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Systematic Review

Psychological Interventions for Women with Polycystic Ovary Syndrome (PCOS): A Systematic Review and Meta-Analysis of Randomised and Non-Randomised Controlled Trials

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Abstract

Polycystic ovary syndrome (PCOS) is an endocrine condition affecting 8–13% of reproductive-aged women globally. Psychological features of PCOS are often overlooked despite their association with mental health complications. This systematic review synthesises existing evidence of psychological interventions for women with PCOS. Database searches returned 4982 articles, of which 20 papers were eligible; 12 studies were meta-analysed. Compared to control, psychological interventions had statistically beneficial effects on change from baseline values for depression, PCOS-specific quality of life, general health, and body image. Significant improvements were found in all PCOS Questionnaire (PCOSQ) domains except acne, yet the importance of these differences in clinical practice was indeterminable. Despite statistical effects, the quality of evidence was judged as low/very-low due to between study heterogeneity, risk of bias, and imprecision in effect estimates. Future studies should focus on rigorously designed, well-reported trials, in order to address the uncertainty around the effectiveness of psychological interventions. The protocol of this systematic review was prospectively registered on the International Prospective Register of Systematic Reviews (PROSPERO: CRD42023472417).

Keywords: polycystic ovary syndrome; PCOS; psychological interventions; systematic review; meta-analysis; mental health; quality of life; body image

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1. Introduction

Polycystic ovary syndrome (PCOS) is the most common endocrine condition affecting women of reproductive age with no clear aetiology (Salari et al., 2024). It is predicted that 8–13% of women globally (Salari et al., 2024) and 1 in 10 in the United Kingdom (Williams et al., 2015) have PCOS, with an estimated 50% of cases being undiagnosed

(Ding et al., 2016). Women with PCOS exhibit a wide range of physical symptoms/signs (e.g., hirsutism, hair loss, acne, menstrual irregularity, and infertility), and also have an increased risk of developing metabolic (e.g., obesity, type 2 diabetes) and mental health (e.g., depression and anxiety) disorders (Teede et al., 2023). Indeed, increasing data from systematic reviews and meta-analyses report that those with PCOS have a higher prevalence of depression and/or anxiety symptoms when compared to those without PCOS (Blay et al., 2016; Brutocao et al., 2018; Cooney et al., 2017; Dokras et al., 2011; Wang et al., 2021; X. Yin et al., 2021). Furthermore, women with PCOS report lower health-related quality of life (HR-QoL) (Asdaq et al., 2020; Kite et al., 2024; Sánchez-Ferrer et al., 2020) and lower self-reported health status (Karjula et al., 2020). Although the cause of frequent mental health comorbidity in PCOS is ambiguous, the symptoms have been found to be prevalent at least until the late reproductive years (Karjula et al., 2020). Notably, the link between PCOS and mental health has been previously overlooked; however, this is gaining more attention with the 2023 international evidence-based guidelines (Teede et al., 2023) acknowledging its importance and recommending healthcare professionals to routinely screen for symptoms of depression and anxiety in women with PCOS.

Education resources (Gibson-Helm et al., 2016; Hoyos et al., 2020; Lau et al., 2022) and lifestyle modification (Cowan et al., 2023; Kazemi et al., 2022; S. S. Lim et al., 2019) have been previously reported to have a beneficial effect on patient experiences, including HRQoL, improved awareness, enhanced patient-centred care, and timely diagnosis, and to improve objective measures such as BMI and weight; however, the current guidelines do not recommend a specific therapy to support women with PCOS presenting with mental health conditions.

In general, non-pharmaceutical interventions (e.g., psychological interventions) have been used to improve physiological and psychological symptoms in several gynaecological conditions. For the purpose of this review, psychological interventions are broadly defined as interventions informed by psychological theory that utilise structured therapeutic approaches to influence cognitive, emotional, or behavioural processes (Nicklas et al., 2022). Psychological interventions have been applied in conditions including PCOS (Pehlivan et al., 2024), endometriosis (Pehlivan et al., 2024; Samami et al., 2023), cervical (Dhakal et al., 2024) and endometrial (Buchanan et al., 2021) cancers, as well as in non-metastatic breast cancer survivors (Jassim et al., 2015), with findings indicating beneficial effects for pain reduction, QoL, and reduced body image concerns. In this context, assessing the effectiveness of psychological interventions for treating women with PCOS is warranted in order to support evidence-based guidelines and recommendations for routine clinical practice.

Existing reviews exploring psychological interventions for women with PCOS have focused on cognitive behavioural therapy (CBT) (Jiskoot et al., 2022; Tang et al., 2022), whilst the broader literature primarily focuses on weight loss and fertility outcomes with interventions involving lifestyle modification (e.g., physical activity, nutrition) (Haqq et al., 2015; Kazemi et al., 2022; Kite et al., 2019; Kite et al., 2022; S. S. Lim et al., 2019; Patten et al., 2021), alternative/holistic treatments (e.g., acupuncture) (C. E. D. Lim et al., 2019), pharmaceutical interventions (Liu et al., 2021), and combined interventions (e.g., lifestyle components combined with holistic treatments) (Cowan et al., 2023; Naderpoor et al., 2015; Song et al., 2021). To the best of our knowledge, there is currently no systematic review with meta-analysis reporting on the effectiveness of multiple psychological interventions for improving the health and QoL of women with PCOS. Accordingly, this systematic review and meta-analysis aimed to synthesise and critically evaluate the effectiveness of psychological interventions on key psychological and QoL outcomes in women with PCOS. Primary outcomes were depression, anxiety, stress, PCOS-specific QoL, general health, and

body image, as these were prioritised for quantitative synthesis and GRADE evaluation. Secondary outcomes, not eligible for meta-analysis, included HR-QoL (self-esteem, coping, life satisfaction, mindfulness, fertility-specific QoL and sexual function), fatigue, and religious issues. This categorisation enhanced the clarity of the analytical focus and supported interpretation across the domains assessed.

2. Materials and Methods

This systematic review is reported following the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) (Page et al., 2021) (Supplementary File S1) and the APA Style Journal Article Reporting Standards Quantitative Meta-Analysis Article Reporting Standards (APA Style Jars). The protocol of this systematic review was prospectively registered on the International Prospective Register of Systematic Reviews (PROSPERO: CRD42023472417).

2.1. Eligibility Criteria

The eligibility criteria for study inclusion are presented in Table 1. Only published, peer-reviewed papers written in English were eligible for inclusion. The databases searched included CENTRAL (Cochrane Library), PubMed, CINAHL, SCOPUS, EMBASE (via Web of Science), SPORTDiscus (via EBSCOhost), and PsycINFO (via OvidSP) with no restriction on date. For the purpose of this review, a psychological intervention is defined as any intervention that involves a psychological approach or therapy (i.e., informed by psychological theory) (Nicklas et al., 2022). A full list of psychological interventions is included in the search strategy (Supplementary File S2: Tables S1–S4).

Table 1. Eligibility criteria for including studies in this systematic review.

Inclusion	
Population	Studies that included women with a mean age between 18 and 45 and with a formal diagnosis of PCOS based on the National Institute of Health (NIH) (Zawadski & Dunaif, 1992), the Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group (2004), or the AE-PCOS diagnostic Criteria (Azziz et al., 2009). We also included studies where PCOS diagnosis had been verified by a general practitioner or specialist clinician.
Intervention	Psychological intervention.
Comparators	Control group (e.g., waitlist, care as usual (CAU) or studies which included another intervention in addition to control, e.g., exercise, diet).
Outcomes	Studies that used validated scales to measure aspects of general health, psychological well-being and/or quality of life pre and/or post treatment. Outcomes included depression, anxiety, stress, general health, health-related quality of life, and PCOS specific quality of life.
Study design	Randomised controlled trials or non-randomised controlled trials.
Exclusion	
Population	Males, adolescent females, post-menopausal women, women without PCOS, women without a formal diagnosis of PCOS, mixed groups of women with and without PCOS.
Intervention	Non psychological intervention.
Comparators	Studies that do not compare studies using psychological interventions (e.g., exercise, diet, and holistic interventions).
Outcomes	Non validated scales, outcomes that do not measure psychological well-being or quality of life.
Study design	Case studies, cross-sectional studies, and secondary research (i.e., systematic/narrative reviews or editorials).

2.2. Search Strategy

A search strategy was developed for PubMed, which was then modified for each database searched (Supplementary File S2: Tables S1–S4). Additionally, independent searches were conducted using Google Scholar. The final searches were completed in October 2025.

2.3. Screening

Searches were conducted by two reviewers (LL and CA) and the references of identified studies were imported into the Rayyan review management software (Ouzzani et al., 2016), and duplicate articles were removed. Title and abstract screening were independently completed by two reviewers (CA and CK), before full-text eligibility screening was undertaken; this was also performed independently by the same two reviewers, while there was no need for arbitration from a third reviewer. Once screening was completed, the reference lists of identified studies were examined to ensure all relevant studies were included.

2.4. Data Extraction

Pertinent data were extracted from all eligible studies according to a proforma and were recorded in a Microsoft Excel spreadsheet. Extracted data included year of publication, citation, country, study design, total number of participants at baseline and follow-up, mean participant age, PCOS diagnostic criteria, number and timings of assessment points, description of the intervention including duration, quantity, and length. We also extracted key findings and data from relevant outcome measures. A summary of study characteristics is presented in Table 2.

2.5. Risk of Bias Assessment

The risk of bias of the included studies was assessed using Version 2 of the Cochrane risk of bias tool for randomized trials (RoB 2) (Sterne et al., 2019). Two independent reviewers (CA and CK) assessed the risk of bias which was evaluated according to the following items: random sequence generation (selection bias), blinding of participants and personnel (performance bias), blinding of outcome assessment (detection bias), incomplete outcome data (attrition bias), selective reporting (reporting bias), and other bias (Higgins et al., 2023). Each bias domain was graded as "low", "high" or "unclear risk". Studies with >20% of missing data were considered to be at a high risk of attrition bias. Studies were considered at high risk of other sources of bias if there were considerable between-group baseline differences that may affect outcomes (e.g., age, body weight), less than 75% adherence to the intervention, and/or contamination of the control group, which is thought to be particularly prevalent in randomized controlled trials (RCTs) of psychological interventions (Magill et al., 2019), since it is possible that participants may undertake psychological treatment independently from the trial which may not be reported or known in the study findings. Due to the nature of psychological interventions, it was considered not possible to blind participants and/or researchers to the intervention, resulting in high risk of performance-reporting bias being made.

2.6. Strategy for Data Synthesis

Where data from at least two trials were available for any included outcome, pooled intervention effect estimates and their 95% confidence intervals (CIs) are presented. Meta-analytical methods involving continuous outcomes assume data are normally distributed, therefore data were excluded from the meta-analysis where results were reported with median and interquartile ranges. Outcomes across the trials were presented as contin-

uous data and the random-effects method for meta-analysis was used to combine data (Higgins et al., 2023). Mean and standard deviation (SD) data for change from baseline values for the intervention and control groups were used in meta-analyses. As there is no standard unit of measurement to measure many of the constructs included in this systematic review (i.e., QoL), effect estimates were expressed as standardised mean difference (SMD) along with 95% CIs. Where change from the baseline was not reported, the mean difference (MD) for each outcome was calculated using the post-intervention means of the intervention and control groups. To derive the corresponding SD of the change scores, we followed the Cochrane Handbook's recommendations (Higgins et al., 2023). This method allows change-score variability to be approximated when not explicitly provided by study authors, thereby enabling the inclusion of additional studies in the meta-analysis while maintaining methodological consistency. The random-effects method for meta-analysis (DerSimonian & Laird, 1986) was used to combine data involving continuous outcomes due to anticipated heterogeneity across the studies (i.e., different ages, diagnostic criteria, and intervention types). We assessed between study heterogeneity by visually inspecting forest plots, and by use of Chi-squared tests and the I^2 statistic for each outcome; I^2 describes the percentage of variability in point estimates that is due to heterogeneity rather than sampling error (Deeks et al., 2019).

