06350-X
- 592 Bulletti, C., Coccia, M. E., Battistoni, S., and Borini, A. (2010). Endometriosis and infertility. *J Assist*  
593 *Reprod Genet* 27, 441–447. doi: 10.1007/s10815-010-9436-1
- 594 Bullo, S., & Hearn, J. H. (2021). Parallel worlds and personified pain: A mixed-methods analysis of  
595 pain metaphor use by women with endometriosis. *British journal of health psychology*, 26(2),  
596 271–288. <https://doi.org/10.1111/bjhp.12472>
- 597 Carpenter, J. K., Pinaire, M., & Hofmann, S. G. (2019). From Extinction Learning to Anxiety  
598 Treatment: Mind the Gap. *Brain sciences*, 9(7), 164. <https://doi.org/10.3390/brainsci9070164>
- 599 Chaman-Ara, K., Bahrami, M. A., and Bahrami, E. (2017). Endometriosis Psychological Aspects: A  
600 Literature Review. *Journal of Endometriosis and Pelvic Pain Disorders* 9, 105–111. doi:  
601 10.5301/jepdp.5000276
- 602 Chiantera, V., Abesadze, E., and Mechsner, S. (2017). How to Understand the Complexity of  
603 Endometriosis-Related Pain. *Journal of Endometriosis and Pelvic Pain Disorders* 9, 30–38. doi:  
604 10.5301/je.5000271
- 605 Culley, L., Law, C., Hudson, N., Denny, E., Mitchell, H., Baumgarten, M., et al. (2013). The social and  
606 psychological impact of endometriosis on women's lives: a critical narrative review. *Human*  
607 *Reproduction Update* 19, 625–639. doi: 10.1093/humupd/dmt027
- 608 Davenport, S., Smith, D., and Green, D. J. (2023). Barriers to a Timely Diagnosis of Endometriosis: A  
609 Qualitative Systematic Review. *Obstetrics & Gynecology* 142, 571–583. doi:  
610 10.1097/AOG.0000000000005255
- 611 Deeks J. J., Higgins J. P. T., Altman D. G. (editors). Chapter 10: Analysing data and undertaking meta-  
612 analyses. In: Higgins J. P. T., Thomas J., Chandler J., Cumpston M., Li T., Page M. J., Welch  
613 V. A. (editors). *Cochrane Handbook for Systematic Reviews of Interventions* version

- 614 6.4 (updated August 2023). Cochrane, 2023. Available  
615 from [www.training.cochrane.org/handbook](http://www.training.cochrane.org/handbook).
- 616 Delanerolle, G., Ramakrishnan, R., Hapangama, D., Zeng, Y., Shetty, A., Elneil, S., et al. (2021). A  
617 systematic review and meta-analysis of the Endometriosis and Mental-Health Sequelae; The  
618 ELEMI Project. *Womens Health (Lond Engl)* 17, 174550652110197. doi:  
619 10.1177/17455065211019717
- 620 Della Corte, L., Di Filippo, C., Gabrielli, O., Reppuccia, S., La Rosa, V. L., Ragusa, R., Fichera, M.,  
621 Commodari, E., Bifulco, G., & Giampaolino, P. (2020). The Burden of Endometriosis on  
622 Women's Lifespan: A Narrative Overview on Quality of Life and Psychosocial  
623 Wellbeing. *International journal of environmental research and public health*, 17(13), 4683.  
624 <https://doi.org/10.3390/ijerph17134683>
- 625 Dobson, K. S., and Dozois, D. J. A. (Eds.). (2019). *Handbook of cognitive-behavioral therapies* (4th  
626 ed.). The Guilford Press.
- 627 Donatti, L., Malvezzi, H., Azevedo, B. C. D., Baracat, E. C., and Podgaec, S. (2022). Cognitive  
628 Behavioral Therapy in Endometriosis, Psychological Based Intervention: A Systematic Review.  
629 *Rev Bras Ginecol Obstet* 44, 295–303. doi: 10.1055/s-0042-1742406
- 630 Dowding, C., Mikocka-Walus, A., Skvarc, D., O'Shea, M., Olive, L., & Evans, S. (2024). Learning to  
631 cope with the reality of endometriosis: A mixed-methods analysis of psychological therapy in  
632 women with endometriosis. *British journal of health psychology*, 29(3), 644–661.  
633 <https://doi.org/10.1111/bjhp.12718>
- 634 Egger, M., Davey-Smith, G., and Altman, D. (2008). *Systematic reviews in health care: meta-analysis  
635 in context*. John Wiley & Sons.
- 636 Egger, M., Davey Smith, G., Schneider, M., & Minder, C. (1997). Bias in meta-analysis detected by a  
637 simple, graphical test. *BMJ (Clinical research ed.)*, 315(7109), 629–634.  
638 <https://doi.org/10.1136/bmj.315.7109.629>
- 639 Evans, S., Fernandez, S., Olive, L., Payne, L. A., and Mikocka-Walus, A. (2019). Psychological and  
640 mind-body interventions for endometriosis: A systematic review. *Journal of Psychosomatic  
641 Research* 124, 109756. doi: 10.1016/j.jpsychores.2019.109756
- 642 Farshi, N., Hasanpour, S., Mirghafourvand, M., and Esmaeilpour, K. (2020). Effect of self-care  
643 counselling on depression and anxiety in women with endometriosis: a randomized controlled  
644 trial. *BMC Psychiatry* 20, 391. doi: 10.1186/s12888-020-02795-7
- 645 Fernández-Pérez, P., Leirós-Rodríguez, R., Marqués-Sánchez, M. P., Martínez-Fernández, M. C., de  
646 Carvalho, F. O., & Maciel, L. Y. S. (2023). Effectiveness of physical therapy interventions in  
647 women with dyspareunia: a systematic review and meta-analysis. *BMC women's health*, 23(1),  
648 387. <https://doi.org/10.1186/s12905-023-02532-8>
- 649 Fleiss, J. (1993). Review papers : The statistical basis of meta-analysis. *Stat Methods Med Res* 2, 121–  
650 145. doi: 10.1177/096228029300200202

