

## REVIEW ARTICLE



# Effectiveness of continuous positive airway pressure therapy on romantic relationships and intimacy among individuals with obstructive sleep apnea: A systematic review and a meta-analysis

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## Summary

Obstructive sleep apnea is a common yet often overlooked chronic sleep disorder with significant health implications globally. Bedpartners play a vital role in motivating individuals with obstructive sleep apnea to seek medical help, though their sleep quality may suffer, straining the couple's relationship. From September 2023 to January 2024, utilizing PubMed, Scopus, BioMed Central, Cochrane Library, ScienceDirect and [www.clinicaltrials.gov](http://www.clinicaltrials.gov) databases, this systematic review meticulously examined data from 27 studies to investigate how continuous positive airway pressure therapy, recognized as the gold-standard for treating obstructive sleep apnea, may positively influence psychological dynamics within couples. Additionally, a meta-analysis was conducted on nine studies, to assess the effect of continuous positive airway pressure on erectile function, which is often compromised in patients with obstructive sleep apnea. The PRISMA checklist and specific quality assessments were followed to ensure methodological rigour and transparency. Findings reveal positive changes in conflict resolution for patients with obstructive sleep apnea post- continuous positive airway pressure adaptation ( $p < 0.05$ ). Emotional functioning ( $p = 0.002$ ) and social relationships ( $p < 0.001$ ) also show improvements in bedpartners. While six subjective assessments indicate enhancements in sexual quality of life for patients with obstructive sleep apnea, challenges related to continuous positive airway pressure use as a barrier to intimacy are acknowledged. Focusing on male patients with obstructive sleep apnea, findings demonstrated a substantial improvement in erectile function post-continuous positive airway pressure utilization, with a Z-score of 4.84 ( $p < 0.00001$ ). Female patients with obstructive sleep apnea using continuous

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positive airway pressure show no significant improvements in sexual functioning, while female bedpartners report positive changes. These insights emphasize the importance of holistic approaches in addressing the impact of obstructive sleep apnea on both individuals and their relationships.

#### KEYWORDS

continuous positive airway pressure therapy, intimate relationships, obstructive sleep apnea, rehabilitation psychology, systematic review

## 1 | INTRODUCTION

Obstructive sleep apnea (OSA) is a chronic sleep disorder characterized by recurrent upper airway obstruction, leading to intermittent breathing interruptions (Ogle, 2023). The global prevalence of OSA ranges from 9% to 38% in middle-aged adults, with higher rates in men and the elderly (Senaratna et al., 2017), particularly those with risk factors like obesity, smoking and alcohol use (Zhou et al., 2020).

Obstructive sleep apnea disrupts sleep-related breathing, and presents symptoms such as loud snoring, frequent awakenings, daytime sleepiness, headaches, nocturia, irritability and impaired concentration (Faber et al., 2019). It is linked to adverse health outcomes (Pauletto et al., 2021), including cardiovascular diseases (Bonsignore et al., 2019), such as hypertension (Battaglia et al., 2023), metabolic disorders (Li et al., 2018), cognitive impairment (Beaudin et al., 2021), and decreases health-related quality of life (Lee et al., 2016).

Despite its impact, underdiagnosis and undertreatment are quite common (Simpson et al., 2013), further expanding the associated health risks (Ayas et al., 2016).

In this context, the bedpartners, typically a spouse or cohabitant, fulfil a crucial function (Luyster, 2017), by often serving as the initial observer of symptomatic disruptions (Deegan & McNicholas, 1996) and motivating the patient to seek medical evaluation (Virkkula et al., 2005). However, this involvement impacts their sleep quality too (Chu et al., 2021), leading to heightened stress (João et al., 2018), depressive states (Yang et al., 2020) and anxiety (Carneiro-Barrera et al., 2022).

Moreover, the interaction between sleep quality and relationship quality is evident (Audigier et al., 2023), as impaired sleep correlates with perceived diminished relationship quality (Beattie et al., 2015) and a decrease in engagement in sexual activities (Kalmbach et al., 2015; Stannek et al., 2009) and sexual desire (King & Cuellar, 2016), both pivotal for marital satisfaction (Roels & Janssen, 2020).

Furthermore, during an apnea, a reduction in oxygen levels in the blood, known as hypoxia, may occur. This can lead to damage to blood vessels and tissues, including those in the penis, compromising typical erectile function (EF; Kellesarian et al., 2018), thereby increasing the risk of sexual dysfunction (Liu et al., 2015).

For these reasons, addressing sleep apnea, from mild (5–15 apneas per hr) to severe (> 30 events per hr; Malhotra et al., 2021), emerges as a crucial component for a couple's overall well-being, encompassing both psychological-relational and physical dimensions (Nishihata et al., 2015).

Currently, continuous positive airway pressure (CPAP) therapy, a device that delivers a continuous flow of air through a mask preventing the collapse of the upper airways during sleep (Basner, 2007), stands as the gold-standard for treating sleep apnea (Nokes et al., 2022). CPAP therapy ensures a deeper sleep (Batool-Anwar et al., 2016), improves oxygen saturation levels and reduces hypoxia (Foster et al., 2007), which is one of the primary causes of erectile dysfunction (ED; Oyedokun et al., 2023).

Given its demonstrated efficacy among patients, bedpartners could experience notable benefits too, reporting reduced fatigue (Parish & Lyng, 2003) and, consequently, more satisfaction with their couple relationship (Lai et al., 2016).

The primary objective is to systematically analyse existing data, examining whether CPAP therapy could potentially improve psychological dynamics within couples, as perceived by both patients and their partners. Furthermore, to explore the physiological aspects of sexual satisfaction and intimacy, through the assessment of sexual dysfunction, we plan to conduct a meta-analysis investigating ED in male patients with OSA before and after the utilization of CPAP therapy.

## 2 | METHODS

The present study is a systematic review and meta-analysis in line with the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement (Moher et al., 2009). The protocol was registered with the International Prospective Register Of Systematic Reviews (PROSPERO; Schiavo, 2019; Registration Number: CRD42023447071).

### 2.1 | Eligibility criteria

Only English-language articles, both quantitative and qualitative analyses, evaluating the impact of CPAP adaptation on the relationship of couples from both the perspective of patients and bedpartners were included. For the meta-analysis, only studies that explicitly provided scores on the EF subscale of the International Index of Erectile Function (IIEF) were included.

Table 1 provides a comprehensive overview of the eligibility criteria.

**TABLE 1** Eligibility criteria for systematic review.

Criterion	Inclusion	Exclusion	Inclusion 2	Exclusion 2
Time	From inception to January 2024	Studies outside these dates	From inception to January 2024	Studies outside these dates
Language	English (the recognized language of international scientific debate)	Non-English	English (the recognized language of international scientific debate)	Non-English
Type of article	Qualitative or quantitative studies (randomized control trials, case control studies, cross-sectional studies, longitudinal studies)	Only abstracts or titles available	Longitudinal studies	Only abstracts or titles available
Ethics clearance	Studies with approved ethics notification	Studies without approved ethics notification	Studies with approved ethics notification	Studies without approved ethics notification
Study focus	Adherence to CPAP therapy and its impact on couple relationship and intimacy	Studies that do not consider the outlined relationship	Studies that explicitly provided scores on the EF subscale of the IIEF before and after CPAP therapy	Studies that do not provide any score about EF
Literature focus	Studies that explore patients with OSA and their bedpartners' experience with CPAP therapy, and its impact on their couple relationship and intimacy	Articles that did not make a passing or token reference to patients with OSA and their bedpartners' experience with CPAP therapy, and its impact on their couple relationship and intimacy	Studies that explore EF scores in male patients with OSA before and after CPAP therapy	Articles that did not explore EF scores in male patients with OSA before and after CPAP therapy
Population and sample	Patients with OSA syndrome and their bedpartner (with any level of OSA severity: 1. Mild: 5–15 events per hr; 2. Moderate: > 15–30 events per hr; 3. Severe: > 30 events per hr)	All the other sleep disturbances	Patients with OSA syndrome (with any level of OSA severity: 1. Mild: 5–15 events per hr; 2. Moderate: > 15–30 events per hr; 3. Severe: > 30 events per hr)	All the other sleep disturbances

Note: Inclusion and exclusion criteria for the studies included in the systematic review.

Abbreviations: CPAP, continuous positive airway pressure; EF, erectile function; IIEF, International Index of Erectile Function; OSA obstructive sleep apnea.

## 2.2 | Information sources

Systematic searches were conducted from September 2023 to January 2024, encompassing studies available from the inception of the selected databases up to January 2024.

PubMed, Scopus, BioMed Central, Cochrane Library, ScienceDirect and [www.clinicaltrials.gov](http://www.clinicaltrials.gov) databases were systematically queried to identify all the included studies.