Heterogeneity is interpreted as follows: 0–40% might not be important, 30–60% "moderate", 50–90% "substantial", and 75–100% "considerable" heterogeneity (Deeks et al., 2019). A meta-analysis of post-intervention values and sensitivity analyses was conducted in order to assess the robustness of each result, and to identify potential sources of heterogeneity. In sensitivity analyses, we reported the effect of removing studies with small sample sizes ($n < 30$), those with a non-randomised design, high risk of overall bias, and studies that used more than one measure to assess the same outcome. Where individual study effect sizes were deemed to be outliers, a leave-one-out analysis was performed and the revised effect estimate reported. Regarding risk of bias, all studies exhibited at least one domain where risk of bias was unclear, as such only studies with an overall high risk of bias were removed in sensitivity analyses.

The quality of the evidence for key outcomes (i.e., depression, stress, anxiety, PCOS-specific QoL, general health and body image) was assessed independently by CA and CK using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach (Guyatt et al., 2011; Schunemann et al., 2022). We did not downgrade the quality based on lack of blinding alone due to the challenges of blinding participants and researchers in psychological interventions. We downgraded the quality based on included studies having a high risk of bias, when there was evidence of considerable heterogeneity, when upper or lower bounds of the CIs crossed (or were close to) zero, when there was a small number of trials, and/or sample sizes within an outcome.

3. Results

3.1. Study Selection

A total of 4982 articles were identified from the database and hand searches (Figure 1). After the removal of duplicates, 3577 articles were screened for eligibility based upon title and abstract. This led to the exclusion of 3527 articles, leaving a total of 50 articles which were retrieved for full-text screening, of which 30 were excluded. Following full-text screening, 20 papers met the inclusion criteria (Abdollahi et al., 2018, 2019; Amirshahi et al., 2024a, 2024b; Bafghi et al., 2024; Baghbani et al., 2024; Cooney et al., 2018; Dema et al., 2023; Dilek et al., 2022; Hamzehgardeshi et al., 2024; Javanbakht et al., 2023; Majidzadeh et al., 2023; Moeller et al., 2019; Moradi et al., 2020; Oberg et al., 2020; Ranasinghe et al., 2023; Salajegheh et al., 2023; Stefanaki et al., 2015; M. X. C. Yin et al., 2021; ZareMobini et al., 2022),

of which 12 studies relating to ten trials were meta-analysed; the results of two trials were reported separately in two separate publications (Abdollahi et al., 2018, 2019 and Amirshahi et al., 2024a, 2024b, respectively); thus, for clarity, these were each treated as one study and only the primary reference was used (Abdollahi et al., 2018; Amirshahi et al., 2024a).

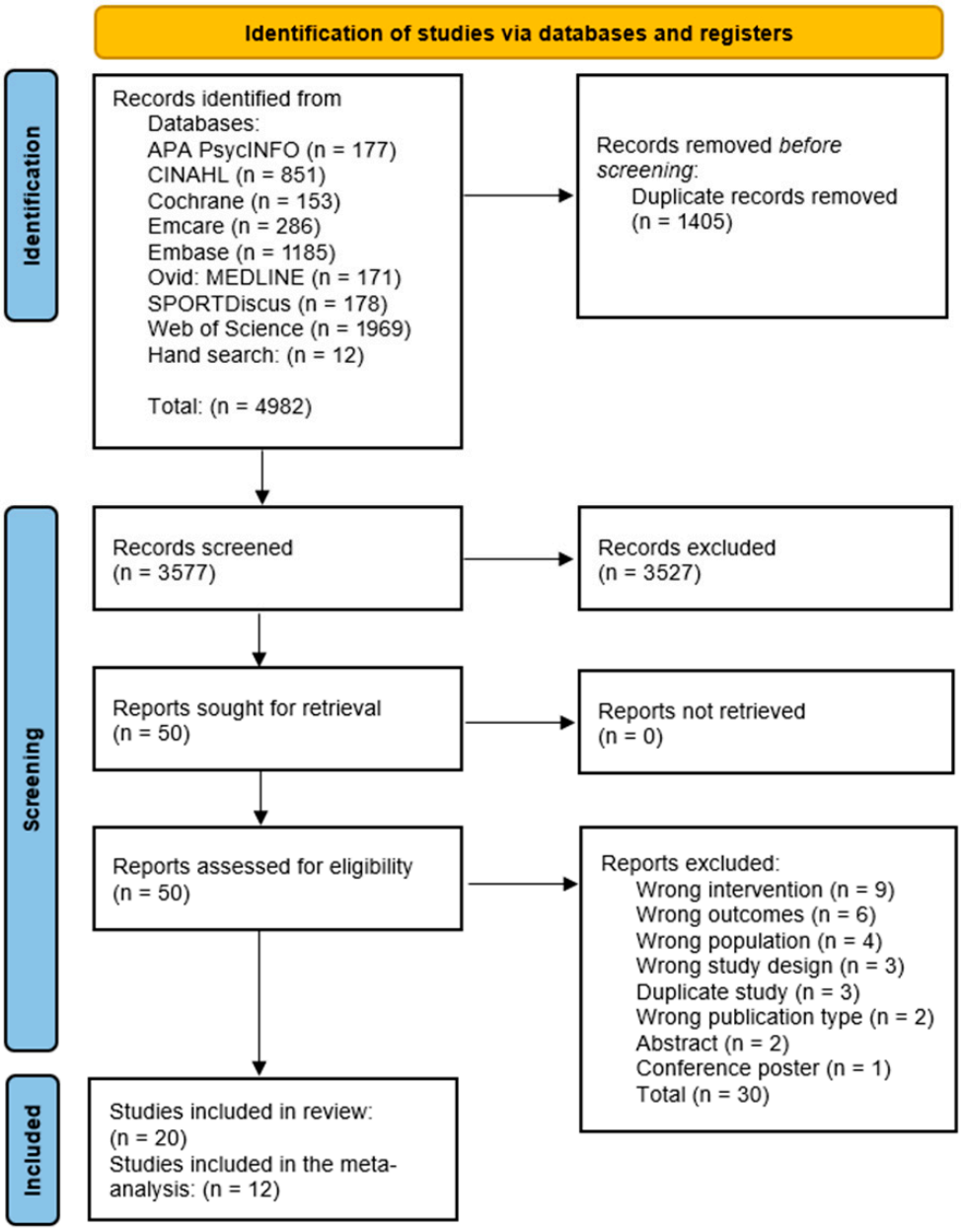

Figure 1. Preferred reporting items for systematic reviews and meta-analyses (PRISMA) flow diagram.

3.2. Study Characteristics

The publication date of the studies ranged between 2015 (Stefanaki et al., 2015) and 2024 (Amirshahi et al., 2024a; Bafghi et al., 2024; Baghbani et al., 2024; Hamzehgardeshi et al., 2024). Of the 18 included trials, 16 were RCTs (Abdollahi et al., 2018; Amirshahi et al., 2024a; Bafghi et al., 2024; Baghbani et al., 2024; Cooney et al., 2018; Dema et al., 2023; Dilek et al., 2022; Hamzehgardeshi et al., 2024; Javanbakht et al., 2023; Majidzadeh et al., 2023; Moeller et al., 2019; Moradi et al., 2020; Oberg et al., 2020; Stefanaki et al., 2015; M. X. C. Yin et al., 2021; ZareMobini et al., 2022) and two trials were non-randomised controlled trials (Ranasinghe et al., 2023; Salajegheh et al., 2023). Ten trials were conducted in Iran (Abdollahi et al., 2018; Amirshahi et al., 2024a; Bafghi et al., 2024; Baghbani et al., 2024;

Hamzehgardeshi et al., 2024; Javanbakht et al., 2023; Majidzadeh et al., 2023; Moradi et al., 2020; Salajegheh et al., 2023; ZareMobini et al., 2022) with the remainder conducted in Denmark (Moeller et al., 2019), USA (Cooney et al., 2018), China (M. X. C. Yin et al., 2021), Greece (Stefanaki et al., 2015), Slovenia (Dema et al., 2023), Sri Lanka (Ranasinghe et al., 2023), Sweden (Oberg et al., 2020), and Turkey (Dilek et al., 2022). Where reported, attrition ranged from 4.5% (Dilek et al., 2022) to 42.9% (Cooney et al., 2018), whilst eight trials did not report any attrition (Abdollahi et al., 2018; Amirshahi et al., 2024a; Baghbani et al., 2024; Dema et al., 2023; Javanbakht et al., 2023; Majidzadeh et al., 2023; M. X. C. Yin et al., 2021; ZareMobini et al., 2022). Reasons for dropouts included lost to follow-up (Dilek et al., 2022; Hamzehgardeshi et al., 2024; Moeller et al., 2019; Moradi et al., 2020; Oberg et al., 2020; Ranasinghe et al., 2023; Stefanaki et al., 2015), pregnancy (Moeller et al., 2019; Oberg et al., 2020; M. X. C. Yin et al., 2021), time commitment (Cooney et al., 2018; Oberg et al., 2020), unwillingness to continue participation (Bafghi et al., 2024; M. X. C. Yin et al., 2021), moving abroad (Oberg et al., 2020), starting in vitro fertilisation (Oberg et al., 2020), unable to organise childcare (Oberg et al., 2020), personal reasons (Oberg et al., 2020), a desire to continue weekly therapy with personal therapist (Cooney et al., 2018), prescribed metformin treatment (Moeller et al., 2019), and unrelated medical issues (Bafghi et al., 2024; Cooney et al., 2018).

All trials specified eligibility criteria for participants. Notably, 12 trials excluded women with various degrees of clinically recognised mental health comorbidities, such as depression and/or currently taking antidepressants (Abdollahi et al., 2018; Bafghi et al., 2024; Baghbani et al., 2024; Cooney et al., 2018; Dema et al., 2023; Dilek et al., 2022; Hamzehgardeshi et al., 2024; Javanbakht et al., 2023; Moradi et al., 2020; Stefanaki et al., 2015; M. X. C. Yin et al., 2021; ZareMobini et al., 2022), and ten trials excluded women with other chronic health conditions (Amirshahi et al., 2024a; Bafghi et al., 2024; Baghbani et al., 2024; Dilek et al., 2022; Hamzehgardeshi et al., 2024; Javanbakht et al., 2023; Oberg et al., 2020; Salajegheh et al., 2023; Stefanaki et al., 2015; M. X. C. Yin et al., 2021).

3.3. Participant Characteristics

There were 861 participants in the included studies (intervention, n = 438; control, n = 423); the smallest study included 15 participants (Cooney et al., 2018) and the largest 84 (Majidzadeh et al., 2023). The age of participants in these studies ranged from a mean ± SD of 23.4 ± 4.62 years (Stefanaki et al., 2015) to a median (IQR) of 34 (23–38) years (Moeller et al., 2019) for the intervention groups; and from 26.43 years (Bafghi et al., 2024) to 32.11 ± 5.9 years (Baghbani et al., 2024) for control groups. Four studies (Dilek et al., 2022) did not report mean age (Supplementary File S2: Table S6). Body mass index (BMI) of participants was reported by ten studies (Abdollahi et al., 2018; Bafghi et al., 2024; Cooney et al., 2018; Dema et al., 2023; Dilek et al., 2022; Moeller et al., 2019; Oberg et al., 2020; Stefanaki et al., 2015; M. X. C. Yin et al., 2021; ZareMobini et al., 2022), of which three studies only reported BMI at baseline (Bafghi et al., 2024; Oberg et al., 2020; ZareMobini et al., 2022). The mean BMI at baseline ranged from 21.3 ± 4.5 kg/m^2 (M. X. C. Yin et al., 2021) to 38 (35–42) kg/m^2 (Cooney et al., 2018) for intervention groups and from 21.4 ± 3.4 kg/m^2 (M. X. C. Yin et al., 2021) to 35.9 (33.9–38.8) kg/m^2 (Moeller et al., 2019) for control groups (Supplementary File S2: Table S7). One study (Cooney et al., 2018) who only included women with depression in the inclusion criteria assessed current and past mood and psychiatric conditions using the Mini International Neuropsychiatric Interview (MINI) where over 75% of participants in the cohort met the criteria for major depressive disorder (MDD) and over 20% met the criteria for generalised anxiety disorder (GAD). Of the 18 studies, 14 defined PCOS based on the Rotterdam criteria (Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004), two trials used gynaecologist confirmation of diagnosis

(Abdollahi et al., 2018; Majidzadeh et al., 2023), one trial (Cooney et al., 2018) used the NIH criteria (Zawadski & Dunaif, 1992), and one mentioned women with PCOS who have been referred for fertility treatment (Amirshahi et al., 2024a) without specifying the exact criteria. No trials specified use of the AE-PCOS definition for diagnosis (Azziz et al., 2009).