- 651 Gonçalves, A. V., Barros, N. F., & Bahamondes, L. (2017). The Practice of Hatha Yoga for the  
652 Treatment of Pain Associated with Endometriosis. *Journal of alternative and complementary*  
653 *medicine (New York, N.Y.)*, 23(1), 45–52. <https://doi.org/10.1089/acm.2015.0343>
- 654 González-Echevarría, A. M., Rosario, E., Acevedo, S., & Flores, I. (2019). Impact of coping strategies  
655 on quality of life of adolescents and young women with endometriosis. *Journal of*  
656 *psychosomatic obstetrics and gynaecology*, 40(2), 138–145.  
657 <https://doi.org/10.1080/0167482X.2018.1450384>
- 658 Gruber, T. M., and Mechsner, S. (2021). Pathogenesis of Endometriosis: The Origin of Pain and  
659 Subfertility. *Cells* 10, 1381. doi: 10.3390/cells10061381
- 660 Guyatt, G. H., Thorlund, K., Oxman, A. D., Walter, S. D., Patrick, D., Furukawa, T. A., et al. (2013).  
661 GRADE guidelines: 13. Preparing Summary of Findings tables and evidence profiles—  
662 continuous outcomes. *Journal of Clinical Epidemiology* 66, 173–183. doi:  
663 10.1016/j.jclinepi.2012.08.001
- 664 Hadoush, H., Alawneh, A., Kassab, M., Al-Wardat, M., & Al-Jarrah, M. (2022). Effectiveness of non-  
665 pharmacological rehabilitation interventions in pain management in patients with multiple  
666 sclerosis: Systematic review and meta-analysis. *NeuroRehabilitation*, 50(4), 347–365.  
667 <https://doi.org/10.3233/NRE-210328>
- 668 Hansen, K. E., Brandsborg, B., Kesmodel, U. S., Forman, A., Kold, M., Pristed, R., et al. (2023).  
669 Psychological interventions improve quality of life despite persistent pain in endometriosis:  
670 results of a 3-armed randomized controlled trial. *Qual Life Res* 32, 1727–1744. doi:  
671 10.1007/s11136-023-03346-9
- 672 Hansen, K. E., Kesmodel, U. S., Kold, M., and Forman, A. (2017). Long-term effects of mindfulness-  
673 based psychological intervention for coping with pain in endometriosis: A six-year follow-up  
674 on a pilot study. *Nordic Psychology* 69, 100–109. doi: 10.1080/19012276.2016.1181562
- 675 Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (2012). *Acceptance and commitment therapy: The*  
676 *process and practice of mindful change* (2nd ed.). Guilford Press.
- 677 Higgins, J. P., Savović, J., Page, M. J., Elbers, R. G., and Sterne, J. A. (2019). “Assessing risk of bias  
678 in a randomized trial,” in *Cochrane Handbook for Systematic Reviews of Interventions*, eds. J.  
679 P. T. Higgins, J. Thomas, J. Chandler, M. Cumpston, T. Li, M. J. Page, et al. (Wiley), 205–228.  
680 doi: 10.1002/9781119536604.ch8
- 681 Higgins, J. P. T. (2003). Measuring inconsistency in meta-analyses. *BMJ* 327, 557–560. doi:  
682 10.1136/bmj.327.7414.557
- 683 Higgins, J. P. T., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M., et al. eds. (2023). *Cochrane*  
684 *Handbook for Systematic Reviews of Interventions*. Version 6.4, 2023. Available at:  
685 [www.training.cochrane.org/handbook](http://www.training.cochrane.org/handbook)
- 686 Hilton, L., Hempel, S., Ewing, B. A., Apaydin, E., Xenakis, L., Newberry, S., Colaiaco, B., Maher, A.  
687 R., Shanman, R. M., Sorbero, M. E., & Maglione, M. A. (2017). Mindfulness Meditation for  
688 Chronic Pain: Systematic Review and Meta-analysis. *Annals of behavioral medicine : a*

- 689            *publication of the Society of Behavioral Medicine, 51(2), 199–213.*  
690            <https://doi.org/10.1007/s12160-016-9844-2>
- 691    Islam, Z., D’Silva, A., Raman, M., and Nasser, Y. (2022). The role of mind body interventions in the  
692            treatment of irritable bowel syndrome and fibromyalgia. *Front. Psychiatry* 13, 1076763. doi:  
693            10.3389/fpsyt.2022.1076763
- 694    Muhammad Khir, S., Wan Mohd Yunus, W. M. A., Mahmud, N., Wang, R., Panatik, S. A., Mohd  
695            Sukor, M. S., & Nordin, N. A. (2024). Efficacy of Progressive Muscle Relaxation in Adults for  
696            Stress, Anxiety, and Depression: A Systematic Review. *Psychology research and behavior*  
697            *management, 17, 345–365.* <https://doi.org/10.2147/PRBM.S437277>
- 698    Kabat-Zinn J. (1990). *Full catastrophe living, using the wisdom of your body and mind to face stress,*  
699            *pain, and illness.* New York: Delacorte.
- 700    Kiesel, L., and Sourouni, M. (2019). Diagnosis of endometriosis in the 21st century. *Climacteric* 22,  
701            296–302. doi: 10.1080/13697137.2019.1578743
- 702    Lamceva, J., Uljanovs, R., and Strumfa, I. (2023). The Main Theories on the Pathogenesis of  
703            Endometriosis. *IJMS* 24, 4254. doi: 10.3390/ijms24054254
- 704    Leça, S., and Tavares, I. (2022). Research in Mindfulness Interventions for Patients With Fibromyalgia:  
705            A Critical Review. *Front. Integr. Neurosci.* 16, 920271. doi: 10.3389/fnint.2022.920271
- 706    Leyland, N., Casper, R., Laberge, P., and Singh, S. S. (2010). Endometriosis: diagnosis and  
707            management. *J Obstet Gynaecol Can* 32, S1-32.
- 708    Lai, L., Liu, Y., McCracken, L. M., Li, Y., & Ren, Z. (2023). The efficacy of acceptance and  
709            commitment therapy for chronic pain: A three-level meta-analysis and a trial sequential analysis  
710            of randomized controlled trials. *Behaviour research and therapy, 165,* 104308.  
711            <https://doi.org/10.1016/j.brat.2023.104308>
- 712    Liu, D., Weng, J. S., Ke, X., Wu, X. Y., & Huang, S. T. (2022). The relationship between cancer-related  
713            fatigue, quality of life and pain among cancer patients. *International journal of nursing*  
714            *sciences, 10(1), 111–116.* <https://doi.org/10.1016/j.ijnss.2022.12.006>
- 715    Liu, K., Liu, Y., Ma, X., Fu, D., and Fan, Z. (2024). Effect of cognitive behavioral therapy on pain,  
716            knee function, and psychological status in patients after primary total knee arthroplasty: a  
717            systematic review and meta-analysis. *BMC musculoskeletal disorders, 25(1), 280.*  
718            <https://doi.org/10.1186/s12891-024-07413-1>
- 719    Machairiotis, N., Vasilakaki, S., and Thomakos, N. (2021). Inflammatory Mediators and Pain in  
720            Endometriosis: A Systematic Review. *Biomedicines* 9, 54. doi: 10.3390/biomedicines9010054
- 721    Márki, G., Bokor, A., Rigó, J., and Rigó, A. (2017). Physical pain and emotion regulation as the main  
722            predictive factors of health-related quality of life in women living with endometriosis. *Human*  
723            *Reproduction* 32, 1432–1438. doi: 10.1093/humrep/dex091