## 2.3 | Search strategy

The following Boolean terms were used for searching titles and abstracts: (“Obstructive Sleep Apnea syndrome” OR “OSA” OR “Sleep Apnea” OR “OSA patient”) AND (“CPAP” OR “Continuous positive airway pressure” OR “CPAP therapy”) AND (“Bedpartner” OR “Bedpartner” OR “Bedpartners”) AND (“Couple relationship” OR “Relationship satisfaction” OR “Relational quality of life” OR “Sexual relationship” OR “Sexual life satisfaction” OR “Sexual function” OR “Intimate relationship” OR “Intimacy”). The outcomes for each database were imported into Zotero (Idri, 2015), a free web-based collaborative software platform designed for organizing selected articles.

## 2.4 | Selection process and data collection process

The initial search and independent screening of all titles and abstracts were conducted by VP, using Zotero Software (Idri, 2015). The articles were then catalogued in a Microsoft Excel database and made available to the other authors. VP and EV independently screened the papers. In cases of disagreement, EV served as the adjudicator. The full texts of those meeting the inclusion criteria were subsequently examined for final inclusion by all authors. Results were synthesized and discussed by VP and EV, under the supervision of EB and PB.

### 2.4.1 | Data items

Given the absence of a universally defined construct for the quality of couple relationships, which encompasses various dimensions, we delineated the constructs explored through the instruments utilized in the included studies and included all outcomes compatible with each of the explored domains. According to our objectives, it is important to note that only the IIEF-15 and its abbreviated five-item version were included in the meta-analysis, while other instruments were examined solely during the systematic review process. This choice

was driven by the heterogeneity of the constructs considered and the diversity of the tools used to measure the psychological dimensions of relationship quality, making the execution of a meta-analysis challenging. For a meta-analysis to be valid, it is essential that included studies assess a similar variable and are based on similar research questions. Furthermore, the lack of numerous mean scores and standard deviations (SD), which could be attributed to the presence of selective reporting bias, further limited the inclusion of more psychological variables in the meta-analysis.

## 2.5 | OSA-specific quality of life questionnaire

In this section, we outline the instruments employed to evaluate the quality of life in patients diagnosed with OSA, with a specific focus on the condition's impact on their couple relationships, considering a CPAP usage period ranging from 6 weeks to 1 year.

1. The Functional Outcomes of Sleep Questionnaire (FOSQ) is a self-report questionnaire used to assess disease-specific quality of life in adults experiencing excessive sleepiness. It consists of either 30 (Weaver et al., 1997) or 10 items (Chasens et al., 2009), depending on the version used. The questionnaire evaluates various aspects of functional status, including activity level, vigilance, intimacy, sexual relationships, general productivity, and social outcomes. Specifically, the dimension of "Intimacy and Sexual Relationships" comprises four questions addressing the impact of sleepiness on intimate and sexual experiences. Participants rate their responses on a scale from 1 ("Yes, extreme") to 4 ("No"), with higher scores indicating less negative impact on the dimension due to sleep disturbance.
2. The Calgary Sleep Apnea Quality of Life Index (SAQLI; Ward Flemons & Reimer, 1998) is a 35-item self-report disease-specific health-related quality of life questionnaire for adult patients with OSA, designed to assess their daily functioning, social interactions, emotional functioning, OSA symptoms, treatment-related symptoms, and the therapeutic intervention impact.
3. The Symptoms of Nocturnal Obstruction and Related Events (SNORE-25; Piccirillo et al., 1998) instrument is a 25-item tailored to assess OSA-related quality of life. Each item is rated on a scale from 0 to 5, reflecting the severity of OSA symptoms over the past 2 weeks. A sexual quality of life domain is derived from two specific items (14 and 21), with scores ranging from 0 to 5.

## 2.6 | Quality of couple relationship questionnaire

In this section, we introduce the instruments that assess several variables defining the quality of a couple's relationship, including dynamics of support and conflict, communication, and cohesion, considering a CPAP usage period ranging from 6 weeks to 1 year.

1. The Quality of Relationship Inventory (QRI; Pierce et al., 1997) is a 25-item self-report questionnaire assessing three dimensions in

close relationships: support (seven items), measuring perceived social support; conflict (12 items), evaluating relationship conflict and ambivalence; and depth (six items), gauging relationship importance. Each dimension is rated on a four-point Likert scale (1 = "not true" to 4 = "almost always true"), with subscale scores derived from item averages.

2. The Couple Satisfaction Index-16 (CSI-16; Funk & Rogge, 2007) is a 16-item self-report questionnaire gauging relationship satisfaction among intact couples. It covers various relationship constructs, including emotional satisfaction, communication, partnership, fulfilment of needs, and overall satisfaction. Scores range from 0 to 81, with higher scores indicating greater relationship satisfaction, and scores below 51.5 indicating significant dissatisfaction.
3. The Quality Marriage Index (QMI; Norton, 1983) is a six-item self-report tool designed to assess the quality of a marital relationship (degree of happiness, sense of partnership, and strength of the marriage). Each item is rated on a 10-point Likert scale for the final item, and a seven-point Likert scale for the remaining five items. Total scores range from 6 to 45, with higher scores indicating a higher level of marital quality.

## 2.7 | Sexual life satisfaction and functioning questionnaire

In this section, our focus is on the dimension of sexuality and intimacy, utilizing instruments that measure both satisfaction with sexual life with a partner and perceived sexual functioning, considering a CPAP usage period ranging from 6 weeks to 1 year.

1. The Life Satisfaction Questionnaire (LiSat-11; Fugl-Meyer et al., 2002) is an 11-item self-report questionnaire designed to evaluate life satisfaction across various domains, including "partner relationship" and "sexual life". Participants rate each statement on a scale from 1 to 6, with 1 indicating "very dissatisfying" and 6 indicating "very satisfying". Higher scores reflect greater satisfaction with life.
2. The Brief Male Sexual Function Inventory (BSFI) (O'Leary et al., 1995) is an 11-item questionnaire used to assess male sexual functioning through five domains: sexual drive, EF, ejaculatory function, problem assessment of these functional domains, and overall sexual life satisfaction. Each item is rated on a five-point scale, with higher scores indicating better sexual functioning.
3. The Golombok Rust Inventory of Sexual Satisfaction (GRISS) (Rust & Golombok, 1985) is a 28-item self-report questionnaire that measures the most common psychosexual complaints. The male questionnaire yields seven subscale scores, reflecting sexual function in the following areas: impotence, premature ejaculation, sensuality, avoidance, satisfaction, frequency, and communication.
4. The Female Sexual Distress Scale (FSDS) (Derogatis et al., 2002) is a 12-item questionnaire designed to evaluate female sexual distress, a multidimensional construct describing distress associated

with inadequate or impaired sexual function in females. Each item is rated on a five-point scale (0–4).

5. The Female Sexual Function Index (FSFI) (Rosen et al., 2000) is a 19-item self-report questionnaire that assesses female sexual emotions and reactions during the last 4 weeks on a six-point scale (0–5). It covers six domain instruments measuring: desire, arousal, lubrication, orgasm, global satisfaction, and pain.
6. The IIEF (Rosen et al., 1997) is a 15-item self-report questionnaire designed to assess male sexual functioning and satisfaction according to four domains, comprising: EF, orgasmic desire, sexual desire, and sexual satisfaction, over the last 4 weeks. A score of 0–5 is awarded to each of the 15 questions that examine the four main domains. For the meta-analysis, we only focused on the ED domain, which was categorized according to three parameters: severe (1–10); moderate (11–16); and mild (17–25), with a score between 26 and 30 indicating its absence. In the literature, there is also a brief version of 5 items (IIEF-5; Rosen et al., 1999). The total score range is from 5 to 25, and it is obtained by summing the ordinal responses to the five items. An ED is classified into five categories based on the scores: severe (5–7); moderate (8–11); mild to moderate (12–16); mild (17–21); and no ED (22–25).

## 2.8 | Customized instruments for assessing CPAP users' and bedpartners' perspectives on individual and couple quality of life

In this section, we have compiled instruments that, while not previously validated, were custom-created by the authors of the included studies to evaluate the dynamics of the relationship between patients and their bedpartners.