3.4. Intervention and Comparison Details

Of the included studies, nine assessed the effectiveness of a psychological intervention compared to usual care or no intervention (Abdollahi et al., 2018; Bafghi et al., 2024; Dema et al., 2023; Dilek et al., 2022; Hamzehgardeshi et al., 2024; Majidzadeh et al., 2023; Moradi et al., 2020; Salajegheh et al., 2023; Stefanaki et al., 2015). Of these nine, three applied mindfulness-based approaches (Dema et al., 2023; Salajegheh et al., 2023; Stefanaki et al., 2015), two used CBT (Abdollahi et al., 2018; Majidzadeh et al., 2023), one trial used acceptance and commitment therapy (ACT) (Moradi et al., 2020), one trial used individual counselling based on the transtheoretical model (TTM) (Dilek et al., 2022), and one trial used social networking based motivational interviewing (MI) (Hamzehgardeshi et al., 2024). Six trials assessed a combined psychological and lifestyle intervention and compared it to a minimal or placebo intervention (Cooney et al., 2018; Moeller et al., 2019; Oberg et al., 2020; Ranasinghe et al., 2023; M. X. C. Yin et al., 2021; ZareMobini et al., 2022) with the psychological component being CBT (Cooney et al., 2018), MI (Moeller et al., 2019), peer-led support groups (Ranasinghe et al., 2023), integrated Body–Mind Spirit (I-BMS) (M. X. C. Yin et al., 2021) and theoretically underpinned lifestyle counselling (Oberg et al., 2020; ZareMobini et al., 2022). A further study assessed mindfulness-based art therapy compared to a waitlist control group (Bafghi et al., 2024). Three trials compared psychological interventions, including CBT, to emotion-focused therapy (EFT), and no intervention (Amirshahi et al., 2024a); online telehealth mindfulness-based intervention (MBI) to face-to-face counselling (Javanbakht et al., 2023); while another trial compared mindfulness based cognitive therapy (MBCT) counselling to dry cupping (Baghbani et al., 2024).

Intervention session frequency ranged from once per week for four weeks (ZareMobini et al., 2022) to once per week for 18 weeks (Amirshahi et al., 2024a). One trial did not specify the frequency, quantity, or length of the intervention (Dilek et al., 2022). In 17 trials participants were fully supervised in all sessions, whilst one trial (Stefanaki et al., 2015) provided an audio CD with a 30 min instruction session and one 30 min follow-up telephone call. Out of the 18 studies, five trials included homework components such as body-scan meditation and breathwork (Amirshahi et al., 2024a; Bafghi et al., 2024; Baghbani et al., 2024; Javanbakht et al., 2023; Stefanaki et al., 2015).

3.5. Characteristics of the Outcome Measures

Of the outcomes eligible for inclusion in this study, the most common were those relating to QoL; 14 studies reported QoL, with the most common measure being the Polycystic Ovary Syndrome Questionnaire (PCOSQ) which was used by eight trials (Abdollahi et al., 2018; Cooney et al., 2018; Dema et al., 2023; Javanbakht et al., 2023; Majidzadeh et al., 2023; Moeller et al., 2019; Stefanaki et al., 2015; M. X. C. Yin et al., 2021), whilst a further two trials used the modified-PCOSQ (M-PCOSQ) (Hamzehgardeshi et al., 2024; Ranasinghe et al., 2023). Several other measures were used by studies to assess QoL, including the Health Promoting Lifestyle Questionnaire (HPLP) (Amirshahi et al., 2024a), HPLP-II (Hamzehgardeshi et al., 2024), the Fertility Quality of Life (FertiQoL) (Baghbani et al., 2024), the Female Sexual Function Index (FSFI) (Amirshahi et al., 2024a), the 36-Item Short Form Survey (SF-36) (Dema et al., 2023; Moeller et al., 2019), and the WHO-5 (Moeller et al., 2019). General health subscales were used by two studies including the SF-36 (Dema et al., 2023) and the Psychological General Well Being Index (PGWBI)

(Oberg et al., 2020). Eleven studies reported on depression (Abdollahi et al., 2018; Amirshahi et al., 2024a; Cooney et al., 2018; Dema et al., 2023; Majidzadeh et al., 2023; Moeller et al., 2019; Oberg et al., 2020; Ranasinghe et al., 2023; Stefanaki et al., 2015; M. X. C. Yin et al., 2021; ZareMobini et al., 2022) with the most common measurement method being the Beck Depression Inventory (BDI-II) (Abdollahi et al., 2018; Dema et al., 2023; Majidzadeh et al., 2023; M. X. C. Yin et al., 2021) followed by the Centre for Epidemiologic Studies Depression (CES-D) scale (Cooney et al., 2018; Ranasinghe et al., 2023), and the Depression Inventory-short form (Amirshahi et al., 2024a). In addition, eight studies reported anxiety (Amirshahi et al., 2024a; Cooney et al., 2018; Dema et al., 2023; Majidzadeh et al., 2023; Oberg et al., 2020; Stefanaki et al., 2015; M. X. C. Yin et al., 2021; ZareMobini et al., 2022) with the most common measures being the Beck Anxiety Inventory (BAI) (Amirshahi et al., 2024a; Dema et al., 2023; M. X. C. Yin et al., 2021) and the Spielberger State-Trait Anxiety Inventory (STAI-S) (Cooney et al., 2018; Majidzadeh et al., 2023). All three studies reporting stress used the Perceived Stress Scale (PSS-14) (Cooney et al., 2018; Dema et al., 2023; Stefanaki et al., 2015) and two studies reported general health using the SF-36 and PGWBI subscales (Dema et al., 2023; Oberg et al., 2020).

Measurement tools/scales are further summarised in Table 2, with scoring detailed in Supplementary File S2; Tables S8 and S9. All trials assessed participants at baseline and immediately upon intervention completion. Two trials report mid-way assessment points (Cooney et al., 2018; Dilek et al., 2022) and follow-up data were available for nine trials (Amirshahi et al., 2024a; Dema et al., 2023; Hamzehgardeshi et al., 2024; Javanbakht et al., 2023; Moradi et al., 2020; Oberg et al., 2020; Salajegheh et al., 2023; M. X. C. Yin et al., 2021; ZareMobini et al., 2022), ranging from 12 weeks (Amirshahi et al., 2024a; Javanbakht et al., 2023; Moradi et al., 2020; ZareMobini et al., 2022) to 12 months (Oberg et al., 2020). Due to the significant time point variation, these data were not meta-analysed but are discussed narratively.

Table 2. Study characteristics of included studies.

Study (Design)	*N* Randomised/Analysed	Intervention Duration (Assessment Points)	Participant Characteristics (PCOS Diagnostic Criteria)	Intervention	Comparator(s)	Outcome Measures
Abdollahi et al. (2018) (RCT)	INT: 37/37 CON: 37/37	8 wk (BL, 12 wk)	INT Age: 28.44 ± 4.24 y CON Age: 27.44 ± 4.6 y (Gynaecologist confirmed)	Type: CBT Quantity: 8 Frequency: 1 × wk Length: 45–60 min	Routine care	BDI-II, PCOSQ, FIS
Amirshahi et al. (2024a) (RCT)	INT: 15/15 INT two: 15/15 CON: 15/15	INT one: (BL, 11 wk) INT two: (BL, 18 wk) BOTH: 12 wk post-intervention	40% 25–35 y 60% 36–45 y (Referred to fertility clinic)	Type: EFT Quantity: 11 Frequency: 1 × wk Length: 2 h	Type: CBT Quantity: 18 Frequency: 1 × wk Length: 2 h CON: Routine care	FSFI, HPLP, BIQ, BAI, Depression Inventory-SF
Bafghi et al. (2024) (RCT)	INT: 32/30 CON: 34/30	4 wk (BL, 4 wk)	INT Age: 27.63 ± 6.82 y CON Age: 26.43 ± 5.43 y (Rotterdam)	Type: MBAT Quantity: 8 Frequency: 2 × wk Length: 90–120 min	Waitlist control	MBSRQ
Baghbani et al. (2024) (RCT)	INT: 10/10 CON: 9/9	(BL, 12 wk post-intervention)	INT one Age: 28.6 ± 3.71 y INT two Age: 32.11 ± 5.9 y (Rotterdam)	Type: counselling with MBCT Quantity: 8 Frequency: 1 × wk Length: 90 min	Type: Dry cupping Quantity: 12 Frequency: b wk during non-menstruation days for 8 wk Length: >20 min	FertiQol
Cooney et al. (2018) (RCT)	INT: 20/7 CON: 13/8	16 wk (BL, 8 wk, 16 wk)	INT Age: 29 (25–33) y CON Age: 32 (27–36) y (NIH)	Type: LS counselling & CBT Quantity: 16 LS & 8 CBT Frequency: 1 × wk Length: 30 min	Type: LS counselling Quantity: 16 LS Frequency: 1 × wk Length: 30 min	PCOSQ, CES-D, STAI-S, TSST PSS
Dema et al. (2023) (RCT)	INT: 21/21 CON: 21/21	8 wk (BL, 8 wk, 6 m)	Age: 40.1 ± 7.3 y (Rotterdam)	Type: MBSR Quantity: 8 Frequency: 1 × wk Length: 2 h	Wait-list	BAI, BDI-II, PSS, SF-36 (RAND version), FFMQ
Dilek et al. (2022) (RCT)	INT: 35/34 CON: 35/33	6 m (BL, 3 m, 6 m)	Age: 20.79 ± 1.43 y (Rotterdam)	Type: individual counselling program based on TM Quantity: n/r Frequency: n/r Length: n/r	No intervention except monthly health check, general health recommendations related to nutrition and exercise	SBCF, TADFC, IPAQ

Table 2. *Cont.*

Study (Design)	*N* Randomised/Analysed	Intervention Duration (Assessment Points)	Participant Characteristics (PCOS Diagnostic Criteria)	Intervention	Comparator(s)	Outcome Measures
Hamzehgardeshi et al. (2024) (RCT)	INT: 30/30 CON: 30/30	5 wk (BL, 5 wk, 13 wk)	INT Age: 30.97 ± 4.18 y CON Age: 28.67 ± 5.30 y (Rotterdam)	Type: WhatsApp MI Quantity: 5 Frequency: 1 × wk Length: 1 h	Routine care	HPLP-II, M-PCOSQ
Javanbakht et al. (2023) (RCT)	INT: 30/30 CON: 30/30	8 wk (BL, 8 wk, 12 wk)	INT Age: 26.77 ± 4.76 y CON Age: 27.60 ± 4.84 y (Rotterdam)	Type: Online telehealth MBI Quantity: 8 Frequency: 1 × wk Length: 120 min	Type: face-to-face counselling Quantity: 8 Frequency: 1 × wk Length: 120 min	PCOSQ
Majidzadeh et al. (2023) (RCT)	INT: 42/42 CON: 42/42	8 wk (BL, 8 wk)	INT Age: 30.3 ± 5.5 y CON Age: 32.0 ± 4.8 y (Gynaecologist & medical records)	Type: CBT Quantity: 8 Frequency: 1 × wk Length: 60–90 min	Routine care	STAI-S, BDI-II, and PCOSQ
Moeller et al. (2019) (RCT)	INT: 19/14 CON: 18/14	6 m (BL, 6 m)	INT Age: 34 (23–38) y CON Age: 27 (22–30) y (Rotterdam)	Type: MI Quantity: 12 Frequency: b wk Length: unspecified	Routine care	WHO-5, MDI, PCOSQ, SF-36
Moradi et al. (2020) (RCT)	INT: 26/22 CON: 26/23	8 wk (BL, 8 wk, 12 wk)	18–45 y actual age of participants not reported (Rotterdam)	Type: ACT Quantity: 8 Frequency: 1 × wk Length: 90 min	Routine care	BICI, RSE
Oberg et al. (2020) (RCT)	INT: 34/30 CON: 34/27	16 wk (BL, 16 wk, 12 m *)	INT Age: 31.0 ± 5.1 y CON Age: 29.9 ± 5.7 y (Rotterdam)	Type: Group Behaviour modification, 1-2-1 coaching Quantity: 16 group and 4 individuals Frequency: Group 1 × wk, 1-2-1 1 × mth Length: Unspecified	Wait-list	PGWBI, SSP
Ranasinghe et al. (2023) (NRCT)	INT: 20/17 CON: 22/17	10 weeks (BL, 6 wk, 14 wk)	INT Age: 29.0 ± 5.0 y CON Age: 28.72 ± 6.04 y (Rotterdam)	Type: Group peer support Quantity: 10 Frequency: 1 × wk Length: 90 min	Placebo intervention (10 health articles)	CES-D, M-PCOSQ, Brief-COPE