- 724 Márki, G., Vászrhelyi, D., Rigó, A., Kaló, Z., Ács, N., & Bokor, A. (2022). Challenges of and possible  
725 solutions for living with endometriosis: a qualitative study. *BMC women's health*, 22(1), 20.  
726 <https://doi.org/10.1186/s12905-022-01603-6>
- 727 Meissner, K., Schweizer-Arau, A., Limmer, A., Preibisch, C., Popovici, R. M., Lange, I., et al. (2016).  
728 Psychotherapy With Somatosensory Stimulation for Endometriosis-Associated Pain: A  
729 Randomized Controlled Trial. *Obstetrics & Gynecology* 128, 1134–1142. doi:  
730 10.1097/AOG.0000000000001691
- 731 Moreira, M. D. F., Gamboa, O. L., and Pinho Oliveira, M. A. (2022). A single-blind, randomized, pilot  
732 study of a brief mindfulness-based intervention for the endometriosis-related pain management.  
733 *European Journal of Pain* 26, 1147–1162. doi: 10.1002/ejp.1939
- 734 National Guideline Alliance (2017). “10. Staging systems.” in *Endometriosis: diagnosis and*  
735 *management*, (London: National Institute for Health and Care Excellence (NICE)). Available  
736 at: <https://www.ncbi.nlm.nih.gov/books/NBK536053/>
- 737 Nnoaham, K. E., Hummelshoj, L., Webster, P., d’Hooghe, T., De Cicco Nardone, F., De Cicco  
738 Nardone, C., et al. (2011). Impact of endometriosis on quality of life and work productivity: a  
739 multicenter study across ten countries. *Fertility and Sterility* 96, 366-373.e8. doi:  
740 10.1016/j.fertnstert.2011.05.090
- 741 Nnoaham, K. E., Hummelshoj, L., Webster, P., d’Hooghe, T., De Cicco Nardone, F., De Cicco  
742 Nardone, C., et al. (2019). Reprint of: Impact of endometriosis on quality of life and work  
743 productivity: a multicenter study across ten countries. *Fertility and Sterility* 112, e137–e152.  
744 doi: 10.1016/j.fertnstert.2019.08.082
- 745 Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D., et al. (2021).  
746 The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *Syst Rev*  
747 10, 89. doi: 10.1186/s13643-021-01626-4
- 748 Paschali, M., Lazaridou, A., Sadora, J., Papianou, L., Garland, E. L., Zgierska, A. E., & Edwards, R.  
749 R. (2024). Mindfulness-based Interventions for Chronic Low Back Pain: A Systematic Review  
750 and Meta-analysis. *The Clinical journal of pain*, 40(2), 105–113.  
751 <https://doi.org/10.1097/AJP.0000000000001173>
- 752 Practice Committee of the American Society for Reproductive Medicine (2012). Endometriosis and  
753 infertility: a committee opinion. *Fertility and Sterility* 98, 591–598. doi:  
754 10.1016/j.fertnstert.2012.05.031
- 755 Prescott, J., Farland, L. V., Tobias, D. K., Gaskins, A. J., Spiegelman, D., Chavarro, J. E., et al. (2016).  
756 A prospective cohort study of endometriosis and subsequent risk of infertility. *Hum. Reprod.*  
757 31, 1475–1482. doi: 10.1093/humrep/dew085
- 758 Qian, X., & Zhang, J. (2024). Mindfulness-Based Interventions on Psychological Comorbidities in  
759 Patients with Inflammatory Bowel Disease: A Systematic Review and Meta-Analysis. *Actas*  
760 *espanolas de psiquiatria*, 52(4), 571–582. <https://doi.org/10.62641/aep.v52i4.1559>

- 761 Ruszafa, M., Dluski, D. F., Winkler, I., Kotarski, J., Rechberger, T., and Gogacz, M. (2022). The State  
762 of Health and the Quality of Life in Women Suffering from Endometriosis. *JCM* 11, 2059. doi:  
763 10.3390/jcm11072059
- 764 Salazar-Méndez, J., Viscay-Sanhueza, N., Pinto-Vera, C., Oyarce-Contreras, F., Parra-Vera, M. F.,  
765 Suso-Martí, L., Guzmán-Muñoz, E., López-Bueno, R., Núñez-Cortés, R., & Calatayud, J.  
766 (2024). Cognitive behavioral therapy for insomnia in people with chronic musculoskeletal pain.  
767 A systematic review and dose-response meta-analysis. *Sleep medicine*, 122, 20–26.  
768 <https://doi.org/10.1016/j.sleep.2024.07.031>
- 769 Samami, E., Shahhosseini, Z., Khani, S., and Elyasi, F. (2023). Pain-focused psychological  
770 interventions in women with endometriosis: A systematic review. *Neuropsychopharm Rep* 43,  
771 310–319. doi: 10.1002/npr2.12348
- 772 Sanduvete-Chaves, S., Chacón-Moscoso, S., & Cano-García, F. J. (2024). Effectiveness of  
773 psychological interventions to decrease cognitive fusion in patients with chronic pain: A  
774 systematic review and meta-analysis. *Journal of psychosomatic research*, 186, 111888.  
775 <https://doi.org/10.1016/j.jpsychores.2024.111888>
- 776 Schünemann H. J., Vist G. E., Higgins J. P. T., Santesso N., Deeks J. J., Glasziou P., Akl E. A., Guyatt  
777 G. H. Chapter 15: Interpreting results and drawing conclusions [last updated August 2023]. In:  
778 Higgins J. P. T., Thomas J., Chandler J., Cumpston M., Li T., Page M. J., Welch V. A.  
779 (editors). *Cochrane Handbook for Systematic Reviews of Interventions* version 6.5. Cochrane,  
780 2024. Available from [www.training.cochrane.org/handbook](http://www.training.cochrane.org/handbook).
- 781 Schwartz, A. S. K., Gross, E., Geraedts, K., Rauchfuss, M., Wölfler, M. M., Häberlin, F., et al. (2019).  
782 The use of home remedies and complementary health approaches in endometriosis.  
783 *Reproductive BioMedicine Online* 38, 260–271. doi: 10.1016/j.rbmo.2018.10.009
- 784 Selvanathan, J., Pham, C., Nagappa, M., Peng, P. W. H., Englesakis, M., Espie, C. A., Morin, C. M.,  
785 & Chung, F. (2021). Cognitive behavioral therapy for insomnia in patients with chronic pain -  
786 A systematic review and meta-analysis of randomized controlled trials. *Sleep medicine reviews*,  
787 60, 101460. <https://doi.org/10.1016/j.smr.2021.101460>
- 788 Steen, J. P., Kannan, V., Zaidi, A., Cramer, H., & Ng, J. Y. (2024). Mind-body therapy for treating  
789 fibromyalgia: a systematic review. *Pain medicine (Malden, Mass.)*, pnae076. Advance online  
790 publication. <https://doi.org/10.1093/pm/pnae076>
- 791 Tajik, M., Shahali, S., and Shadjoo, K. (2022). The co-effect of sensate focus technique and sexual  
792 position changing on sexual function of women who use medical treatment for endometriosis.  
793 *Journal of Obstetrics and Gynaecology* 42, 3706–3711. doi: 10.1080/01443615.2022.2158316
- 794 Tan, L., Fang, P., Cui, J., Yu, H., & Yu, L. (2022). Effects of progressive muscle relaxation on health-  
795 related outcomes in cancer patients: A systematic review and meta-analysis of randomized  
796 controlled trials. *Complementary therapies in clinical practice*, 49, 101676.  
797 <https://doi.org/10.1016/j.ctcp.2022.101676>
- 798 Theadom, A., Copley, M., Smith, H. E., Feigin, V. L., and McPherson, K. (2015). Mind and body  
799 therapy for fibromyalgia. *Cochrane Database of Systematic Reviews* 2015. doi:  
800 10.1002/14651858.CD001980.pub3