1. The *Questionnaire on CPAP Therapy for the Partner of the Mask-Wearing Patient* (Fietze et al., 2023) is a self-report tool combining literature research and input from experienced staff members of the Sleep Medicine Center of the University Hospital Charit'e Berlin. It consists of three major areas: Demographics; Bedpartners' opinion and support of the mask and mask therapy (including the looks of the mask, its effect on relationship and intimacy, and support of the bedpartner); Satisfaction with relationship and mask therapy (four questions; from 1 = Very Satisfied to 5 = Very Dissatisfied, and 6 = Not Applicable).
2. A series of focus groups (Luyster, 2017), consisting of six overarching stimulus questions, was conducted with small groups of three or four individuals, separately targeting patients and bedpartners, to assess their experience with CPAP, as well as the obstacles and facilitators to its usage.
3. A semi-structured interview (Berg et al., 2023) based on topics such as how OSA had affected participants' lives and what the experience of using CPAP, or having a partner who uses CPAP, is like.

## 2.9 | Data extraction and coding

Data abstraction for the selected articles was conducted sequentially and independently by two reviewers (VP; EV) using an electronic database created in Microsoft Excel. In line with the criteria, we extracted means and SDs about the variables under consideration, including the quality of intimate and sexual relationships (encompassing sexual function, distress, and overall satisfaction) and the quality of couple relationships (in terms of support and conflict, emotional functioning, couple satisfaction, quality of marriage, and sexual life quality) both before and after CPAP therapy, considering a CPAP usage period ranging from 6 weeks to 1 year.

These results were drawn from a sample comprising both patients with OSA and/or their bedpartners involved in a couple relationship, in which the patient's apnea treatment using CPAP was deemed necessary.

Data about the study design, publication year, geographic region, sample size (including the percentage of male participants), mean age, body mass index (BMI) and the apnea–hypopnea index (AHI) were also extracted.

Furthermore, details such as the type of CPAP mask (nasal or oronasal), the duration of the relationship, the period between baseline and follow-up CPAP usage, nightly hours of CPAP usage, the drop-out frequency, and daytime sleepiness assessed using the Epworth Sleepiness Scale (ESS; Johns, 1991) were further documented.

Regarding the meta-analysis, the same databases were employed. However, exclusivity was given to those studies that compared the IIEF (Neijenhuijs et al., 2019) score, pre- and post-CPAP therapy, considering a CPAP usage period ranging from 6 weeks to 1 year.

## 2.10 | Study risk of bias assessment

Two independent authors (VP; EV) conducted a comprehensive risk-of-bias assessment, resolving uncertainties through collaborative discussions with other team members.

Evaluation of study quality employed distinct tools: Cochrane Risk-of-Bias version 2 (RoB 2) for randomized control trials (Higgins et al., 2011), the National Institutes of Health (NIH) Quality Assessment Tool for Observational Cohort and Cross-Sectional Studies (National Institutes of Health, 2014), and the Newcastle–Ottawa Quality Assessment Scale (NOS) for longitudinal studies (Wells et al., 2000).

These checklists included descriptive issues, and internal and external validity.

For qualitative records, the Critical Appraisal Skills Program (CASP) Qualitative Checklist was applied (CASP Qualitative Checklist, 2018). This checklist encompasses 10 facets, including study methodology, recruitment strategy, data collection, researcher–participant relationships, ethical considerations, data analysis, findings, and validity. Ratings were assigned as “Yes”, “No” or “Can't tell”.

## 2.11 | Effect measures

Where available, the effect size (ES) measure was extracted. Specifically, for the QRI, Cohen's *d* was extracted, while for the FOSQ, SAQLI, SNORE-25 and CSI-16, ESs were calculated by dividing the mean change scores by the SD of the changes (Cohen, 2013).

## 2.12 | Synthesis methods

Data synthesis in the Systematic Review followed a comprehensive strategy encompassing key parameters. This included extraction of details such as authors, number of participants, theoretical framework related to the quality of couple relationships and tool employed to assess it, average scores and SD recorded pre- and post-CPAP usage, ES, mean change, SD change, significance levels (at both 0.05 and 0.001 thresholds), and duration of follow-up. This systematic approach was consistently applied to articles exploring perspectives from both patients and bedpartners alike, ensuring a rigorous and uniform analysis across the board.

Only the articles discussing a subjective assessment of ED, before and after CPAP therapy, were used to conduct the meta-analysis. Specifically, through Review Manager 5.4.1, data from the IIEF-5 and the IIEF-15 EF subscales were extracted to synthesize CPAP treatment effects on EF in male patients suffering from OSA.

The IIEF-5 and IIEF-15 EF subscales served as the primary outcome measures and mean, and SD values were extracted for both pre- and post-treatment phases. Heterogeneity among the studies was assessed using the  $I^2$  statistic, with values of 25, 50 and 75 indicative of low, medium and high heterogeneity, respectively (Huedo-Medina et al., 2006). Given the modest sample size of the included studies, 95% confidence intervals (CIs) around  $I^2$  were reported, anticipating potential large heterogeneity. A random effects model was chosen to account for such anticipated heterogeneity. Evaluation of publication bias involved the inspection of a Funnel plot.

To minimize variability in results due to differences in assessment timing among the included studies and ensure greater robustness of the presented findings, the meta-analysis was conducted twice. In the initial run, studies examining the EF scale of the IIEF pre- and post-CPAP usage were included without distinguishing the duration of therapy usage. In the second iteration, only studies assessing EF pre-CPAP usage and at a 3-month interval were incorporated.

## 3 | RESULTS

### 3.1 | Study selection

Figure 1 illustrates the study's selection process. The initial database search generated a total of  $N = 424$  potentially relevant studies. Among these,  $N = 136$  duplicates were identified and subsequently eliminated, resulting in  $N = 288$  studies eligible for further evaluation. Upon the assessment of titles and abstracts and the removal of

additional duplicate entries,  $N = 41$  articles were retrieved for full-text examination and potential inclusion. After a thorough review of the full texts,  $N = 14$  studies were excluded for various specified reasons. Ultimately, our final dataset comprised  $N = 27$  studies that satisfied the inclusion criteria, nine of them, exploring ED through the IIEF-15 and IIEF-5, were also included in the meta-analysis. No study was excluded based on the quality assessment.

### 3.2 | Study descriptions

In total, 27 studies were analysed. Nearly all these studies (26 out of 27) explored the patients' perspectives, with six of them also considering the bedpartners' experiences. Only one study exclusively focused on the bedpartners' viewpoint (Fietze et al., 2023). Nine of the included articles are considered in the meta-analysis (Acar et al., 2016; Apergis et al., 2021; İrer et al., 2018; Kyrkou et al., 2022; Melehan et al., 2018; Pascual et al., 2018; Pastore et al., 2014; Taskin et al., 2010; Zhang et al., 2016).

More specific information about studies that focus on the points of view of patients with OSA are reported in Table 2, while Table 3 is about those studies on bedpartners' perspectives.

The total sample consists of 1806 patients (male,  $n = 1531$ ; 84.77%), mean age  $52 \pm 5.25$  years, with severe OSA (AHI  $\geq 30$ ), except for one study (Baron et al., 2017), and 916 bedpartners (male,  $n = 232$ ; 25.33%), mean age  $53 \pm 11.6$  years.

The mean BMI of the patients is  $34.41 \text{ kg m}^{-2}$  (5.68), and the mean ESS score at the baseline is 11.21 (4.28).