Table 2. *Cont.*

Study (Design)	*N* Randomised/Analysed	Intervention Duration (Assessment Points)	Participant Characteristics (PCOS Diagnostic Criteria)	Intervention	Comparator(s)	Outcome Measures
Salajegheh et al. (2023) (NRCT)	INT: 30/27 CON: 30/30	8 weeks (BL, 8 wk, 12 wk)	INT Age: 32.25 ± 4.67 y CON Age: 31.4 ± 4.37 y (Rotterdam)	Type: MBSR Quantity: 8 Frequency: bi-wk Length: 90 min	Routine care	Researcher-created PCOS questionnaire
Stefanaki et al. (2015) (RCT)	INT: 23/15 CON: 15/15	8 wk (BL, 8 wk)	INT Age: 23.4 ± 4.62 y CON Age: 28.3 ± 7.20 y (Rotterdam)	Type: MSM audio compact CD & follow-up call Quantity: 8 Frequency: 1 × wk Length: 30 min	Routine care	DASS-21, PCOSQ, PSS-14, DLGLF
M. X. C. Yin et al. (2021) (RCT)	INT: 9/9 CON: 9/9	6 wk (BL, 6 weeks, 3 m PV)	INT Age: 29.22 ± 2.33 y CON Age: 28.11 ± 3.44 y (Rotterdam)	Type: Group I-BMS Quantity: 6 Frequency: 1 × wk Length: 3 h	No intervention except one health education information session	BAI, BDI-II, PCOSQ
ZareMobini et al. (2022) (RCT)	INT: 33/33 CON: 33/33	1 wk (BL, 4 wk, 3 m)	INT Age: 29.15 ± 6.94 y CON Age: 30.15 + 6.48 y (Rotterdam)	Type: LS modification using 5A's model Quantity: 4 Frequency: 4 × 1 wk Length: 45–60 min	No intervention except 2 × nutritional and physical activity recommendations	SCL-90-R

Studies are presented by lead author and year of publication. Design: RCT—randomised controlled trial; NRCT—non-randomised controlled trial. N randomised—the number of participants that were randomised into each study arm at baseline. N analysed is the number of participants included within the analysis. INT—intervention group. CON—control group. Diagnostic criteria: the specific criteria used to confirm a PCOS diagnosis, NIH National Institute of Health diagnostic criteria (Zawadski & Dunaif, 1992; Rotterdam ESHRE/ASRM-Sponsored PCOS Consensus Workshop Group, 2004). Intervention duration: length of the duration; assessment points the time-points at which researchers have assessed outcome measures. Participant characteristics presented as mean ± standard deviation (SD) or median in two studies (Moeller et al., 2019, Cooney et al., 2018) for age (in years, y). Outcome measures refer to the outcomes from each study that are relevant to this systematic review. BL—baseline; mins—minutes; hr—hour; wk—week; bi-wk—bi-weekly; mth—month; PV—post-intervention; n/r—not reported. 5A's model of behaviour change provides a sequence of evidence-based clinician and office practice behaviours (Assess, Advise, Agree, Assist, Arrange) (Fitzpatrick et al., 2016). ACT—acceptance and commitment therapy. BAI—Beck Anxiety Inventory. BDI-II—Beck's Depression Inventory. BICI—Body Image Concern Inventory. BIQ—Body Image Questionnaire; Brief-COPE—Brief Coping Orientation to Problems Experienced Inventory. CBT— cognitive behavioural therapy. CES-D—Centre for Epidemiological Studies Depression. DLGLF—Daily Life and General Life Satisfaction Questionnaires. DASS-21—Depression, Anxiety and Stress Scale. EFT—emotion-focused therapy. FertiQoL—Fertility Quality of Life. FIS—Fatigue Impact Scale. FFMQ—Five Facet Mindfulness Questionnaire. FSFI—Female Sexual Function Index. HPLP—Walker Health Promoting Lifestyle Questionnaire, HPLP-II—Walker Health Promoting Lifestyle Questionnaire version two. I-BMS—Integrative Body–Mind Spirit. IPAQ—The International Physical Activity Questionnaire. LS—lifestyle counselling. MBAT—mindfulness art-based therapy. MDI—Major Depression Inventory. MBI—mindfulness-based intervention. MBSR—mindfulness-based stress reduction. MI—motivational interviewing. M-PCOSQ—Modified Polycystic Ovary Syndrome Quality of Life Scale. MSM—Mindfulness stress management. PSS-14— Perceived Stress Scale. MBSRQ—Multidimensional Body-Self Relations Questionnaire. PCOSQ—Polycystic Ovary Syndrome Quality of Life Scale. PGWBI— Psychological General Well-Being Index. RSE—Rosenberg Self-Esteem Questionnaire. SBCF—Stages of Behavioural Change Form. SF—short form; SSP—Swedish Universities Scales of Personality. STAI-S—The Spielberger State-Trait Anxiety Inventory. SCL-90-R—Symptom Checklist-90-Revised. SF-36—36-Item Short Form Survey. TADFC—Type and Amount of Daily Food Consumption Form. TM—transtheoretical model. TSST—Trier Social Stress Test. WHO-5—The World Health Organisation- Five Well-Being Index. * Control group received intervention in this time.

3.6. Risk of Bias in Studies

Risk of bias judgements are presented in Figure 2 (Supplementary File S3: Figure S1). Eight trials were judged to have a low risk of bias arising from the randomisation process (Abdollahi et al., 2018; Bafghi et al., 2024; Baghbani et al., 2024; Dilek et al., 2022; Hamzehgardeshi et al., 2024; Javanbakht et al., 2023; Majidzadeh et al., 2023; ZareMobini et al., 2022), whilst five studies were judged as having a high risk (Amirshahi et al., 2024a; Cooney et al., 2018; Salajegheh et al., 2023; Stefanaki et al., 2015; M. X. C. Yin et al., 2021). The remaining trials were judged to have an unclear risk of bias due to insufficient reporting of sequence generation or allocation concealment methods. Six studies were judged as having a low risk of bias regarding deviations from the intended intervention (Dema et al., 2023; Dilek et al., 2022; Hamzehgardeshi et al., 2024; Javanbakht et al., 2023; Oberg et al., 2020; Stefanaki et al., 2015). Conversely, three studies were judged to have a high risk of bias due to deviations from the intended intervention (Baghbani et al., 2024; Cooney et al., 2018; Majidzadeh et al., 2023), with the remaining trials judged as having an unclear risk of bias due to either minor amendments to intended intervention, no identified protocol, or insufficient information provided to make an informed assessment. The majority of trials were deemed to have a low risk of bias due to missing outcome data, with only one trial judged as high risk of bias (Stefanaki et al., 2015) due to high attrition (35%). There were 12 trials judged as having a high risk of bias in outcome measurement (Amirshahi et al., 2024a; Bafghi et al., 2024; Cooney et al., 2018; Dilek et al., 2022; Javanbakht et al., 2023; Majidzadeh et al., 2023; Moeller et al., 2019; Oberg et al., 2020; Ranasinghe et al., 2023; Salajegheh et al., 2023; M. X. C. Yin et al., 2021; ZareMobini et al., 2022) due to possible influence from knowledge of the intervention received, variation in administration of questionnaires, or inappropriate outcome measures. Three trials were judged as having a low risk of bias in this domain (Abdollahi et al., 2018; Hamzehgardeshi et al., 2024; Stefanaki et al., 2015), whilst the remaining trials were judged as having an unclear risk (Baghbani et al., 2024; Dema et al., 2023; Moradi et al., 2020) due to a lack of clarity in how blinding was reported. All trials were judged as having unclear risk of bias for selection of reported results due to trials not reporting a prespecified analysis plan.

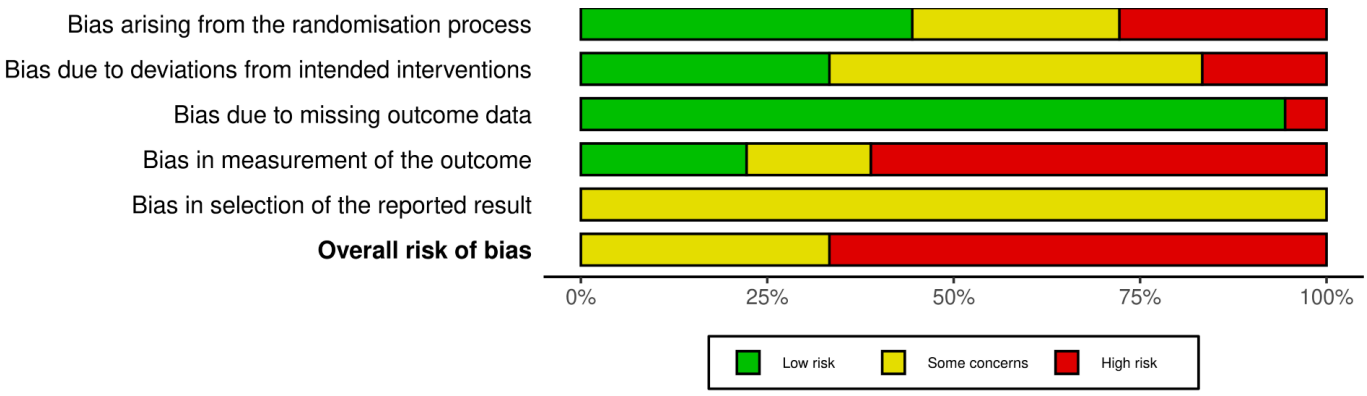

Figure 2. Summary of authors' judgement for each domain of the Cochrane Risk of Bias 2 tool, presented as a percentage across all included studies.

3.7. Meta-Analysis Results

Due to data availability, a meta-analysis was possible for only one comparison: psychological intervention versus control. Twelve trials were included in this meta-analysis, and the results are presented in Figures 3–6. It was not possible to include two studies in the meta-analysis (Cooney et al., 2018; Moeller et al., 2019) as extracting the relevant data was not feasible. Attempts were made to contact the authors and to transform the data; however, contact was not possible, so these studies have been discussed narratively. Other outcomes in six studies (Dema et al., 2023; Dilek et al., 2022; Hamzehgardeshi et al., 2024; Moradi et al., 2020; Oberg et al., 2020; Salajegheh et al., 2023; Stefanaki et al., 2015) were excluded from the meta-analysis due to lack of comparable measures, and are also discussed narratively.