- 801 Van Barneveld, E., Manders, J., Van Osch, F. H. M., Van Poll, M., Visser, L., Van Hanegem, N., et al.  
802 (2022). Depression, Anxiety, and Correlating Factors in Endometriosis: A Systematic Review  
803 and Meta-Analysis. *Journal of Women's Health* 31, 219–230. doi: 10.1089/jwh.2021.0021
- 804 Van Niekerk, L., Weaver-Pirie, B., and Matthewson, M. (2019). Psychological interventions for  
805 endometriosis-related symptoms: a systematic review with narrative data synthesis. *Arch  
806 Womens Ment Health* 22, 723–735. doi: 10.1007/s00737-019-00972-6
- 807 Wang, X., Dai, Z., Zhu, X., Li, Y., Ma, L., Cui, X., & Zhan, T. (2024). Effects of mindfulness-based  
808 stress reduction on quality of life of breast cancer patient: A systematic review and meta-  
809 analysis. *PloS one*, 19(7), e0306643. <https://doi.org/10.1371/journal.pone.0306643>
- 810 Wang, Y., Yang, L., Lin, G., Huang, B., Sheng, X., Wang, L., Chen, L., Qiu, X., Wu, X., & Lin, R.  
811 (2024). The efficacy of progressive muscle relaxation training on cancer-related fatigue and  
812 quality of life in patients with cancer: A systematic review and meta-analysis of randomized  
813 controlled studies. *International journal of nursing studies*, 152, 104694.  
814 <https://doi.org/10.1016/j.ijnurstu.2024.104694>
- 815 Williams, A. C. D. C., Fisher, E., Hearn, L., and Eccleston, C. (2020). Psychological therapies for the  
816 management of chronic pain (excluding headache) in adults. *Cochrane Database of Systematic  
817 Reviews* 2021. doi: 10.1002/14651858.CD007407.pub4
- 818 World Health Organization (2023). Endometriosis. Available at: [https://www.who.int/news-room/fact-  
819 sheets/detail/endometriosis](https://www.who.int/news-room/fact-sheets/detail/endometriosis)
- 820 Wu, H., Li, F., & Zhang, F. (2022). The efficacy of mindfulness-based stress reduction vs. standard or  
821 usual care in patients with breast cancer: a systematic review and meta-analysis of randomized  
822 controlled trials. *Translational cancer research*, 11(11), 4148–4158.  
823 <https://doi.org/10.21037/tcr-22-2530>
- 824 Yang, J., Lo, W. L. A., Zheng, F., Cheng, X., Yu, Q., & Wang, C. (2022). Evaluation of Cognitive  
825 Behavioral Therapy on Improving Pain, Fear Avoidance, and Self-Efficacy in Patients with  
826 Chronic Low Back Pain: A Systematic Review and Meta-Analysis. *Pain research &  
827 management*, 2022, 4276175. <https://doi.org/10.1155/2022/4276175>
- 828 Yates, A. J. (1970) *Behavior Therapy*. New York: Wiley.
- 829 Ye, L., Li, Y., Deng, Q., Zhao, X., Zhong, L., & Yang, L. (2024). Acceptance and commitment therapy  
830 for patients with chronic pain: A systematic review and meta-analysis on psychological  
831 outcomes and quality of life. *PloS one*, 19(6), e0301226.  
832 <https://doi.org/10.1371/journal.pone.0301226>
- 833 Zandi, N., Behboodi Moghadam, Z., Hossein Rashidi, B., Namazi, M., and Haghani, S. (2023).  
834 Reproductive health of women with endometriosis: an improving educational intervention  
835 based on the planned behavior theory. *Middle East Fertil Soc J* 28, 4. doi: 10.1186/s43043-023-  
836 00129-7
- 837 Zhang, Q., Xu, H., Wang, Y., Jiang, J., Xue, Q., & Qiu, Z. (2023). Efficacy of cognitive behavioral  
838 therapy for reducing pain susceptibility and increasing social engagement in patients with



- 839 chronic low back pain: A systematic review and meta-analysis. *Medicine*, 102(45), e35269.  
840 <https://doi.org/10.1097/MD.00000000000035269>
- 841 Zhao, L., Wu, H., Zhou, X., Wang, Q., Zhu, W., and Chen, J. (2012). Effects of progressive muscular  
842 relaxation training on anxiety, depression and quality of life of endometriosis patients under  
843 gonadotrophin-releasing hormone agonist therapy. *European Journal of Obstetrics &  
844 Gynecology and Reproductive Biology* 162, 211–215. doi: 10.1016/j.ejogrb.2012.02.029
- 845 Zondervan, K. T., Becker, C. M., and Missmer, S. A. (2020). Endometriosis. *N Engl J Med* 382, 1244–  
846 1256. doi: 10.1056/NEJMra1810764
- 847