## 4 | SYSTEMATIC REVIEW FINDINGS

### 4.1 | CPAP effect on psychological dynamics in couple relationships: Insights from patients with OSA

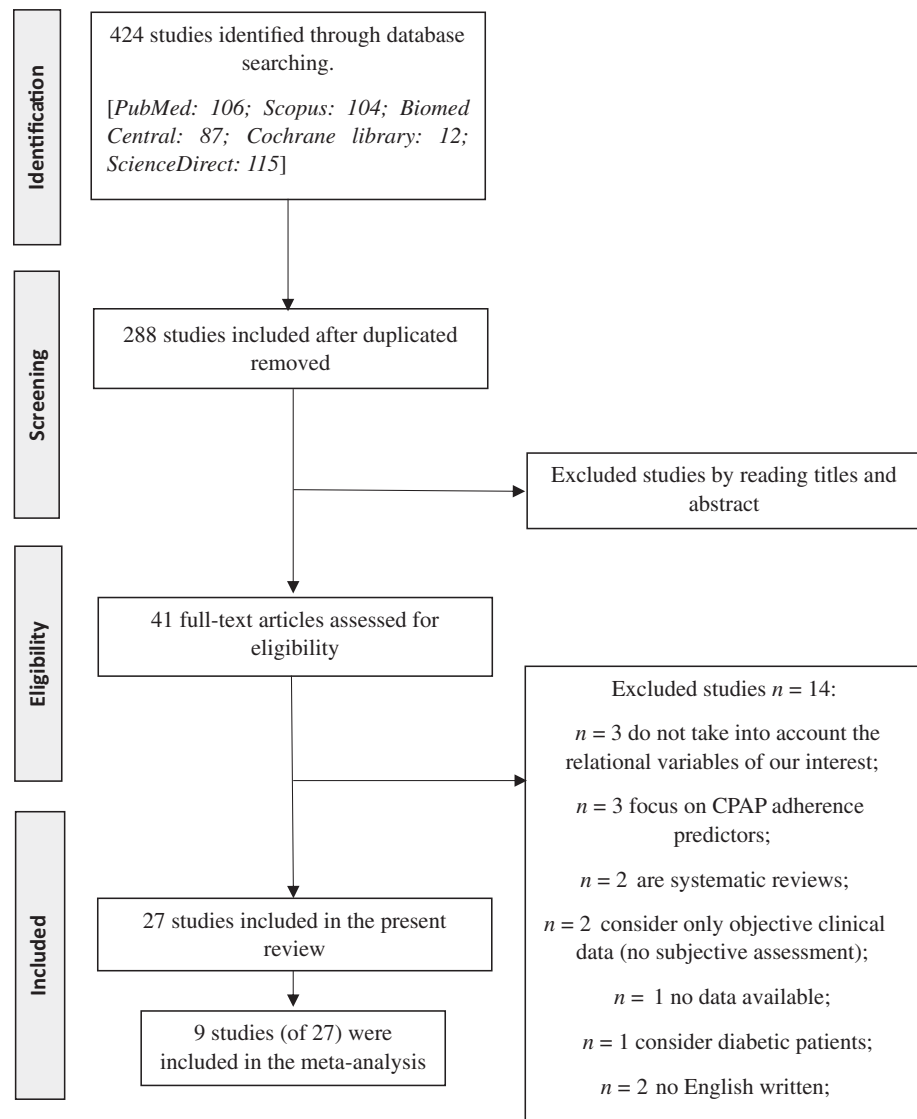
Five studies (Adams et al., 2020; Baron et al., 2009; Baron et al., 2017; Mendelson et al., 2020; Parish & Lyng, 2003) examined the perspective of the patient with OSA, investigating how the quality of their relationship with the bedpartner, parsed into sub-dimensions such as perceived support, conflict, emotional functioning and overall satisfaction with the relationship, expressed as a result of effective communication, a sense of partnership and fulfilment of personal needs, could be influenced by adapting to CPAP therapy for the treatment of sleep apnea.

Based on the findings, it was observed that, following a 3-month adaptation period to CPAP therapy, the dimension of conflict in men exhibited a positive and statistically significant change ( $p < 0.05$ ; Baron et al., 2009). However, perceived support did not show any changes in response to CPAP adaptation, neither among male (Baron et al., 2009) nor female patients (Baron et al., 2017).

No statistically significant changes were evident in overall couple satisfaction ( $p = 0.98$ ; Adams et al., 2020) or in the quality of marital relationships, regardless of the age or lifestyle of the partners



FIGURE 1 Study selection process.



(Mendelson et al., 2020). In terms of emotional well-being, spanning the emotional state across the previous 4 weeks, and social connections, particularly emphasizing the bond with one's partner, statistically significant findings have surfaced, demonstrating the treatment's effectiveness not only in enhancing sleep quality but also in improving the quality of the relationship with one's partner ( $p < 0.001$ ;  $p = 0.002$ ; Parish & Lyng, 2003; Table 4).

#### 4.2 | CPAP effect on psychological dynamics in couple relationships: Insights from bedpartners

According to the emerged results, female bedpartners did not exhibit statistically significant improvements in either the dimension of conflict or the perceived support in response to their partners' adaptation to CPAP (Baron et al., 2009). Additionally, there were no significant changes observed in satisfaction with their marital relationship following CPAP adaptation (Mendelson et al., 2020). On the other hand, statistically significant changes were evident both in emotional

functioning and in the social relationships of bedpartners with their partners undergoing treatment ( $p < 0.001$ ; Parish & Lyng, 2003).

Furthermore, according to Fietze, bedpartners who displayed a high level of satisfaction with the quality of their relationship increased by 21% ( $p < 0.001$ ) following their partners' adaptation to CPAP (Fietze et al., 2023; Table 5).

#### 4.3 | Assessment of sexual well-being in patients with OSA using CPAP

Five authors (Jara et al., 2018; Lai et al., 2016; Petersen et al., 2013a; Petersen et al., 2013b; Reishtein et al., 2010; Ye et al., 2009) investigated how the subjective assessment of the sexual quality of life in patients with OSA could be influenced following adaptation to CPAP therapy. In all instances, significant changes in perceived sexual quality of life were observed irrespective of the duration between baseline (pre-treatment) and the second assessment with treatment (3 months or 1 year), and regardless of the patient's gender. However, in both

**TABLE 2** Study characteristics of the included studies considering the point of view of patients with OSA.

Author	Country	QL/ QNT	Study design	Sample size (male n, %)	Mean age (years)	Relationship duration (years)	AHI (events per hr)	ESS score	BMI (kg m <sup>-2</sup> )	CPAP mask	CPAP hr per night	Follow- up time	Drop- out (N)	Meta- analysis
Acar et al. (2016)	Turkey	QNT	Longitudinal	21 (21, 100%)	46.95 ± 8.58	NA	54.95 ± 21.25	12.42 ± 2.56	31.29 ± 3.60	Nasal	≥ 6	12 weeks	0	Yes
Adams et al. (2020)	America	QNT	Longitudinal	71 (8, 25.8%)	50.6 ± 9.4	≥ 6 months	34.00 (18.30– 60.60)	9.71 ± 5.48	35.43 ± 7.30	NA	5.35 ± 1.94	3 months	9	No
Apergis et al. (2021)	Greece	QNT	Longitudinal	62 (62, 100%)	47.7 ± 9.0	NA	70.5 ± 24.1	11.4 ± 6.2	37.6 ± 8.2	NA	5.9 ± 1.4	1 year	0	Yes
Baron et al. (2009)	America	QNT	Longitudinal	23 (23, 100%)	47.18 ± 11.81	23.49 ± 10.72	37.94 ± 23.95	12.13 ± 4.10	34.86 ± 7.27	NA	≥ 4	3 months	1	No
Baron et al. (2017)	America	QNT	Longitudinal	13 (0, 0%)	50.8 ± 9.1	NA	16.2 ± 12.4	11.7 ± 4.7	35.0 ± 8.4	NA	4.6 ± 2.8	3 months	0	No
Berg et al. (2023)	Africa	QL	Observational	15 (3, 20%)	47.4 ± 8.9	NA	36.1 ± 39.3	10.8 ± 7.1	44.8 ± 11.4	NA	5.5 ± 1.6	NA	NA	No
Budweiser et al. (2013)	Germany	QNT	Longitudinal	91 (91, 100%)	NA	NA	NA	NA	NA	NA	NA	36.5 ± 3.7 months	NA	No
Hoekema et al. (2007)	Netherlands	QNT	RCT	27 (27, 100%)	51 ± 9	NA	46.7 (10.0– 64.6)	14 ± 8.5	32 ± 3	NA	6.3 ± 1.3	8 weeks	0	No
irer et al. (2018)	Turkey	QNT	Longitudinal	61 (61, 100%)	42.133 ± 1.696	NA	31.1 ± 20.43	NA	30.53 ± 2.01	NA	NA	3 months	7	Yes
Jara et al. (2018)	America	QNT	Longitudinal	72 (43, 59.7%)	52.4 ± 11.3	NA	39.4 ± 23.5	NA	32.2 ± 5.6	NA	≥ 4	1 year	0	No
Khafagy & Khafagy (2012)	Egypt	QNT	Longitudinal	80 (80, 100%)	41.9 ± 9.3	NA	33.4 ± 1.7	13.7 ± 1.7	31.3 ± 2.6	NA	≥ 4	3 months	23	No
Kyrkou et al. (2022)	Greece	QNT	Longitudinal	25 (25, 100%)	47.1 ± 10.8	NA	62.7 ± 27.1	11.6 ± 6.1	31.8 ± 5.4	NA	NA	1 year	0	Yes
Lai et al. (2016)	China	QNT	Longitudinal	73 (73, 100%)	52 ± 10	NA	NA	9.5 ± 5.6	29.0 ± 5.2	NA	4.3 ± 0.6	1 year	0	No
Luyster et al. (2016)	America	QL	Observational	15 (9, 64%)	NA	NA	NA	NA	NA	NA	5.5	NA	NA	No



TABLE 2 (Continued)