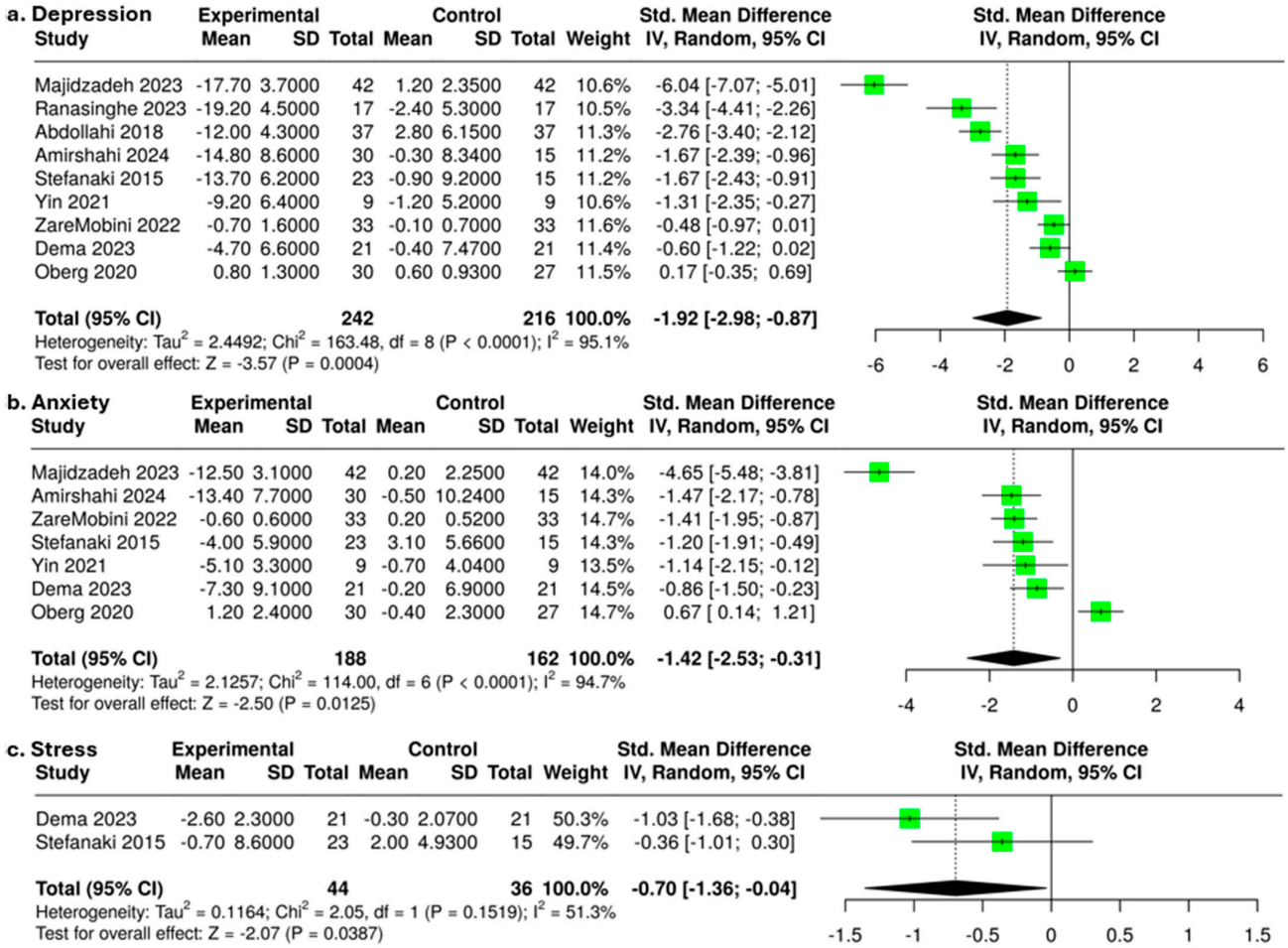

Figure 3. Forest plot of comparison: change from baseline, outcomes: (**a**) depression, (**b**) anxiety, and (**c**) stress.

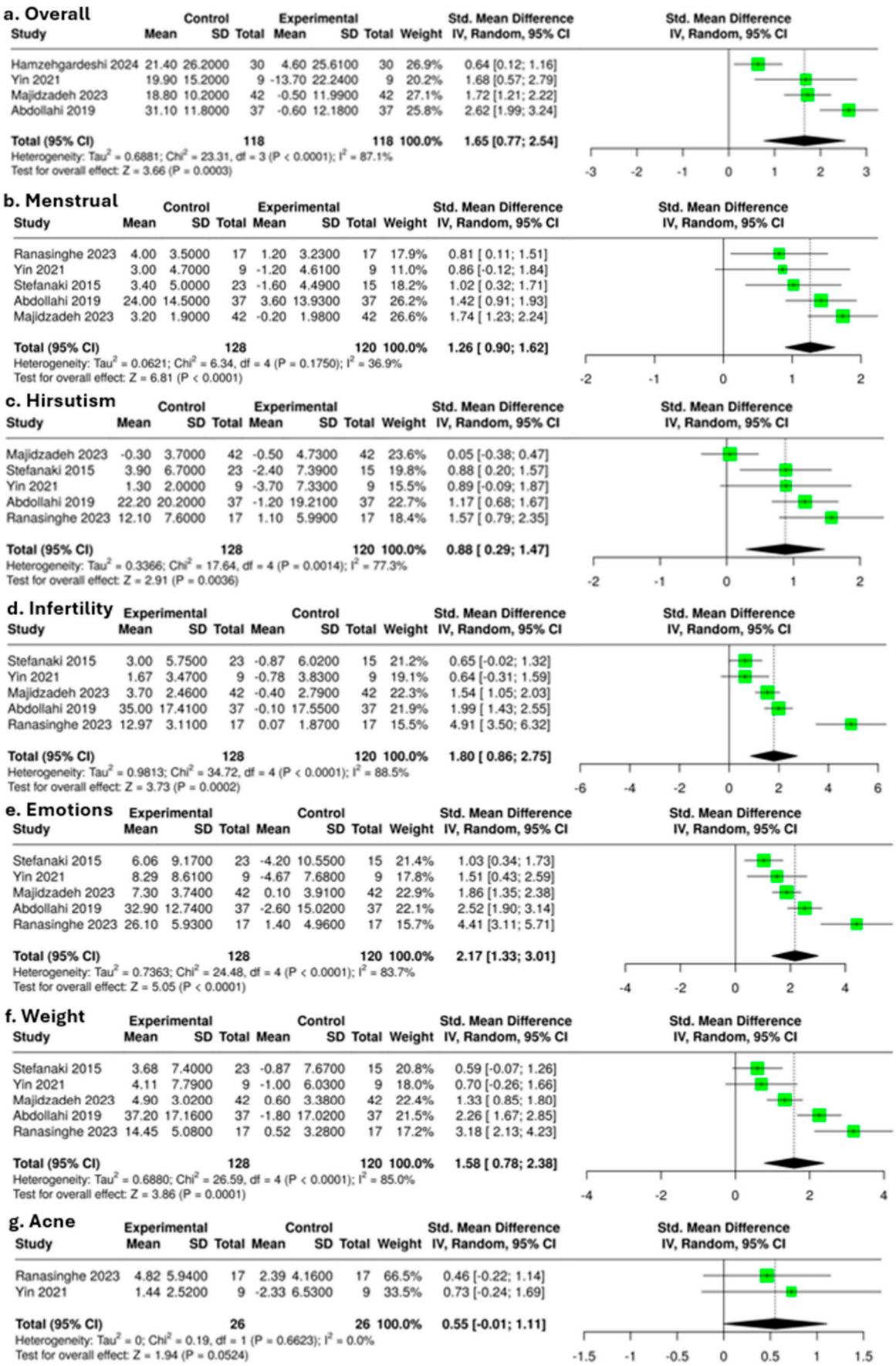

Figure 4. Forest plot of comparison: change from baseline, outcomes for PCOS specific quality of life: (**a**) overall, (**b**) menstrual, (**c**) hirsutism, (**d**) infertility, (**e**) emotions, (**f**) weight, and (**g**) acne domains.

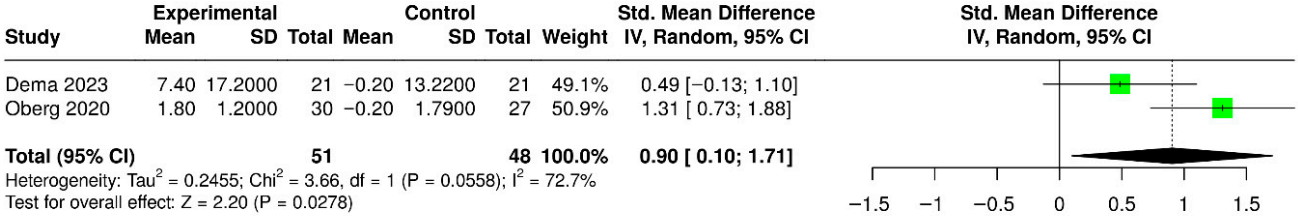

Figure 5. Forest plot of comparison: change from baseline, outcome: general health.

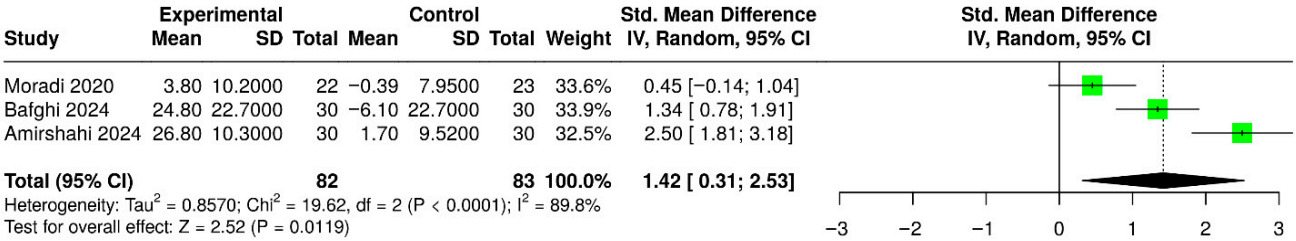

Figure 6. Forest plot of comparison: change from baseline, outcome: body image.

3.7.1. Depression

Meta-analysis of nine studies (Abdollahi et al., 2018; Amirshahi et al., 2024a; Dema et al., 2023; Majidzadeh et al., 2023; Oberg et al., 2020; Ranasinghe et al., 2023; Stefanaki et al., 2015; M. X. C. Yin et al., 2021; ZareMobini et al., 2022), including 458 participants, revealed a statistically beneficial effect of psychological interventions on change from baseline depression when compared to controls (SMD: −1.92; 95% CI: −2.98 to −0.87; p = 0.0004; Figure 3a), but with evidence of a considerable degree of heterogeneity (I^2 = 95.1%). After visual inspection of the forest plot, the study by Majidzadeh et al. (2023) was identified as an outlier; in a leave-one-out analysis, we excluded that study which reduced the effect estimate to −1.41 (95% CI: −2.22 to −0.61; p = 0.0006). Whilst there was a reduction in the effect estimate, heterogeneity remained at a considerable level (I^2 = 91.1%). Applying GRADE, the quality of the evidence that psychological interventions improve depression in PCOS was rated as low-quality evidence (Table 3) due to an unclear or high-risk of selection, detection, and reporting bias, as well as due to the observed heterogeneity between individual studies. Based on the performed sensitivity analyses, the observed effect remained when assessing only RCTs (SMD: −1.76; 95% CI: −2.86 to −0.66; 8 studies; 424 participants; p = 0.0018; I^2 = 95.3%), excluding high risk of bias studies (SMD: −2.20; 95% CI: −3.89 to −0.51; 3 studies; 150 participants; p = 0.0108; I^2 = 93.5%), and studies with fewer than 30 participants (SMD: −2.00; 95% CI: −3.16 to −0.85; 8 studies; 440 participants; p = 0.0007; I^2 = 95.7%). When analysis of post-intervention values was completed, the statistical effect was not retained, but the heterogeneity might not be important (I^2 = 11%) (Supplementary File S2: Tables S12 and S13).

Table 3. Summary of findings for primary outcomes: psychological interventions versus control/usual care, and certainty of the corresponding evidence using the Grading of Recommendations Assessment, Development, and Evaluation (GRADE) approach (Guyatt et al., 2011; Schunemann et al., 2022).

Outcomes (Change from Baseline)	SMD (95% CI)	Number of Participants (Studies)	Certainty of the Evidence (GRADE)	Comments
Depression	−1.92 (−2.98 to −0.87)	458 (9 trials)	⊕⊕◯◯ Low [a,b]	Compared to control, psychological interventions may improve depression but there is some uncertainty about the true effect.
Anxiety	−1.42 (−2.53 to −0.31)	350 (7 trials)	⊕⊕◯◯ Low [a,b]	Compared to control, psychological interventions may improve anxiety but there is some uncertainty about the true effect.
Stress	−0.70 (−1.36 to −0.04)	80 (2 trials)	⊕◯◯◯ Very low [a,c,d]	Compared to control, psychological interventions may improve stress, but we are very uncertain about the true effect.
PCOSQ Overall	1.65 (0.77 to 2.54)	236 (4 trials)	⊕⊕◯◯ Low [a,b]	Compared to control, psychological interventions may improve PCOS-specific quality of life, but there is some uncertainty about the true effect.
General Health	0.90 (0.10 to 1.71)	99 (2 trials)	⊕◯◯◯ Very low [a,b,c,d]	Compared to control, psychological interventions may improve general health, but we are very uncertain about the true effect.
Body Image	1.42 (0.31 to 2.53)	165 (3 trials)	⊕◯◯◯ Very low [a,b,d]	Compared to control, psychological interventions may improve body image, but we are very uncertain about the true effect.