Provisional

848 **Table 1.** Characteristics of Included Studies

First author, year	Context	Follow-up time (post intervention)	CI	Funding
Farshi et al., 2020	Teaching and Treatment Center	4 weeks	No	Tabriz University of Medical Sciences
Hansen et al., 2023	Specialized outpatient clinics for endometriosis	0, 2 weeks	No	TrygFonden, Ladywalk, and the Danish Endometriosis Patient Association
Meissner et al., 2016	Institute of Medical Psychology Departments of Neuroradiology, Obstetrics and Gynecology Neurology clinic Department of Gynecologic Endocrinology and Fertility Disorder	3, 6, 24 months	No	Horst Görtz Foundation, Theophrastus Foundation and Schweizer-Arau Foundation
Moreira et al., 2022	Endometriosis Outpatient Clinic	1, 4 weeks	No	No
Tajik et al., 2022	Fertility clinic	1, 2 months	No	Medical University of Tarbiat Modares
Zandi et al., 2023	Fertility clinic	4 y 8 weeks	No	No
Zhao et al., 2012	Obstetrics and Gynecology Departments	0 weeks	NR	NR

Note. CI: conflict of interest; NA: Not applicable; NR: Not reported

850 **Table 2.** Selection Criteria and Baseline Characteristics of Participants

First author, year	Clinical Condition	Inclusion criteria	Exclusion	N		Previous treatment/ medication N (%)	Actual treatment/ medication N (%)	Marital status N (%)	Biological children	Age Mean (SD)	N			
				R	P						I	L	C	L
Farshi et al., 2020	Endometriosis	1) Residing in Tabriz 2) at least secondary school education degrees 3) Diagnosed with endometriosis via laparoscopy during the past 5 years 4) 15–45 years 5) accessible via landline phone or cellphone numbers	1) Any condition that increased the risk of anxiety and depression 2) Antidepressants (3 months) 3) Malignancies 4) Severe depression and very severe anxiety 5) Recent trauma 6) Speech or hearing disorders 7) Being pregnant 8) A history of past mental illness or hospitalization for this reason	76	3	1) Laparoscopy: 61 (80.26%) 2) Laparoscopy+ medical: 11 (14.47%) 3) Laparoscopy+ medical+ Herbal: 3 (3.95%) 4) Laparoscopy+ herbal: 1 (1.32%)	NR	1) Widow: 1 (1.32%) 2) Divorced: 79 (21%) (78.95%) 3) Married: 60 (10.53%) 4) Single: 8;	1) 0: 20 (26.32%) 2) 1: 23 (30.26%) 3) 2 or more: 22 (28.95%)	34.4 <sup>†</sup> (NR)	38	0	38	3
Hansen et al., 2023	Endometriosis and chronic pelvic pain	1) 18–47 years 2) Surgery or MRI-confirmed endometriosis 3) Moderate to severe chronic pelvic pain 4) relevant clinical and surgical treatment according to the ESHRE guidelines 5) Willingness to spend 30–45 min on housework 5–7 days a week for 10 weeks	1) Other serious physical pain diseases 2) Severe psychiatric diagnosis 3) pregnancy or planned 4) Estimated lack of mental or physical surplus to start a psychological treatment or linguistic or cultural barriers	58	16	1) Removal of endometriosis lesions: 48 (88.88% <sup>†</sup> ) 2) No treatment: 52 (96.29% <sup>†</sup> ) 3) Pain medication: 52 (96.3% <sup>†</sup> ) 4) Physical treatment: 25 (46.3% <sup>†</sup> ) 5) Psychological treatment: 4 (7.41 % <sup>†</sup> ) 6) Psychological treatment: 14 (25.93% <sup>†</sup> )	1) No treatment: 3 (5.56% <sup>†</sup> ) 2) No treatment: 45 (83.33% <sup>†</sup> ) 3) Pain medication: 43 (79.63% <sup>†</sup> )	1) Married/living together 33 (61.11% <sup>†</sup> ) 2) Single: 15 (27.78% <sup>†</sup> ) 3) Others: 6 (1.11% <sup>†</sup> )	1) 0: 35 (64.81% <sup>†</sup> ) 2) 1: 9 (16.67% <sup>†</sup> ) 3) 2: 7 (12.97% <sup>†</sup> ) 4) 3: 3 (5.56% <sup>†</sup> )	31.82 <sup>†</sup> (NR)	20	6	19	6

Meissner et al., 2016	Endometriosis and chronic pelvic pain	1) 18–40 years 2) A history of histologically verified endometriosis 3) Chronic pelvic pain	1) Hormonal treatment 2) Drug or alcohol addiction 3) Pregnancy 4) Insufficient knowledge of German 5) Contraindications for MRI	67	11	Surgical treatment during last laparoscopy: Complete removal of endometriosis lesions: 35 (52,24%) Incomplete or no removal of endometriosis lesions: 32 (47,76%)	Use of analgesics NSAIDs: 41 (61.19%) Opioids: 5 (7.46%) Other: 17 (25.37%)	NR	NR	35.6 (NR)	35	5	32	6
Moreira et al., 2022	Deep endometriosis	1) 18-50 years 2) ≥1 deep endometriotic nodules evaluated by MRI 3) Endometriosis-related pain of moderate to severe intensity (≥6 months)	1) Current or past 6-month meditation-related practices 2) Other treatment initiation or treatment change (3 months before and during the trial) 3) Psychotic symptoms 4) Current suicidal ideation 5) Malignant lesions 6) Pregnancy 7) Inability to understand assessment or treatment instructions	63	17	NR	Dienogest: 48 (76.19%) COC: 15 (23.81%)	1) Divorced: 4 (6.35%) 2) Married: 29 (46.03%) 3) Single: 29 (46.03%)	NR	36.15 <sup>+</sup> (NR)	31	9	32	12
Tajik et al., 2022	Peritoneal or superficial endometriosis + medical treatment (COC + GnRH)	1) Married 2) 18–45years 3) Having sexual intercourse in the last 8 weeks	1) A known underlying disease other than endometriosis 2) A history of mental illness 3) Partner addicted to drugs or alcohol	80	0	NR	NR	1) Married: 80 (100%)	NR	35.61 (4.42)	40	0	40	0