Author	Country	QL/ QNT	Study design	Sample size (male n, %)	Mean age (years)	Relationship duration (years)	AHI (events per hr)	ESS score	BMI (kg m <sup>-2</sup> )	CPAP mask	CPAP hr per night	Follow- up time	Drop- out (N)	Meta- analysis
Melehan et al. (2018)	Australia	QNT	RCT	31 (31, 100%)	55.7 ± 7.7	NA	48.2 ± 26.9	10.3 ± 5.1	32.9 ± 4.2	NA	≥ 4	12 weeks	2	Yes
Mendelson et al. (2020)	France	QNT	Longitudinal	290 (223, 77%)	53	NA	Old 7 (5–12); Young 12 (8–16); Mature 11 (7– 15)		32 (IQR: 28.6– 35.9)	Orofacial	≥ 4	120 days	0	No
Parish & Lyng (2003)	America	QNT	Longitudinal	54 (47, 87%)	58.9 ± 14.1	NA	48.4 ± 3.3	12.9 ± 4.4	34.3 ± 9.5	NA	6.1	6 weeks	0	No
Pascual et al. (2018)	Australia	QNT	RCT	30 (30, 100%)	54.8 ± 1	NA	51.6 ± 20.9	10.2 ± 5.8	33.0 ± 0.6	NA	NA	3 months	0	Yes
Pastore et al. (2014)	Italy	QNT	RCT	41 (41, 100%)	48.6 ± 8.5	NA	47.3 ± 14.9	NA	48.6 ± 8.5	Nasal	457.1 ± 35.6 (min)	12 weeks	0	Yes
Petersen et al. (2013a)	Denmark	QNT	Longitudinal	146 (146, 100%)	51.5 ± 10.4	NA	43.3 ± 26.3	11.6 ± 3.9	31.7 ± 6.1	Nasal	≥ 4	1 year	162	No
Petersen et al. (2013b)	Denmark	QNT	Longitudinal	54 (0, 0%)	52 ± 10.9	NA	35.7 ± 27.3	11 ± 3.7	34.7 ± 7.9	Nasal	≥ 4	1 year	10	No
Reishtein et al. (2010)	America	QNT	Longitudinal	123 (123, 100%)	46.85 ± 8.47	NA	66.90 ± 28.7	14.48 ± 4.90	37.59 ± 8.42	NA	4.6 ± 2.8	3 months	0	No
Schulz et al. (2019)	Germany	QNT	Longitudinal	94 (94, 100%)	51.5 ± 0.9	NA	56 ± 2.3	9.8 ± 0.5	34.2 ± 0.6	NA	NA	1 year	0	No
Taskin et al. (2010)	Turkey	QNT	Longitudinal	40 (40, 100%)	52.06 ± 8.02	NA	35 ± 19.3	10.06 ± 1.95	NA	NA	7	1 month	0	Yes
Ye et al. (2009)	America	QNT	Longitudinal	176 (152, 86.4%)	46.7 ± 8.8	NA	63.9 ± 29.4	15.65 ± 4.45	38.0 ± 8.2	NA	4.7 ± 2.1	3 months	0	No
Zhang et al. (2016)	China	QNT	Longitudinal	78 (78, 100%)	44.0 ± 11.1	NA	63.45 ± 12.03	11.74 ± 4.47	28.71 ± 3.25	NA	≥ 4	3 months	25	Yes

Abbreviations: AHI, apnea-hypopnea index; BMI, body mass index; CPAP, continuous positive airway pressure; CPAP hr/night, hours of CPAP usage per a single night; CPAP mask, kind of CPAP mask (nasal/oronasal); ESS, Epworth Sleepiness Scale; IQR, interquartile range; N, number; NA, not available; QL/QNT, qualitative/quantitative data; RCT, randomized controlled trial.

**TABLE 3** Study characteristics of the included studies considering bedpartners' point of view.

Author	Country	QL/ QNT	Study design	Sample size (male n, %)	Mean age (years)	Relationship duration (years)	AHI (events per hr)	ESS score	BMI (kg m <sup>-2</sup> )	CPAP mask	CPAP hr per night	Follow- up time	Drop- out
Acar et al. (2015)	Turkey	QNT	Longitudinal	21 (21, 100%)	42.14 ± 7.62	22.04 ± 10.77	54.95 ± 21.25	12.42 ± 2.56	27.26 ± 5.42	Nasal	≥ 6	12 weeks	0
Baron et al. (2009)	America	QNT	Longitudinal	17 (0, 0%)	NA	23.49 ± 10.72	37.94 ± 23.95	5.8 ± 4.7	Not specified	NA	≥ 4	3 months	0
Berg et al. (2023)	Africa	QL	Observational	15 (12, 80%)	48.7 ± 10.6	NA	36.1 ± 39.3	10.7 ± 6.2	38.2 ± 10.7	NA	5.5 ± 1.6	NA	NA
Fietze et al. (2023)	Germany	QNT	Observational	508 (132, 26.03%)	NA	33.4 ± 15.4	NA	NA	NA	NA	NA	NA	NA
Luyster et al. (2016)	America	QL	Observational	11 (3, 27.2%)	53.3 ± 16.6	NA	NA	NA	NA	NA	5.5	NA	NA
Mendelson et al. (2020)	France	QNT	Longitudinal	290 (57, 19.65%)	53	NA	43 (IQR: 33–58)	Old 7 (5–12); Young 12 (8–16); Mature 11 (7–15)	32 (IQR: 28.6–35.9)	Orofacial	≥ 4	120 days	0
Parish & Lyng (2003)	America	QNT	Longitudinal	54 (7, 12.96%)	NA	NA	48.4 ± 3.3	NA	NA	NA	6.1	6 weeks	0

Abbreviations: AHI, apnea-hypopnea index; BMI, body mass index; CPAP, continuous positive airway pressure; CPAP hr per night, hours of CPAP usage per a single night; CPAP mask, kind of CPAP mask (nasal/oronasal); ESS, Epworth Sleepiness Scale; IQR, interquartile range; N, number; NA, not available; QL/QNT, qualitative/quantitative data.

**TABLE 4** CPAP effect on psychological dynamics in couple relationships: insights from patients with OSA.

Author	Gender	Theoretical framework	Tool	N/ subjects	Mean (before CPAP)	SD	N/ subjects	Mean (after CPAP)	SD	ES	Mean change	SD change	p-Value	Follow-up	
Baron et al. (2009)	Male	Support	QRI	23	3.56	0.42	22	3.45	0.39	0.29	NA	NA	Non-significant	3 months	
Baron et al. (2009)	Male	Conflict	QRI	23	2.13	0.41	22	1.93	0.51	0.43	NA	NA	<0.05	3 months	
Baron et al. (2017)	Female	Support	QRI	13	3.5	0.5	13	3.4	0.8	NA	NA	NA	Non-significant	3 months	
Baron et al. (2017)	Female	Conflict	QRI	13	2.0	0.7	13	2.1	0.7	NA	NA	NA	Non-significant	3 months	
Adams et al. (2020)	Mixed	Overall couple satisfaction	CSI-16	71	65	54-76	31	62	52-72	0.25	1	-4 to 4	0.98	3 months	
Mendelson et al. (2020)	Mixed	Quality of a marital relationship	QMI	145	Older retired couples n = 76, 18 (IQR: 16-21) Young working couples n = 128, 20 (IQR: 17-22) Mature active couples n = 86, 20 (IQR: 18-22)	NA	145	NA	NA	NA	NA	NA	NA	Non-significant	120 days
Parish & Lyng (2003)	Mixed	Emotional functioning	SAQLI	54	4.9	1.3	54	5.5	1.3	0.47	0.7	1.5	0.002	6 weeks	
Parish & Lyng (2003)	Mixed	Social interactions	SAQLI	54	4.8	1.3	54	5.8	1.2	0.63	1	1.6	p < 0.001	6 weeks	

Abbreviations: CPAP, continuous positive airway pressure; CSI-16, Couple Satisfaction Index-16; EF, effect size; IQR, interquartile range; N, number; NA, not available; QMI, Quality Marriage Index; QRI, Quality of Relationship Inventory; SAQLI, Calgary Sleep Apnea Quality of Life Index; SD, standard deviation.

TABLE 5 CPAP effect on psychological dynamics in couple relationships: insights from bedpartners.