Key: SMD: standardised mean difference; CI: confidence interval; PCOSQ: polycystic ovary syndrome questionnaire

GRADE Working Group grades of evidence
High certainty: We are very confident that the true effect lies close to that of the estimate of the effect. Moderate certainty: We are moderately confident in the effect estimate, the true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different. Low certainty: Our confidence in the effect estimate is limited, the true effect may be substantially different from the estimate of the effect. Very low certainty: We have very little confidence in the effect estimate, the true effect is likely to be substantially different from the estimate of effect.

Explanations:
[a] Downgraded once: all trials judged to have an overall unclear/high risk of bias.
[b] Downgraded once: substantial to considerable degree of between-study heterogeneity.
[c] Downgraded once: despite statistical significance, null/negligible effect and appreciable benefit included in the 95% CIs.
[d] Downgraded once: small number of studies and small sample size.

Two additional studies that were not meta-analysed also reported depression (Cooney et al., 2018; Moeller et al., 2019), but neither found statistically significant changes in depression following their respective interventions. However, it should be noted that participants who presented with depressive symptoms in both studies did see a statistical improvement; Moeller et al. (2019) found a statistical decrease in MDI scores ($p = 0.008$) in 12 participants presenting with depression at baseline. Cooney et al. (2018), who only included depressed participants, found an overall reduction in depression across the cohort with 46.6% demonstrating a normal screening for depression at the end of the intervention; however, no significant differences between groups were found ($p = 0.68$). Whilst there are statistical improvements in depression, the quality of the evidence is very uncertain and contradictory evidence is presented in the narrative synthesis.

3.7.2. Anxiety

Meta-analysis of seven studies (Amirshahi et al., 2024a; Dema et al., 2023; Majidzadeh et al., 2023; Oberg et al., 2020; Stefanaki et al., 2015; M. X. C. Yin et al., 2021; ZareMobini et al., 2022) including 350 participants, revealed a statistical effect for psychological interventions on change from baseline anxiety when compared to controls (SMD: −1.42; 95% CI: −2.53 to −0.31; $p = 0.0125$; Figure 3b) with evidence of considerable heterogeneity ($I^2 = 94.7\%$). Once again, the study by Majidzadeh et al. (2023) was identified as an outlier and was removed in a leave-one-out analysis. Removing this study reduced the effect estimate to −0.88 (95% CI: −1.64 to −0.13; $p = 0.0213$) and reduced the I^2 value slightly to 87.2%. It was only possible to conduct a sensitivity analysis removing small studies, and when this was performed, a statistically beneficial effect remained (SMD: −1.47; 95% CI: −2.72 to −0.21; 6 studies; 332 participants; $p = 0.0219$; $I^2 = 95.6\%$). Post-intervention analyses showed non-significant results (Supplementary File S2: Tables S12 and S13). Applying GRADE, the quality of the evidence for the psychological interventions to improve anxiety in PCOS was rated as low-quality evidence (Table 3) due to unclear risk or high-risk of selection, detection, and reporting bias, as well as due to the observed heterogeneity between individual studies (Figure 3b).

Two studies that also reported on anxiety were not included in the meta-analysis (Cooney et al., 2018; Dilek et al., 2022). One of these studies (Cooney et al., 2018) reported that anxiety decreased 0.27 points per week ($p = 0.03$) but that there were no differences between the CBT and CBT plus lifestyle intervention groups ($p = 0.49$). Whilst statistically significant, the overall improvement is small and may not be considered clinically relevant. Dilek et al. (2022) reported decreased anxiety following the intervention ($p = 0.045$), but it is unclear how this was measured.

3.7.3. Stress

Meta-analysis of two studies (Dema et al., 2023; Stefanaki et al., 2015) including 80 participants, revealed a statistically beneficial effect of psychological interventions on change from baseline stress when compared to controls (SMD: −0.70; 95% CI: −1.36 to −0.04; $p = 0.0387$; Figure 3c) with evidence of moderate to high heterogeneity ($I^2 = 51.3\%$). Applying GRADE, the quality of the evidence was rated as very low-quality (Table 3) due to unclear risk and/or high-risk of selection, detection, and reporting bias, the upper 95% CI being very close to zero (i.e., a negligible effect), a low number of eligible included studies and a small sample size. Post-intervention comparisons between intervention and control groups had no statistical effect. Sensitivity analyses could not be performed except for when the measure was swapped with the Depression, Anxiety and Stress Scale (DASS-21) stress subscale (Stefanaki et al., 2015) (SMD: −1.52; 95% CI: −2.53 to −0.51; $p = 0.0033$; $I^2 = 73.6\%$) which increased the effect estimate (Supplementary File S2: Table S13). Of note,

the DASS-21 assesses perceived stress during the last week, whereas the PSS assesses daily stress experienced during the last month.

One additional study also reported on stress, but it was not possible to meta-analyse the corresponding findings (Cooney et al., 2018). That study found that in both the CBT and CBT plus lifestyle intervention groups, stress was decreased in the overall cohort per week ($p = 0.03$); however, no differences were identified between groups ($p = 0.49$).

3.7.4. PCOS-Specific Quality of Life

Meta-analysis of four studies (Abdollahi et al., 2019; Hamzehgardeshi et al., 2024; Majidzadeh et al., 2023; M. X. C. Yin et al., 2021) showed a statistically beneficial effect of psychological interventions on the change from baseline for the overall PCOSQ scores when compared to controls (SMD: 1.65; 95% CI: 0.77 to 2.54; $p = 0.0008$; Figure 4a), but with evidence of substantial heterogeneity ($I^2 = 87.1\%$). Applying GRADE, the quality of the evidence was rated as low-quality (Table 3) due to unclear risk and/or high-risk of bias in more than one domain, and a substantial degree of heterogeneity. In sensitivity analyses, the observed effect on the change from baseline for the PCOS-specific QoL remained significant when only including larger sample sizes (SMD: 1.65; 95% CI: 0.57 to 2.73; 3 studies; 218 participants; $p = 0.0028$; $I^2 = 91.4\%$) (Supplementary File S2: Table S13). Post-intervention analysis showed non-significant results (Supplementary File S2: Tables S12 and S13).

Meta-analysis of five studies (Abdollahi et al., 2018; Majidzadeh et al., 2023; Ranasinghe et al., 2023; Stefanaki et al., 2015; M. X. C. Yin et al., 2021) including 248 participants found a statistically beneficial effect in change from baseline values for the menstrual (SMD: 1.26; 95% CI: 0.90 to 1.62; $p < 0.0001$; $I^2 = 36.9\%$), hirsutism (SMD: 0.88; 95% CI: 0.29 to 1.47; $p = 0.0036$; $I^2 = 77.3\%$), infertility (SMD: 1.80; 95% CI: 0.86 to 2.75; $p = 0.0002$; $I^2 = 88.5\%$), emotion (SMD: 2.17; 95% CI: 1.33 to 3.01; $p < 0.0001$; $I^2 = 83.7\%$), and weight (SMD: 1.58; 95% CI: 0.78 to 2.38; $p = 0.0001$; $I^2 = 85.0\%$) domains (Figure 4b–f). Based upon only two studies (52 participants), there was no statistical effect for the acne domain (Figure 4g). Comparison of post-intervention values showed no statistical effects for any of these domains. In the performed sensitivity analyses, all observed statistical effects remained apart from when studies with a high risk of bias were removed when analysing the overall score from the PCOSQ (Supplementary File S2: Tables S12 and S13).

Three additional studies also reported on PCOS-specific QoL, but it was not possible to meta-analyse their findings (Cooney et al., 2018; Dema et al., 2023; Javanbakht et al., 2023). These studies used the PCOSQ and showed improved PCOS-specific QoL. Moeller et al. (2019) did not report significance for PCOSQ overall; however, three PCOSQ domains for weight ($p = 0.004$), infertility ($p = 0.044$), and menstruation ($p = 0.037$) improved significantly. In contrast, Cooney et al. (2018) observed greater improvement in QoL in the combined CBT plus lifestyle intervention group at mid-point (8 weeks) in all PCOSQ domains compared to the LS group (3.7 points [IQR 2.9–5.0] vs. 1.2 points [IQR 0.9–2.7]; $p = 0.021$) and found minimal clinically important difference (MCID) in all domains except for the menstruation domain. There was, however, significantly improved QoL in the overall cohort by the end of the study (16 weeks) ($p < 0.005$) with no differences between groups. Another study (Javanbakht et al., 2023) found a significant increase in overall PCOS specific QoL for both MBI-based online and face-to-face ($p < 0.001$) interventions with between group difference indicating a greater improvement in the online group both at the end of the intervention and follow-up ($p < 0.001$).

3.7.5. General Health

Meta-analysis of two studies (Dema et al., 2023; Oberg et al., 2020) revealed a statistical effect on change from baseline general health when compared to controls (SMD: 0.90; 95% CI: 0.10 to 1.71; $p = 0.0278$; Figure 5), with evidence of substantial heterogeneity ($I^2 = 72.7\%$). Due to a lack of studies, sensitivity analyses on the change from baseline data were not possible, but the post-intervention analysis showed no statistical significance (Supplementary File S2: Tables S12 and S13). Applying GRADE, the quality of evidence was rated as low-quality due to unclear risk and/or high-risk of selection, detection, and reporting bias, inclusion of only two eligible studies, and small sample sizes (Table 3).

3.7.6. Body Image

Meta-analysis of three studies (Amirshahi et al., 2024a; Bafghi et al., 2024; Moradi et al., 2020) reporting on body image found a statistically beneficial effect upon body image for those receiving a psychological intervention when compared to control (SMD: 1.42; 95% CI: 0.31 to 2.53; $p = 0.0119$; 165 participants) but there was a considerable degree of heterogeneity ($I^2 = 89.8\%$). When sensitivity analyses were conducted, a statistically beneficial effect remained when studies with a high risk of bias (SMD: 0.90, 95% CI: 0.03 to 1.78; $p = 0.0431$; 105 participants; $I^2 = 78.1\%$) were removed. Analysis of post-intervention values retained a statistical effect (SMD: 0.80, 95% CI: 0.49 to 1.12; $p < 0.0001$) whilst also reducing heterogeneity to 0% (Supplementary File S2: Table S12).

3.7.7. Additional Outcomes

In total, 11 studies (Abdollahi et al., 2018; Amirshahi et al., 2024a; Baghbani et al., 2024; Dema et al., 2023; Dilek et al., 2022; Hamzehgardeshi et al., 2024; Moeller et al., 2019; Moradi et al., 2020; Oberg et al., 2020; Ranasinghe et al., 2023; Salajegheh et al., 2023) measured varying concepts of HR-QoL using a range of measures (Table 2). All studies reported statistical benefits following a psychological intervention, particularly those relating to general health (Moeller et al., 2019; Oberg et al., 2020; Salajegheh et al., 2023), mental health (Ranasinghe et al., 2023; Salajegheh et al., 2023), emotional health (Dema et al., 2023; Dilek et al., 2022; Moeller et al., 2019; Moradi et al., 2020; Ranasinghe et al., 2023; Salajegheh et al., 2023), interpersonal problems (Salajegheh et al., 2023), fatigue (Abdollahi et al., 2018; Dilek et al., 2022), sexual function (Amirshahi et al., 2024a; Salajegheh et al., 2023), fertility (Baghbani et al., 2024), and religious issues (Salajegheh et al., 2023) (Supplementary File S2: Tables S10 and S11).

Two studies (Cooney et al., 2018; Dilek et al., 2022) included mid-way assessment points. Of these two, one study (Cooney et al., 2018) assessed depression using the Center for Epidemiological Studies Depression (CES-D) and STAI weekly for 16 weeks and a mid-way assessment (week eight) was conducted for PCOSQ and PSS. Depression was found to decrease by 0.31 points per week ($p = 0.01$) in the overall cohort with no statistical differences between groups ($p > 0.05$). STAI-S scores decreased by 0.27 points per week, but no difference was found between groups ($p > 0.01$). At the mid-point assessment, the CBT plus lifestyle intervention group showed greater improvement in PCOSQ scores (3.7 points versus 1.2 points) with a clinically significant improvement in all PCOSQ domains except for the menstrual domain. The second study (Dilek et al., 2022) tracked monthly, and included six follow-up interviews (mid-test assessment at three months), finding statistical improvement in nutrition, physical activity, increased consumption of fruits and vegetables, and decreased daily calorie intake at the mid-point ($p < 0.01$), and post-intervention ($p < 0.001$) measures.