Zandi et al., 2023	Endometriosis	<p>1) 15–45 years and living with husband</p> <p>2) Married and living with husband</p> <p>3) Confirmed diagnosis of endometriosis by laparoscopy</p> <p>4) Volunteering to participate in the study</p> <p>5) Not having a history of psychological problems or chronic diseases</p> <p>6) Ability to use the internet</p>	<p>4) A stressful accident in the past month</p> <p>5) Taking drugs that affect sexual function</p> <p>6) Urinary tract infection, vaginitis, cervicitis, active sores or genital lesions</p> <p>7) A history of being sexually assaulted</p>	76	5	<p>1) Being absent for two or more sessions</p> <p>1) yes: (85.53%<sup>†</sup>)</p> <p>2) no: (14.47%<sup>†</sup>)</p>	65	NR	<p>1) Married: 76 (100%)</p> <p>1) 0: 49 (64.47%<sup>†</sup>)</p> <p>2) 1: 21 (27.63%<sup>†</sup>)</p> <p>3) ≥2: 6 (7.90%<sup>†</sup>)</p>	34.6 <sup>†</sup> (NR)	38	3	38	2
Zhao et al., 2012	Endometriosis + GnRH	<p>1) 18–48 years</p> <p>2) Endometriosis verified by laparoscopy or laparotomy and confirmed by histology</p> <p>3) Complaining of dysmenorrhea, dyspareunia and/or pelvic pain</p> <p>4) Having failed COC therapy</p>	<p>1) Previously surgically treated for endometriosis</p> <p>2) Previously treated with a GnRH</p> <p>3) A family or personal history of mental illness</p> <p>4) Severe cognitive impairment</p> <p>5) Concurrent</p>	100	13	COC	NR	NR	<p>1) Married: 53 (60.9%)</p> <p>2) Single: 34 (49.1%)</p>	NR	50	8	50	5

5) An above- elementary school education  
6) Able to communicate clearly and give informed consent

oncologic or psychiatric diseases  
6) Treatment for anxiety or depression

---

Note. C: Control; COC: combined oral contraceptives; ESHRE: European Society of Human Reproduction and Embryology; GnRH: gonadotropin- releasing hormone analogues; I: Intervention; L: Loss; N: number of patients NA: Not applicable; NR: Not reported; NSAIDs: nonsteroidal anti-inflammatory drugs; MRI magnetic resonance imaging; R: recruited; Tx: treatment  
† own calculation

852 **Table 3.** Characteristics of the Psychological Interventions and Control Groups in the Included Studies

First author, year	Intervention	Intervention deliverer	Sessions			Total length	Control group	Pain	QoL	Anxiety	Depression
			N	Duration (minutes)	Periodicity						
Farshi et al., 2020	Self-care group counselling	Researcher	7	60-90	1/week	7 weeks	Routine care	NA	SF-36	STAI	BDI
Hansen et al., 2023	MYENDO. Specific mindfulness- and acceptance-based psychological intervention	Psychologist	10	180	1/week	10 weeks	Waiting list, medical treatment as usual	NRS	EHP-30	NA	NA
	Non-specific psychological intervention (relaxation and guided physical training)	Psychologist	10	NR	1/week	10 weeks					
Meissner et al., 2016	Psychotherapy with somatosensory stimulation	A medical specialist for psychosomatic medicine and traditional Chinese medicine	N	30-60	NR	NR	Waiting list control, cared for by the study gynecologists	NRS	SF-12	HADS, STAI	HADS
Moreira et al., 2022	Brief Mindfulness-Based Intervention + conventional medical treatment	An experienced mindfulness instructor	4	90	1/week	4 weeks +3 home exercise instructions	Standard medical care (hormonal therapy and analgesics)	NRS	SF-36	NA	NA
Tajik et al., 2022	Sensate focus technique and sexual positions	Researcher	1	120	NA	1 session	Routine care	VAS	NA	NA	NA

Zandi et al., 2023	Education based on the theory of planned behavior	Researcher	4	90-120	1/week	4 weeks	Routine hospital care	ERH Q	NA	NA	NA
Zhao et al., 2012	Progressive muscle relaxation training + GnRH (1 dose of depot leuprolide, 11.25 mg)	Researcher	24	40	2/week	12 weeks	GnRH (1 dose of depot leuprolide, 11.25 mg)	NA	SF-36	STAI	HADS

Note. BDI: Beck Depression Inventory; EHP-30 QoL: Danish version of The Endometriosis Health Profile 30 questionnaire; GnRH: gonadotropin- releasing hormone analogues; HADS Hospital Anxiety and Depression Scale; NA: Not applicable; NR: Not reported; NRS: 0–10-point numeric rating scale; SF-36: Short Form-36 Health Survey; SF-12: Short Form-12 Health Survey; STAI: State-trait Anxiety Inventory; VAS: Visual analogue scale



- 854 **Figure 1.** Flow Diagram of the Selection Process  
855 **Figure 2.** Risk of Bias in Included Studies  
856 **Figure 3.** Forest Plot for the Effect of Psychological Interventions on Dyspareunia  
857 **Figure 4.** Forest Plot for the Effect of Psychological Interventions on Dyschezia  
858 **Figure 5.** Forest Plot for the Effect of Psychological Interventions on Pelvic pain  
859 **Figure 6.** Forest Plot for the Effect of Psychological Interventions on State Anxiety  
860 **Figure 7.** Forest Plot for the Effect of Psychological Interventions on Depression