Author	Gender	Theoretical framework	Tool	N/ subjects	Mean (before CPAP)	SD	N/ subjects	Mean (after CPAP)	SD	ES	Mean change	SD change	p-Value	Follow-up
Baron et al. (2009)	Female	Support	QRI	17	3.73	0.52	17	3.61	0.62	0.21	NA	NA	Non-significant	3 months
Baron et al. (2009)	Female	Conflict	QRI	17	1.87	0.54	17	1.76	0.69	0.18	NA	NA	Non-significant	3 months
Parish & Lyng (2003)	Mixed	Social interactions	SAQLI	54	5.3	1.4	54	6.2	0.9	0.75	0.9	1.2	<0.001	6 weeks
Parish & Lyng (2003)	Mixed	Emotional functioning	SAQLI	54	5	1.5	54	5.9	1	0.57	0.8	1.4	<0.001	6 weeks
Mendelson et al. (2020)	Mixed	Quality of a marital relationship	QMI	145	Older retired couples <i>n</i> = 76, 18 (IQR: 16–21) Young working couples <i>n</i> = 128, 20 (IQR: 17–22) Mature active couples <i>n</i> = 86, 20 (IQR: 18–22)	NA	145	NA	NA	NA	NA	NA	Non-significant	120 days
Fietze et al. (2023)	Mixed	Relationship satisfaction	Ad hoc questionnaire	508	49% satisfied bedpartners	NA	508	70% satisfied bedpartners	NA	NA	NA	NA	<0.001	NA

Abbreviations: CPAP, continuous positive airway pressure; EF, effect size; IQR, interquartile range; N, number; NA, not available; QMI, Quality Marriage Index; QRI, Quality of Relationship Inventory; SAQLI, Calgary Sleep Apnea Quality of Life Index; SD, standard deviation.

qualitative studies (Berg et al., 2023; Luyster, 2017), it emerged that CPAP, especially at the beginning of the treatment, was described as a barrier to intimacy with the partner. This is because once worn, it is advisable to refrain from sudden movements to prevent the mask from shifting. In some cases, it was also revealed that patient, feeling less attractive, avoided physical contact with their partners (Berg et al., 2023; Petersen et al., 2013a; Petersen et al., 2013b; Table 6).

#### 4.4 | CPAP effect on female sexual function in patients with OSA and bedpartner

Petersen investigated the perspective of female patients with OSA undergoing CPAP treatment. The FSFI was administered to assess potential changes in sexual functioning, yet paired t-tests revealed no significant improvements in any FSFI components: desire ( $p = 0.69$ ); arousal ( $p = 0.97$ ); lubrication ( $p = 0.85$ ); orgasm ( $p = 0.90$ ); satisfaction ( $p = 0.96$ ); pain ( $p = 0.94$ ); or total score ( $p = 0.89$ ). Additionally, the FSDS was administered for sexual distress but, again, no statistically significant change was observed ( $p = 0.06$ ; Petersen et al., 2013a; Petersen et al., 2013b).

### 5 | META-ANALYSIS FINDINGS

#### 5.1 | CPAP effect on male sexual function in patients with OSA

In this meta-analysis, the impact of CPAP usage on the EF subscale score of the IIEF scale in a cohort of male subjects with OSA was investigated. A total of nine studies were included (Table 2), comprising an initial sample of 389 participants, which was reduced to 355 during the follow-up period. Seven studies used the IIEF-15, while two studies used the IIEF-5 (Taskin et al., 2010; Zhang et al., 2016). Six studies investigated the scale after a 3-month follow-up period, two studies after 1 year (Apergis et al., 2021; Kyrkou et al., 2022), and one study after 1 month (Taskin et al., 2010).

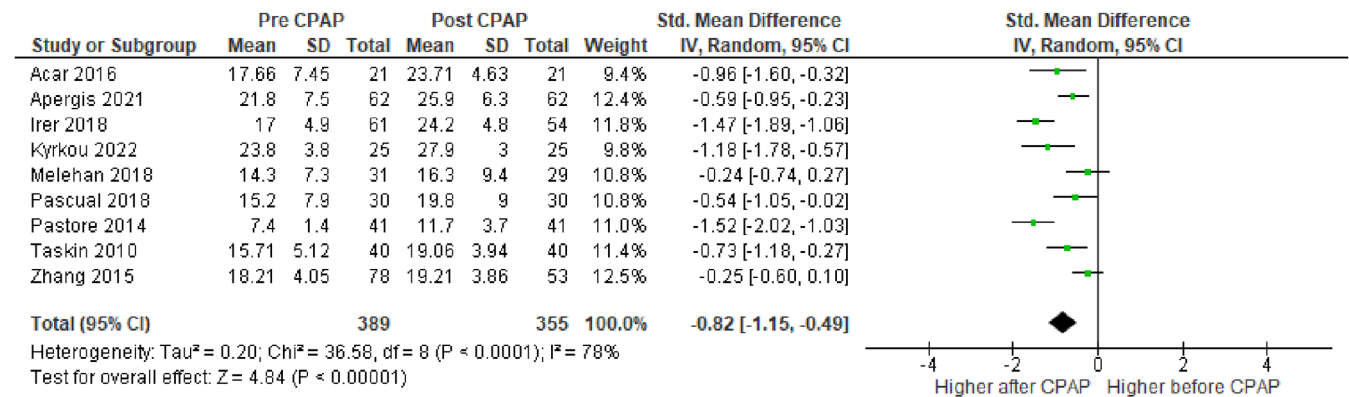
Considering that the studies used two different versions of the same scale to assess male sexual function, the standardized mean difference was selected as the ES metric, and a random-effects model was employed. Results revealed a significant overall effect, with a Z-score of 4.84 ( $p < 0.00001$ ), indicating a substantial improvement in IIEF scores following CPAP utilization. However, notable heterogeneity was observed among the studies, as indicated by  $\text{Tau}^2 = 0.20$ ,  $I^2 = 36.58$  with 8 degrees of freedom ( $p < 0.00001$ ), and an  $I^2$  statistic of 78%. This suggests substantial variability in the treatment effects across the studies (Figure 2).

In a subsequent phase, aimed at assessing the efficacy of 3 months of CPAP utilization on ED in patients with OSA, only six of the previous studies were included (Acar et al., 2016; İrer et al., 2018; Melehan et al., 2018; Pascual et al., 2018; Pastore et al., 2014; Zhang et al., 2016). The outcomes of the meta-analysis demonstrated a statistically significant overall impact, with a Z-score

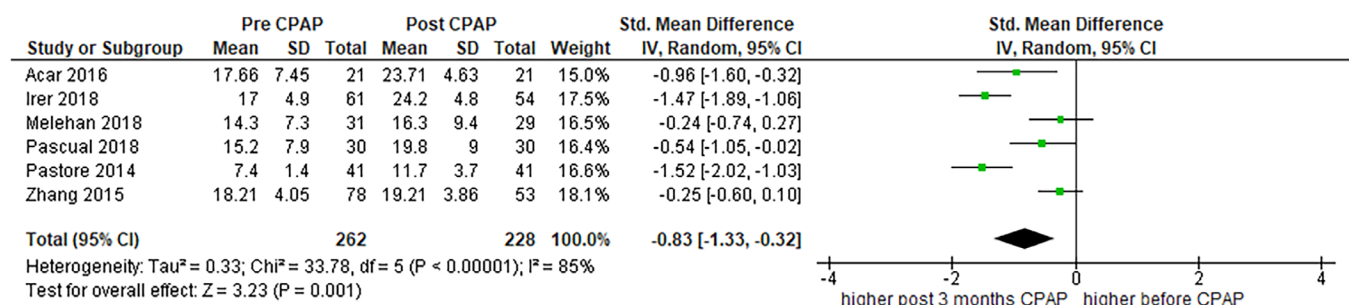
**TABLE 6** Subjective assessment of sexual well-being in patients with OSA using CPAP.

Author	Gender	Theoretical framework	Tool	N/ subjects	Mean (before CPAP)	SD	N/ subjects	Mean (after CPAP)	SD	ES	Mean change	SD change	p-Value	Follow- up
Lai et al. (2016)	Male	Quality of intimate and sexual relationships	FOSQ	73	3.3	0.7	51	3.6	0.6	0.52	0.3	0.5	< 0.01	1 year
Reishtein et al. (2010)	Male	Quality of intimate and sexual relationships	FOSQ	123	3.17	0.79	123	3.62	0.59	0.61	0.44	0.73	< 0.001	3 months
Jara et al. (2018)	Male	Quality of intimate and sexual relationships	SNORE-25	72	1.2	1.1	72	0.5	0.7	0.6	0.7	1.2	Medium	1 year
Ye et al. (2009)	Male	Quality of intimate and sexual relationships	FOSQ	147	3.2	0.8	136	NA	NA	0.57	0.4	0.7	< 0.001	3 months
Ye et al. (2009)	Female	Quality of intimate and sexual relationships	FOSQ	16	3	1.2	16	NA	NA	0.71	0.5	0.7	0.015	3 months
Petersen et al. (2013a); Petersen et al. (2013b)	Male	Quality of intimate and sexual relationships	LiSat	146	NA	NA	146	NA	NA	NA	NA	NA	< 0.05	1 year

Abbreviations: CPAP, continuous positive airway pressure; ES, effect size; FOSQ, Functional Outcomes of Sleep Questionnaire; LiSat, Life Satisfaction Questionnaire; N, number; NA, not available; SD, standard deviation; SNORE-25, Symptoms of Nocturnal Obstruction and Related Events.