One study (Dema et al., 2023) followed up at six months post-intervention reported a longitudinal effect of the intervention on pain ($p < 0.05$), general health status ($p < 0.01$), and emotional limitations ($p = 0.01$) between the intervention and control group. Another study (Hamzehgardeshi et al., 2024) included a two-month follow-up assessment, finding that health-promoting behaviours increased for the intervention group ($p < 0.001$), while no statistical change was found for QoL. A further study (Javanbakht et al., 2023) conducted a follow-up four weeks post-intervention with PCOSQ results showing a statistical increase in PCOS specific QoL for both online and face-to-face groups, with a greater increase in the online group ($p < 0.001$). One study (Moradi et al., 2020) conducted a follow-up one month post-intervention, with the results showing a statistical reduction in body image concern and improved self-esteem in an intra-group comparison both immediately following the intervention and at follow-up ($p < 0.001$). A 12-month follow-up was conducted by another study (Oberg et al., 2020), finding that the subgroup of women with more than 5% weight loss had significantly lower anxiety at baseline compared to the group with no such weight loss ($p < 0.01$) and a higher proportion of moderate distress versus severe distress ($p < 0.01$). One study (Salajegheh et al., 2023) found that worries decreased ($p < 0.001$) in the intervention group at one month follow-up. Another study conducted a three month follow-up (M. X. C. Yin et al., 2021) with results suggesting that both depression ($p < 0.05$) and anxiety ($p < 0.01$) were statistically reduced, whilst HR-QoL also improved ($p < 0.01$) at post-intervention and follow-up. The study by ZareMobini et al. (2022) also conducted a three month follow-up finding that psychological symptoms (Symptom Checklist-90-R), except for obsessive compulsive level, were significantly lower at both one and three months post-intervention ($p < 0.05$) with the level of these symptoms decreasing overtime ($p < 0.001$) (Supplementary File S2: Table S11).

4. Discussion

4.1. Key Findings

The present systematic review provides a comprehensive synthesis of the existing evidence from studies assessing the effectiveness of psychological interventions on depression, anxiety, stress, PCOS-specific QoL, general health, and body image in women living with PCOS. It also includes a meta-analysis regarding these effects, with novel findings which are summarised in the following sections. Notably, we identified a statistically beneficial effect for depression, anxiety, stress, overall and multiple domain scores of the PCOSQ (i.e., menstrual, hirsutism, infertility, emotion and weight domain), general health, and body image. These findings are in agreement with previously published reviews (Jiskoot et al., 2022; Phimphasone-Brady et al., 2022), despite differences in included studies, and in methodological approaches. Similarly, a further systematic review and meta-analysis focusing on multiple health conditions (Pehlivan et al., 2024) found that psychological interventions led to significant improvements in body image and overall QoL. Several studies included in the review (De Frène et al., 2015; Mani et al., 2018; Mavropoulos et al., 2005; Nidhi et al., 2013) demonstrated positive effects across different domains of the PCOSQ, suggesting that psychological interventions, particularly those focusing on lifestyle modifications, education, and mind–body approaches like yoga, can significantly improve body image and various aspects of health for women with PCOS. However, it is important to note that findings derived from individual studies, particularly those reported narratively and not included in the meta-analysis, should be interpreted with caution. Results from single studies are more vulnerable to bias, imprecision, and methodological variability, and should not be considered equivalent in evidential weight to pooled estimates derived from quantitative synthesis.

The results of the present meta-analysis suggest psychological interventions may have a beneficial effect on anxiety and depression (decrease from baseline) in adult women with PCOS; these findings were not supported in the comparison of post-intervention values, whilst mixed results were reported in the narrative synthesis of the studies which were not eligible for the meta-analysis. However, there is a marked paucity of relevant studies, and the existing evidence is of low-quality, limiting the certainty of these conclusions. These findings are in agreement with a previously published review by Phimphasone-Brady et al. (2022) which found no significant effects upon post-intervention values and a lack of overall long-term beneficial effect, despite differences in included studies. However, a distinctive finding of their review identified a significant duration of effect for anxiety within intervention groups, suggesting that while psychological interventions may not lead to substantial between-group differences, they could still offer sustained benefits for individuals receiving the intervention particularly when scores are lower. This contrasts with the present systematic review's findings, which did not observe a significant duration of effect within (or between) study groups, highlighting potential variability in study methodologies, participant characteristics, and intervention types that may have influenced the corresponding reported outcomes. The substantial heterogeneity observed across several meta-analyses likely reflects important clinical and methodological differences between studies. PCOS is a heterogeneous condition with multiple diagnostic criteria (e.g., Rotterdam, NIH, AE-PCOS), each capturing different phenotypes that may influence psychological burden and treatment responsiveness (Azziz, 2014; Teede et al., 2023). Additionally, the included interventions varied in theoretical approach, format, duration, and intensity, while differences in sample characteristics such as baseline symptom severity, and comorbidity profiles may have further contributed to variability in effect estimates, a recognised challenge in psychosocial intervention research (Cuijpers et al., 2016). These factors likely contributed to the high I^2 values observed and suggest that pooled findings should be interpreted with appropriate caution, highlighting the need for greater standardisation in future trials.

The results of the present meta-analysis also highlight that the effectiveness of psychological interventions for improving stress in women with PCOS is very uncertain. We reported a statistically beneficial effect on change from baseline and when sensitivity analyses were conducted, replacing the PSS with the DASS-21 stress subscale, the effect estimate was increased. Whilst both DASS-21 and PSS are considered valid and reliable measures of psychological distress, the DASS-21 offers a more nuanced assessment by differentiating between depression, anxiety, and stress, and by assessing perceived stress during the last week with seven items (Lovibond & Lovibond, 1995a; Lovibond & Lovibond, 1995b), whereas the PSS measures general daily perceived stress during the last month using 14 items without distinguishing its sources (Cohen et al., 1983). Studies examining the relationship between these two scales (Andreou et al., 2011; Soria-Reyes et al., 2023) found high correlation coefficients between the subscales, indicating that, while both scales measure related constructs, they remain as distinct instruments. As such, the DASS-21 arguably provides a more comprehensive evaluation when assessing emotional constructs (Soria-Reyes et al., 2023).

Non-significant findings were also noted regarding the comparison of post-intervention stress values. The quality of the evidence relating to the effects on stress was deemed very low-quality (Table 3); since only two studies (Dema et al., 2023; Stefanaki et al., 2015) were included in the analysis which consisted of small samples, reported negligible effects, and had potential for bias in how they were conducted. When CBT was used alone or in conjunction with lifestyle changes, a statistical effect was reported by Cooney et al. (2018). The sensitivity evidenced in our meta-analysis, and the findings of the study by Cooney

et al. (2018) which was not eligible for the meta-analysis, warrant further investigation into the effect of psychological interventions on stress.

Compared to control, the present meta-analysis also showed that psychological interventions had a statistically beneficial effect on the overall change from baseline PCOSQ score. Such significant improvements were also noted for the menstrual, hirsutism, infertility, emotion, and weight domains of the PCOSQ, but not for the acne domain. The quality of the relevant evidence is low, and as such these findings remain uncertain (Table 3). The noted effect for the overall PCOSQ score became non-significant in the sensitivity analysis when we removed studies with a high risk of bias; however, all domain scores remained significant, suggesting that the results from the primary analysis can be considered robust (Deeks et al., 2019). Nevertheless, the quality of the existing evidence was judged to be low and as such these findings remain uncertain (Table 3).

Whilst the statistical significance for the PCOSQ and its domains reported in this review appear promising, comparable results have been observed in other systematic reviews evaluating different interventions for PCOS-related QoL. Zhao et al. (2024) meta-analysed the effectiveness of MBIs, such as yoga, tai chi, and CBT, finding significant improvements in the emotion (MD: 7.75; 95% CI: 6.10 to 9.40), hirsutism (MD: 2.73; 95% CI: 0.54 to 4.91), menstrual (MD: 3.79; 95% CI: 2.89 to 4.69), and weight (MD: 1.48; 95% CI: 0.03 to 2.93) domains. However, no significant improvement was observed in the infertility domain (MD: 2.10; 95% CI: −0.05 to 4.24). Xie et al. (2024) assessed behavioural interventions for PCOS, reporting a significant effect in the weight domain (MD: 0.58; 95% CI: 0.15 to 1.02), while other domains showed no statistical benefits. Similarly, Kite et al. (2019) analysed exercise interventions and found no significant improvements in the overall or domain-specific PCOSQ scores. Collectively, these suggest that psychological interventions may serve as a valuable adjunct or alternative to exercise for enhancing QoL. Compared to previous findings, our review demonstrated statistically significant improvements across all assessed PCOSQ domains except for acne. Notably, it showed a greater effect on infertility (SMD: 1.09; 95% CI: 0.41 to 1.78), whereas Zhao et al. (2024) found that MBIs had no significant impact on this domain. While MBIs reported stronger effects on the emotional, hirsutism, and weight PCOSQ domains, our findings align with those of psychological and lifestyle-based interventions, reinforcing their role as effective strategies for improving QoL in PCOS. Post-intervention differences indicated that all PCOSQ domain scores became non-significant, suggesting that psychological interventions may only provide short-term benefits to PCOS specific QoL. Additional studies that conducted follow up assessments, ranging from one month to one year show mixed results. Some studies report sustained improvements in QoL (Javanbakht et al., 2023; M. X. C. Yin et al., 2021), others indicate more limited or short-term benefits (Hamzehgardeshi et al., 2024) raising possible concerns regarding long-term effectiveness, and also highlighting the need for ongoing support or alternative approaches to sustain beneficial effects. This may also be attributed, at least in part, to methodological limitations, such as the small sample sizes and intervention variability. Previous studies reflect similar concerns (Cooney et al., 2017; Phimphasone-Brady et al., 2022; Tang et al., 2022), noting that the long-term sustainability of benefits remains unclear. These findings underscore the importance of exploring strategies for ensuring lasting effects, as well as the need for further research to determine not only the duration and stability of these effects but also the factors influencing long-term success. Moreover, the results of the present meta-analysis suggest that psychological interventions produce a moderate statistical improvement in the general health of women with PCOS, compared to controls. The corresponding existing evidence was deemed as being very low-quality and the sensitivity and post-intervention analyses failed to demonstrate sustained effects, suggesting that the initial benefits may not persist over time.

Findings from this meta-analysis suggest that psychological interventions may have a beneficial effect on reducing body image dissatisfaction from baseline in adult women with PCOS. Although a considerable degree of heterogeneity was initially observed, sensitivity analyses demonstrated that the beneficial effect remained statistically significant following the removal of studies at high risk of bias. Furthermore, analyses of post-intervention values retained a statistically significant effect, while heterogeneity was reduced to 0%, indicating greater consistency in treatment effects at post-intervention. However, the overall certainty of the evidence was rated as very low, limiting the certainty of the observed effects. Nevertheless, within a population in which body image dissatisfaction is consistently reported as elevated (Davitadze et al., 2023) and has been shown to mediate symptoms of depression, anxiety (Alur-Gupta et al., 2019), and disordered eating behaviours (Hofmann et al., 2025), psychological interventions may offer broader downstream benefits for psychological well-being. This pattern is consistent with improvements observed in certain PCOSQ domains that are closely related to body image (e.g., weight and hirsutism related domains), suggesting the presence of a shared underlying psychological mechanism. Such findings align with emerging literature emphasising the relevance of psychological approaches in PCOS management (Pehlivan et al., 2024). Improvements in body image dissatisfaction may therefore represent a key mechanism through which psychological interventions reduce mental health burden, enhance QoL, and support more adaptive coping with the physical and social challenges associated with PCOS.

Reported outcomes from studies included in this systematic review which were not possible to be meta-analysed report statistically beneficial effects on general health, mental health, emotional health, interpersonal problems, fatigue, sexual function, fertility, and religious issues. Psychological interventions have been shown to lead to moderate improvements by alleviating symptoms of anxiety, depression, and stress, which in turn can enhance physical health outcomes, including energy levels and symptom management (Cuijpers et al., 2016; Goyal et al., 2014). Furthermore, stress management has been linked to improved immune function and overall health (Shields et al., 2020). While psychological interventions may not induce significant physical changes, they offer meaningful benefits by addressing the psychological aspects of PCOS, which may indirectly contribute to the overall general health (Kubzansky et al., 2023). However, the limited sustainability of these effects suggests that longer-term or combined interventions may be necessary to achieve more lasting improvements in both mental and physical health.