Provisional

Figure 01.TIF

Identification of studies via databases and registers

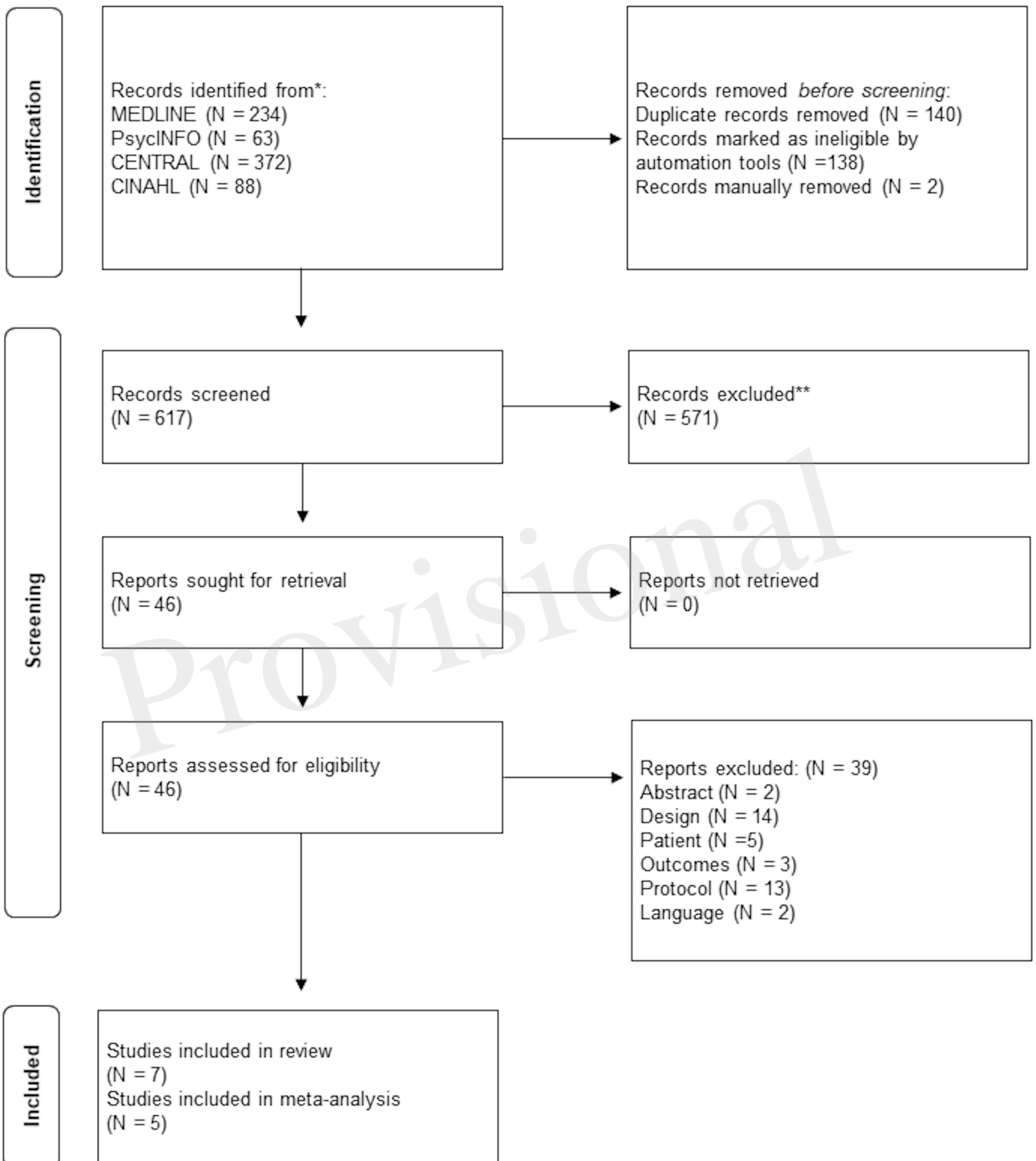


Figure 02.TIF

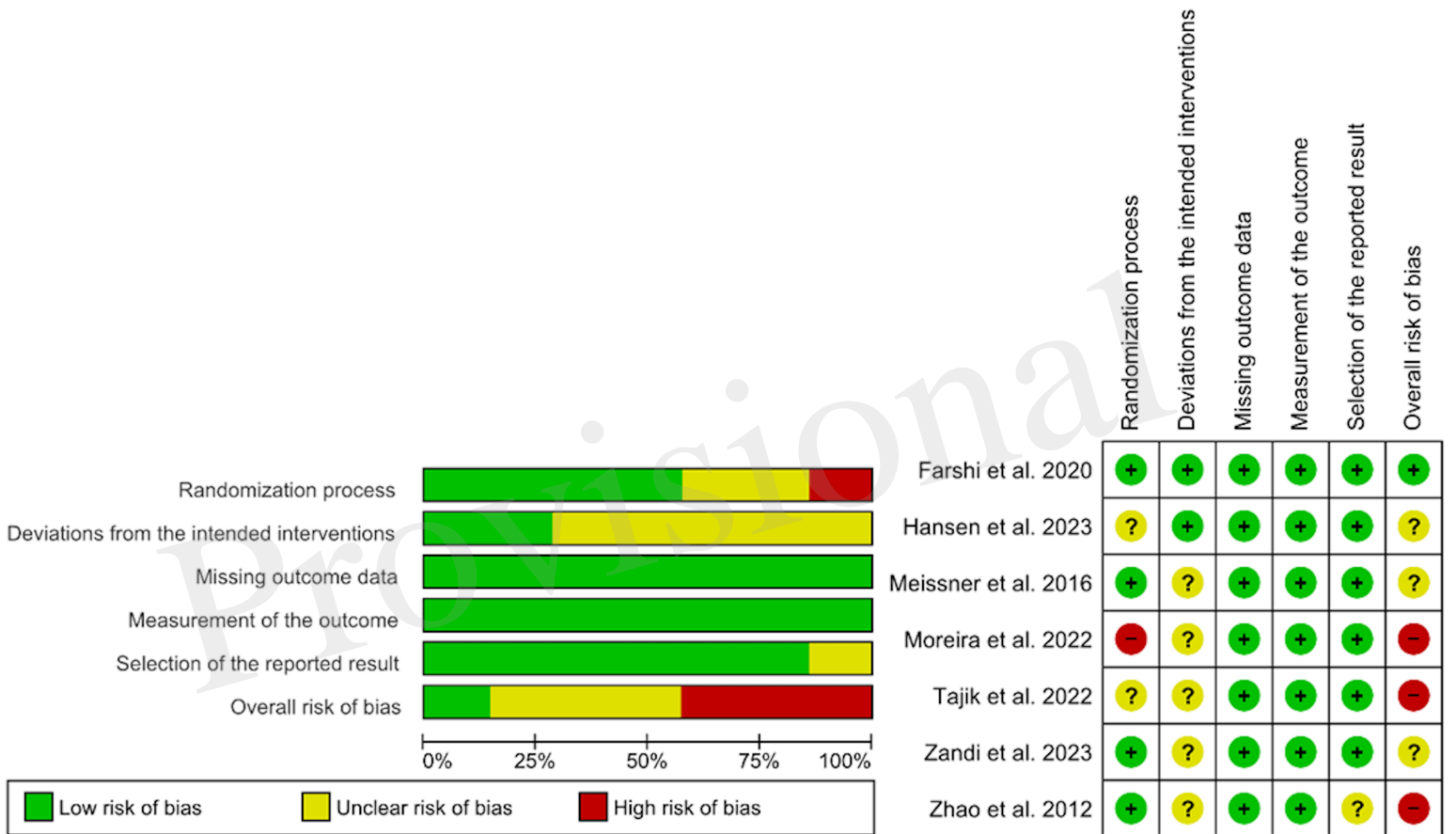
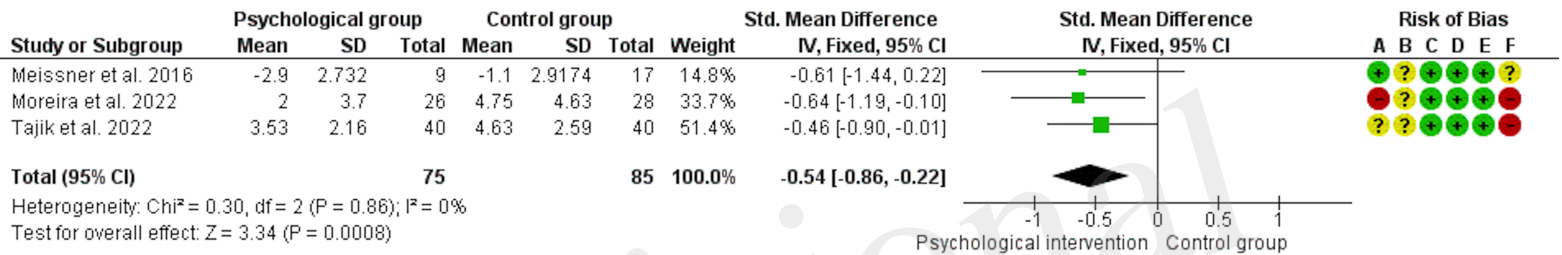