**FIGURE 2** Forest plot of the comparison of EF-IIEF outcomes before and after CPAP use. CPAP, continuous positive airway pressure; EF-IIEF, Erectile Function subscale of the International Index of Erectile Function.



**FIGURE 3** Forest plot of the comparison of EF-IIEF outcomes, before and after 3 months of CPAP. CPAP, continuous positive airway pressure; EF-IIEF, Erectile Function subscale of the International Index of Erectile Function.

of 3.23 ( $p < 0.001$ ), signifying a considerable enhancement in IIEF scores after the implementation of CPAP. Nevertheless, considerable heterogeneity was identified among the investigations, as evidenced by  $I^2 = 0.33$ ,  $\chi^2 = 33.78$  with 5 degrees of freedom ( $p < 0.00001$ ), and an  $I^2$  statistic of 85%. This implies a noteworthy variability in the treatment effects observed across the diverse studies (Figure 3).

Upon scrutinizing the funnel plots for both comparisons, a discernible asymmetry and lack of organization become apparent, indicating a noteworthy degree of heterogeneity and the potential presence of publication bias. The plots exhibit a somewhat scattered distribution, particularly noticeable is the paucity of studies in the lower regions, implying a potential underrepresentation of smaller or less statistically significant studies, and an increased density of points in areas corresponding to both large and small ESs (central area; Figures 4 and 5).

In addition to the authors focusing on ED changes using the IIEF, other studies explored sexual functioning in patients with OSA.

Khafagy reported a significant reduction in the number of men with mild ED, decreasing from 43 to 38, moderate dysfunction from 24 to 15, and severe dysfunction from 13 to 9 ( $\chi^2 = 7.454$ ,  $p < 0.01$ ), with CPAP use for at least 4 hr per night over 3 months. This was further corroborated by the utilization of the Rigiscan, a tool employed to measure nocturnal erections (Khafagy & Khafagy, 2012). Schulz observed improved EF in seriously affected patients with long-term

CPAP therapy ( $\Delta$ IIEF pre-post CPAP = 7; Schulz et al., 2019). Budweiser found higher IIEF scores in CPAP users compared with non-users in subjects with ED and OSA (54.5 [25.8; 66.0] versus 41.0 [26.0; 61.0]; Budweiser et al., 2013). Hoekema used the GRISS tool to assess psychosexual complaints (premature ejaculation, ED, non-sensuality, avoidance, sexual dissatisfaction, infrequency of sexual contact, and non-communication with the partner), showing no significant statistical change after CPAP therapy (Hoekema et al., 2007).

## 5.2 | Risk of bias in studies

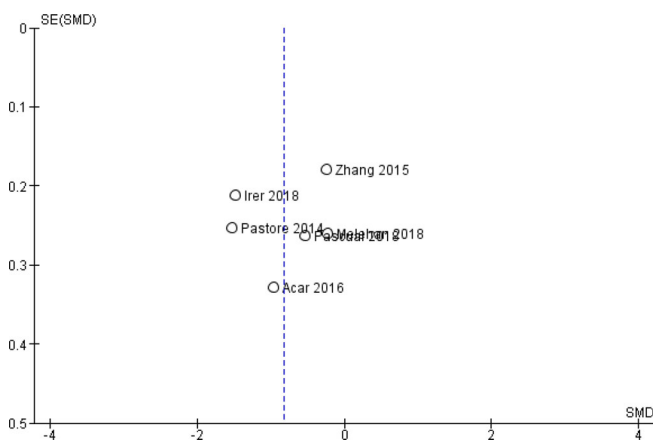
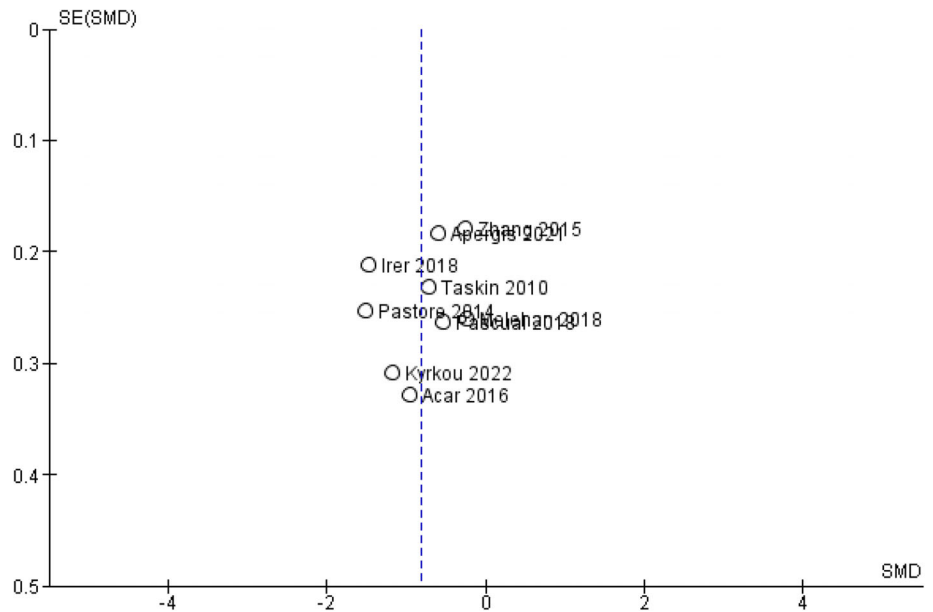
The results of the quality assessment, divided into quantitative and qualitative, were subsequently summarized and graphically represented using the Review Manager 5.4 software (Cochrane Collaboration; <https://training.cochrane.org/online-learning/core-software/revman>) in Figures 6, 7, 8, 9 and 10. No studies were excluded following the risk of bias assessment.

## 6 | DISCUSSION

Despite CPAP being widely accepted as the gold-standard treatment for OSA (Khafagy & Khafagy, 2012), therapeutic effects extend



**FIGURE 4** Funnel plot of comparison between EF-IIEF subscale before CPAP and after CPAP therapy. CPAP, continuous positive airway pressure; EF-IIEF, Erectile Function Subscale of the International Index of Erectile Function; SE, standard error; SMD, standard mean difference.



**FIGURE 5** Funnel Plot of comparison between EF-IIEF subscale before CPAP and after 3 months of CPAP therapy. CPAP, continuous positive airway pressure; EF-IIEF, Erectile Function Subscale of the International Index of Erectile Function; SE, standard error; SMD, standard mean difference.

beyond simple resolution of nighttime symptoms. Several studies have highlighted cardiovascular (Battaglia et al., 2023; Foster et al., 2007) and metabolic benefits of CPAP (Çuhadaroğlu et al., 2009), but only a few have explored its impact on bedpartner well-being and couple relationships. This systematic review with meta-analysis aims to address this research gap by exploring the implications of CPAP therapy on relational dynamics and sexual well-being in patient–bedpartner couples.

Utilizing rigorous methodology, 27 relevant studies published to date were examined, interested in understanding both the perspective of patients with OSA and that of their bedpartners.

Specifically, from the patients' perspective, an improvement in relational dynamics with the bedpartner emerged (Glazer Baron

et al., 2009), which could be explained by the reduction in OSA symptoms, such as snoring and apneas. This symptomatology, altering the couple's sleep quality, can cause increased irritability, listed among daytime symptoms of OSA (Saraiva et al., 2015), as well as stress due to fatigue in professional performance and social life, despite poor sleep quality (Wong et al., 2021). Of interest is also the improvement in emotional well-being and sense of connection with the bedpartner (Parish & Lyng, 2003), which could be motivated by the active participation of the latter in the CPAP adaptation process. Collaboration and mutual support, indeed, can contribute to greater satisfaction in the relationship and better emotional connection between partners (Fekete et al., 2007). On the other hand, the lack of a significant increase in the perception of general support (Glazer Baron et al., 2009) could stem from a series of complex factors. Among these, pre-existing relational dynamics between the patient and the bedpartner could influence the perception of support during the CPAP adaptation period. Additionally, it is possible that the bedpartner was already a supportive figure before the start of therapy, and that this role was perceived as less necessary or less evident with the reduction in difficulties encountered by the patient during treatment adaptation.

Turning to the bedpartners' perspective, in general, a significant increase in marital satisfaction following CPAP adaptation was not observed (Mendelson et al., 2020). This may suggest that CPAP treatment alone is not sufficient to improve the overall quality of the relationship for the couples involved, but only contributes partially. In support of this, improvements were observed in both the perceived quality of the couple's relationship (Fietze et al., 2023) and emotional functioning (Parish & Lyng, 2003), that is, the management and expression of emotions within the relationship (Ştefănuţ et al., 2021). Therefore, although improvement is more tangible from the patients' perspective, the indirect effect that CPAP has on couples from the bedpartners' point of view should not be underestimated.