In parallel to the duration of effect, it is also pertinent to explore its magnitude, at least in respect to the identified minimal difference which is clinically important. As such, MCID is a patient-centred metric which captures both the magnitude of improvement and the value that the patient places on that improvement (Jaeschke et al., 1989; McGlothlin & Lewis, 2014). MCID values are population and context-specific (e.g., dependent on baseline severity), and therefore are considered non-transferable across patient groups (Mouelhi et al., 2020). For the PCOSQ, the MCID is defined as >0.5 per domain (Cronin et al., 1998). Because the included studies have not consistently interpreted the PCOSQ scores to report their results, it is difficult to determine an MCID. However, when we consider the 0.5 as a percentage change, it is equivalent to at least 7%. Of note, where we identified statistically beneficial effects, increases in individual included studies ranged from 12% to 154%, suggesting that the reported improvements are likely to be clinically relevant. Whilst our reported effect sizes may help researchers/clinicians to determine the importance of observed differences in PCOSQ scores, caution should be adopted as the quality of the evidence is low, and individual studies have applied their results inconsistently (Cronin et al., 1998). This warrants further investigation and efforts to ensure that such questionnaires are applied and interpreted according to their instructions.

The present review found that psychological interventions had the largest effect on the emotion domain of the PCOSQ (SMD: 2.17), followed by the infertility (SMD: 1.80) and weight (SMD: 1.58) domains. These findings are consistent with Patten et al. (2021) who identified that psychological interventions, particularly CBT combined with lifestyle interventions, led to clinically significant improvements across all PCOSQ domains, while lifestyle interventions alone showed notable benefits in the weight and infertility domains.

Half of the included studies in the present study assessed depression by using the BDI-II, with the remaining studies by using the DASS-21, and CES-D scales, as well as the PGWBI and SCL-90-R subscales. Due to a lack of studies recommending MCID for depression in women with PCOS, previous studies reported using other populations as a guide to inform whether the data presented may be considered clinically important (Jiskoot et al., 2022). For the BDI-II, a reduction from baseline of 17.5% (or 32% for treatment resistant depression) is considered of clinical importance (Button et al., 2015). For outpatients, a reduction in DASS-21 scores between 3.86 (13.8%) and 6.15 (22%) for depression, 3.85 (19.3%) to 6.92 (34.6%) for anxiety, and 4.90 (14.4%) to 6.20 (18.2%) for stress (Ronk et al., 2013); or a reduction of 5.4 (29%) for depression, 3.61 (25%) for anxiety, and 7.16 points (30%) for stress (Yohannes et al., 2019), respectively, have been regarded as the MCID threshold. For the CES-D the only definition of MCID is based on the CES-D-15 (Haase et al., 2022) which suggests that a reduction of 11 points (18.3%) is clinically important. To the best of our knowledge, MCID is unavailable for both the PGWBI and the SCL-90-R. Although reported depression scores cannot be compared directly, the results from the included studies in the present systematic review and meta-analysis indicate larger reductions from baseline than those in the MCID for depression in the majority of included studies (87.5%). Previous studies have reported the effects of mixed clinical importance for depression with one exercise intervention not finding an MCID despite reporting significance (Sopna et al., 2023), whereas results of a three-component lifestyle intervention showed more than a 17.5% reduction from baseline for both intervention groups (Jiskoot et al., 2020). Based on the aforementioned limitation that the MCID is non-transferable across patient groups in conjunction with the low-quality evidence, it is not possible to determine the MCID with certainty for all outcomes. Whilst several outcomes showed beneficial effects, their clinical relevance should be interpreted with caution. MCID thresholds were not consistently available across outcome measures, limiting the ability to determine whether observed improvements represent meaningful benefits for patients. Additionally, the generally short follow-up periods restrict conclusions regarding the durability and long-term clinical value of psychological interventions for women with PCOS. Further well-designed trials incorporating clearly defined MCIDs and longer follow-up periods are needed to better establish real-world clinical impact.

4.2. Overall Completeness and Applicability of the Evidence

Comprehensive and systematic searches of key relevant electronic databases, as well as hand citation searches, were completed for the present systematic review, identifying 16 RCTs and two non-RCTs up to October 2025. The inclusion criteria applied included a broad definition of what constitutes a psychological intervention and, as such, a greater number of studies/interventions were included for evidence synthesis, with a wider range of reported outcomes, compared to previous systematic reviews (Jiskoot et al., 2022; Phimphasone-Brady et al., 2022; Tang et al., 2022). Four recent trials (Amirshahi et al., 2024a; Baghbani et al., 2024; Hamzehgardeshi et al., 2024; Javanbakht et al., 2023) which were not eligible for meta-analysis were not included in previous systematic reviews (Jiskoot et al., 2022; Pehlivan et al., 2024; Phimphasone-Brady et al., 2022; Tang et al., 2022), thus adding to the completeness of the reported data. Moreover, a particular strength of the conducted

meta-analyses is the use of change from baseline data in addition to post-intervention analysis between intervention and control.

The findings of this systematic review and meta-analysis highlight both alignments and tensions with existing literature, reflecting the complexities in evaluating psychological interventions for PCOS, particularly given the heterogeneity of the condition in terms of phenotypic presentation, symptom severity, and individual treatment responses. The present review identifies statistically significant improvements in depression and PCOS-specific QoL, but the evidence quality is low, with results potentially overstated due to heterogeneity and risk of bias. However, the observed benefits are consistent with existing published literature (Jiskoot et al., 2022; Pehlivan et al., 2024; Phimphasone-Brady et al., 2022), who also report positive effects on depression and QoL. However, the magnitude of improvements in anxiety and stress contrast with findings from Raja-Khan et al. (2018) who reported substantial mental health benefits, and Cooney et al. (2017), who demonstrated reductions in stress within intervention groups, albeit without between-group significance. Differences in findings may be explained, at least in part, by imprecision in effect estimates, and the sensitivity of those estimates to the addition/removal of individual studies or measurement tools. The variability across studies impacts on the robustness of the evidence, particularly given the reliance on small sample sizes and inconsistent methodologies. Moreover, the inability to consistently determine MCIDs restricts the direct practical relevance of these findings.

All studies were judged to have a high or unclear risk of overall bias which was a contributing factor to the low or very low evidence quality judgments. High heterogeneity, imprecision in effect estimates, and small sample sizes also contributed to the noted reduced confidence. Taking quality into account, the evidence presented should be viewed with consideration to the variability in intervention design/methodologies between the included studies, and the possibility that the corresponding effect sizes may overestimate certain outcomes. This has also been acknowledged in previous systematic reviews and/or meta-analyses (Jiskoot et al., 2022; Pehlivan et al., 2024; Phimphasone-Brady et al., 2022; Tang et al., 2022) as a key factor limiting the generalizability of the relevant findings.

Five included trials (Amirshahi et al., 2024a; Cooney et al., 2018; Dema et al., 2023; Hamzehgardeshi et al., 2024; M. X. C. Yin et al., 2021) are likely insufficiently powered, further limiting the generalizability of the corresponding findings. Moreover, most trials excluded women with recognised mental health comorbidities such as depression, currently taking antidepressants, and other chronic health conditions. Due to the prevalence of comorbid mental health conditions in women with PCOS (Blay et al., 2016; Brutocao et al., 2018; Cooney et al., 2017; Dokras et al., 2011; Wang et al., 2021; X. Yin et al., 2021), future research (and indeed clinical practice) should routinely screen for mental health conditions and support women accordingly. Overall, the small number of trials meeting the applied eligibility criteria (although broadly defining eligible psychological interventions) and of those reporting on the same outcomes (and the same measurement method) resulted in limited numbers for specific outcomes. However, the potential beneficial effects reported here, suggest that there is an urgent need for sufficiently powered, well-designed and well-reported, RCTs to further investigate the potential of psychological interventions to improve the health of women living with PCOS.

4.3. Limitations of the Present Systematic Review

Although a robust search strategy was utilised across key relevant databases, it is possible that trials were missed which may have been eligible for inclusion. To decrease that possibility, hand citation searches of the identified literature were also conducted, and relevant studies were added to the search results for screening. Furthermore, the

applied inclusion criteria specified only those studies published in peer reviewed journals reported in English. Thus, potentially eligible studies within the grey literature or those published in another language may have been overlooked. Finally, due to the lack of a sufficient number of eligible trials, a publication bias analysis was not performed, since this is not sufficiently reliable when fewer than 10 studies are included in a meta-analysis (Deeks et al., 2019). Additionally, although NRCTs were included to provide a more comprehensive synthesis in an emerging field with a limited number of RCTs, this methodological decision introduces further considerations when interpreting the evidence. The RoB 2 (Sterne et al., 2019) tool is primarily designed for randomised trials, and its application to non-randomised designs may have resulted in more conservative bias judgments, as certain domains are inherently more likely to indicate higher risk in the absence of randomization. Consequently, these studies may have been inadvertently penalised in the appraisal process, potentially contributing to lower overall certainty ratings. Therefore, findings derived from non-randomised studies should be interpreted with appropriate caution when considering the strength and applicability of the evidence. Additionally, the substantial clinical and methodological heterogeneity observed across included studies, including variation in diagnostic criteria, intervention characteristics, and sample profiles may further limit the comparability of findings and reduce the precision of pooled effect estimates.

5. Conclusions

This systematic review and meta-analysis present an up-to-date, comprehensive synthesis of the existing evidence on the effects of psychological interventions in the management of PCOS. Findings include statistically beneficial effects on change from baseline for depression, anxiety, stress, general health, and PCOS specific QoL. Existing evidence is not sufficiently robust to support widespread implementation or to inform clinical practice with confidence, and as such, more evidence is needed to facilitate the development of evidence-based and effective psychological support for women with PCOS. Future work should consider undertaking robust, sufficiently powered RCTs with appropriate comparisons and consistent and validated outcome measures to strengthen the existing evidence base. To ensure interventions are also replicable, future trials should stipulate clear protocols, including the content of the intervention, and the delivery format (including frequency, number, and duration of sessions). Whilst blinding participants in psychological interventions is difficult, future trials should endeavour to ensure measures are implemented to blind individuals involved with data collection and analysis to reduce bias. Future research should also prioritise co-creation with patients and stakeholders, tailoring interventions to individual needs, whilst also ensuring accessibility and inclusivity. By advancing personalised and scalable solutions, psychological interventions have the potential for improved healthcare benefits for women with PCOS, as well as the potential to reduce healthcare costs by mitigating the long-term implications of psychological and physical comorbidities. Healthcare professionals should ensure that they follow evidence-based guidelines, screen for mental health issues, and develop patient-centred care pathways that allow prompt and appropriate referrals, dependent on the preference of the patient.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/psycholint8010015/s1, Supplementary File S1: PRISMA Checklist. Supplementary File S2: Table S1. Search algorithm OvidSP; Table S2. Search algorithm EBSCOhost; Table S3. Search algorithm Web of Science. Table S4. Search algorithm Cochrane library; Table S5. Details of excluded studies and reasons for exclusion; Table S6. Demographic characteristics of included studies: Age; Table S7. Demographic characteristics of included studies: Body Mass Index (BMI); Table S8. Summary of the scoring of the different mental health assessment scales/tools applied by the included studies; Table S9. Summary of the scoring of the different quality of life assessment

scales/tools applied by the included studies; Table S10. Summary of the scoring of the different general health assessment scales/tools applied by the included studies; Table S11. Summary of the scoring of the different body image assessment scales/tools applied by the included studies; Table S12. Summary of the scoring of miscellaneous outcome measures, including Fatigue, Self-Esteem, Coping and Mindfulness; Table S13. Summary of the effect estimates and heterogeneity for change from baseline and post-intervention for mental health, PCOS specific quality of life and general health outcomes; Table S14. Summary of the sensitivity analysis effect estimates and heterogeneity for change from baseline and post-intervention for mental health, PCOS specific quality of life and general health outcomes. Supplementary File S3: Figure S1. Authors' judgements for each risk of bias domain of the Cochrane Risk of Bias 2 tool for each included study.

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