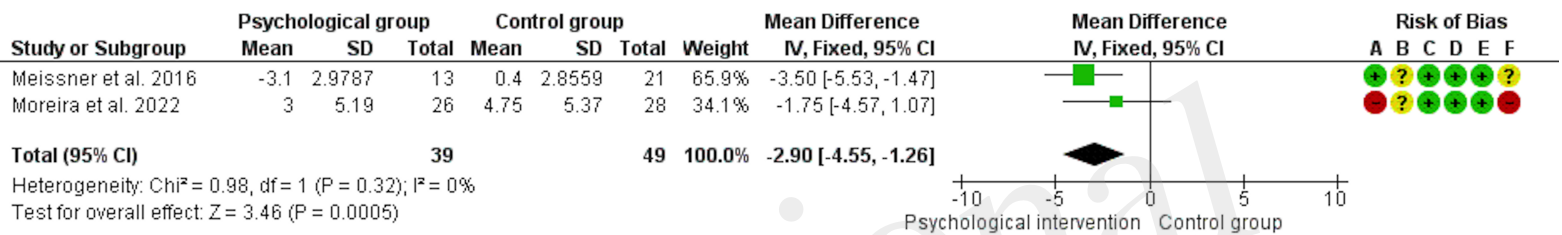
Figure 03.TIF



Risk of bias legend

- (A) Randomization process
- (B) Deviations from the intended interventions
- (C) Missing outcome data
- (D) Measurement of the outcome
- (E) Selection of the reported result
- (F) Overall risk of bias

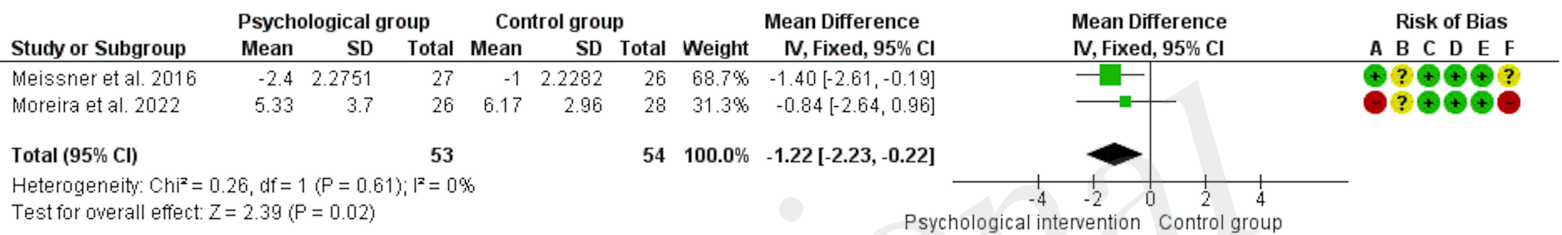
Figure 04.TIFF



Risk of bias legend

- (A) Randomization process
- (B) Deviations from the intended interventions
- (C) Missing outcome data
- (D) Measurement of the outcome
- (E) Selection of the reported result
- (F) Overall risk of bias

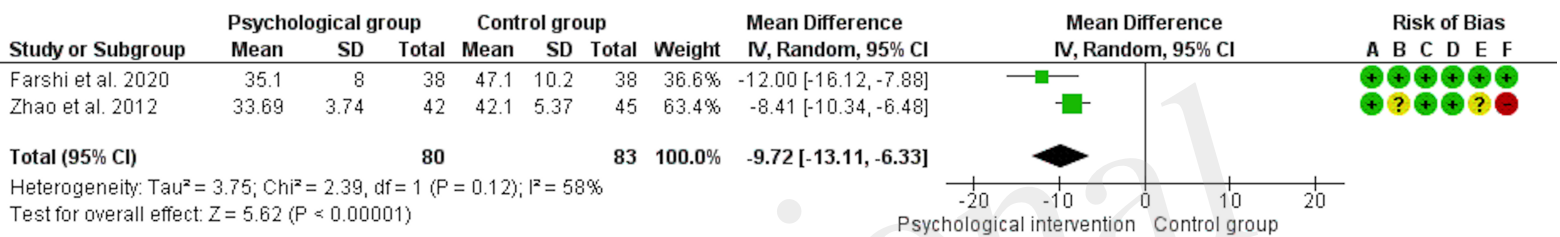
Figure 05.TIFF



Risk of bias legend

- (A) Randomization process
- (B) Deviations from the intended interventions
- (C) Missing outcome data
- (D) Measurement of the outcome
- (E) Selection of the reported result
- (F) Overall risk of bias

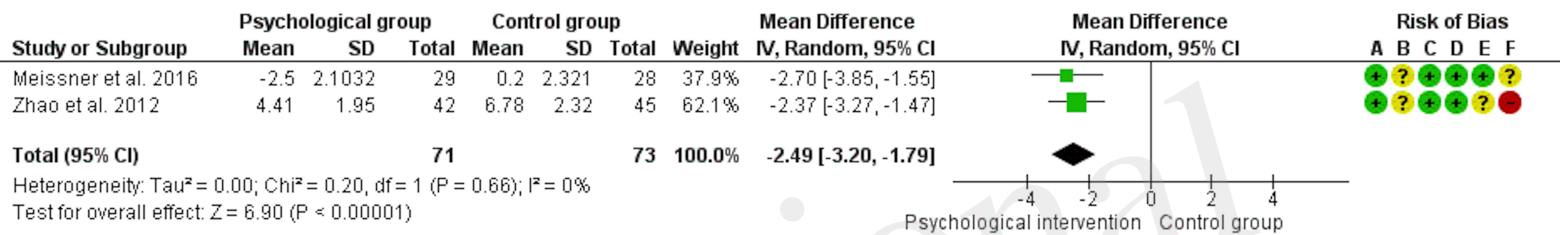
Figure 06.TIFF



Risk of bias legend

- (A) Randomization process
- (B) Deviations from the intended interventions
- (C) Missing outcome data
- (D) Measurement of the outcome
- (E) Selection of the reported result
- (F) Overall risk of bias

Figure 07.TIFF



Risk of bias legend

- (A) Randomization process
- (B) Deviations from the intended interventions
- (C) Missing outcome data
- (D) Measurement of the outcome
- (E) Selection of the reported result
- (F) Overall risk of bias

Provisional