	Attrition Bias	Reporting Bias	Measurement Bias	Selection Bias	Representativeness Bias	Sampling Bias	Implementation Bias
Acar 2016	+	+	+	+	+	-	+
Adams 2020	-	+	+	+	+	+	+
Apergis 2021	+	+	+	+	+	-	+
Baron 2009	+	+	+	+	+	+	+
Baron 2017	-	+	+	+		-	+
Budweiser 2013	-	+	+	+	+	+	+
Irer 2018	+	+	+			+	+
Jara 2018		+		+	+	+	+
Khafagy 2012	+	+	+	+	+	+	+
Kyrkou 2022	+	-		+		+	+
Lai 2016		+	+	+	+		+
Mendelson 2020		+	+	+	+	+	+
Parish 2003		+	+	+	+		+
Petersen 2013a	+	-	+	+	-	-	+
Petersen 2013b	+	+	+	+	+	+	+
Reishtein 2010		+	+	+		+	+
Schulz 2019		-	+	+	-	+	+
Taskin 2010		+	+	+	+	-	+
Ye 2009	+	+	+	+		+	+
Zhang 2016	-	+	+	+	-	+	+

FIGURE 6 Risk of bias summary of longitudinal studies.

The dimension of sexuality, considered an important component in couple relationships, has also shown interesting results in the context of CPAP adaptation in patients with OSA.

Overall, patients reported an improvement in the perception of quality of sexual life with their partner after starting CPAP therapy (Jara et al., 2018; Lai et al., 2016; Petersen et al., 2013a; Petersen et al., 2013b; Reishtein et al., 2010; Ye et al., 2009), this could be

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)	Other bias
Hoekema 2007	+	-	-	+	-	+	+
Melehan 2018	+	+	+	-		+	+
Pascual 2018	+	-	-	-	-	+	-
Pastore 2014	+	+	+	-	+	+	+

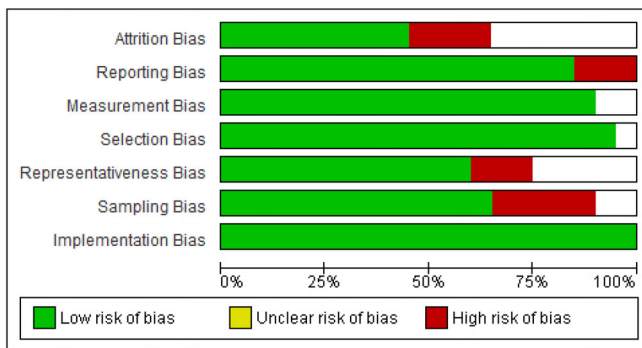
FIGURE 7 Risk of bias summary of randomized control trials.

explained by the reduction in daytime sleepiness, thanks to symptom correction. With greater energy and vitality during the day, patients feel more willing and active in engaging intimately with their partner (Reishtein et al., 2010). However, it is worth noting that some patients described the presence of the mask as an obstacle to intimacy (Luyster, 2017). Feeling “trapped” by a device on the face highlighted vulnerabilities related to aesthetic appearance or physical limitations, such as the inability to move freely while using it. In these cases, it is useful to work with the patient on better self-acceptance and education on device usage only at bedtime and immediately after lying down.

Regarding the dimension of male sexual functioning, focused on the dimension of ED and explored through a meta-analysis comparing scores on the EF-IIEF subscale pre- and post-CPAP adaptation, an improvement in the considered variable emerged. This could be justified by an increase, to normal levels, in blood oxygen levels, fundamental to ensure effective muscle function (Campos-Juanatey et al., 2017). Also on the rise are sexual satisfaction, frequency of sexual contact, and communication with the partner (Hoekema et al., 2007). The reduction or elimination of snoring, which can be a source of embarrassment for the patient (Douglas et al., 2006), can improve their level of self-esteem, favouring greater openness to sexuality and communication with the partner. Conversely, no benefit

	Luyster 2016	Berg 2023	
	+	+	Clear statement of the aims
		+	Appropriate qualitative methodology
	+	+	Appropriate research design
	+	+	Appropriate recruitment strategy
	+	+	Appropriate data collection
	+		Adequate consideration of the relationship between researchers and participants
		+	Ethical issues
	+	+	Accurate data analysis
	+	+	Adequate discussion
	+	+	Research value

**FIGURE 8** Risk of bias summary of qualitative studies.



**FIGURE 9** Risk of bias graph of longitudinal studies.

regarding female sexual functioning was highlighted following CPAP adaptation in female patients. On the other hand, in support of the growth of the aforementioned male variables, female bedpartners also reported an increase in their sexual desire and satisfaction with the quality of sexual life with their partner following his adaptation (Acar et al., 2016).

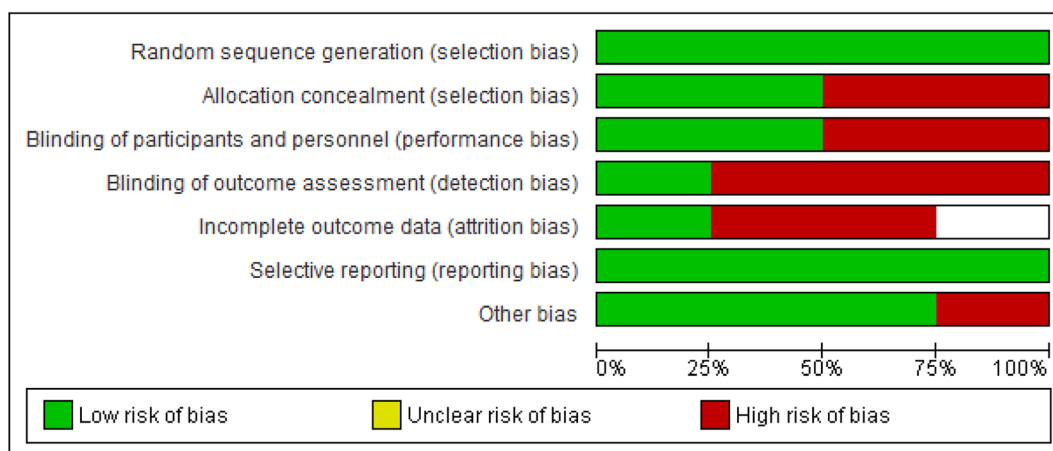
In conclusion, this systematic literature review with meta-analysis emphasizes the importance of considering the role of bedpartners in the treatment of OSA, and suggests that an integrated approach to therapy, taking into account the needs and perspectives of both partners, can maximize treatment benefits and improve overall couple quality of life.

## 7 | STRENGTHS AND LIMITATIONS

This study undertakes a comprehensive investigation into the psychological impact of CPAP therapy on couples dealing with OSA, encompassing perspectives from both patients with OSA and their bedpartners. It offers a nuanced understanding of the multifaceted effects of CPAP therapy by surpassing traditional physiological outcomes, and exploring dimensions such as conflicts, emotional harmony and sexual well-being. Specifically, a gender-specific analysis acknowledges the distinct experiences of male and female bedpartners, contributing to a more refined understanding of how CPAP therapy may influence individuals within the context of a couple dynamic.

However, the study reveals certain drawbacks. The limited exploration of bedpartners' perspectives underscores a gap in the existing literature, with few studies deeply investigating the experiences of this critical group. Moreover, the focus on male patients with OSA in the meta-analysis neglects the potential impact of CPAP therapy on female sexual well-being, underscoring the necessity for more balanced research in this domain. This choice stems from the fact that couple psychological dynamics were explored through highly heterogeneous constructs, which did not allow for the inclusion of all studies in the meta-analysis. On the other hand, relationship quality is a multifaceted concept, where each dimension contributes uniquely to the overall quality of a relationship.

Additionally, the study highlights high heterogeneity in the instruments used to assess outcomes, all of which are subjective, raising



**FIGURE 10** Risk of bias graph of randomized controlled trials.

concerns about consistency and comparability. It is important to note that this heterogeneity may be rooted in various individual psychological variables, although not extensively explored in this study, which could significantly influence observed outcomes.

To strengthen future research from a methodological standpoint, consideration could be given to conducting subgroup analyses based on relevant variables such as baseline EF or CPAP adherence, to elucidate potential moderators of the relationship between CPAP therapy and EF. Furthermore, integrating more objective medical examinations could enhance the quality of intervention efficacy assessments. Exploring these individual psychological variables could further improve understanding of how patients and their bedpartners may interact with CPAP therapy.

Despite these limitations, the study offers valuable insights into the psychological dynamics influenced by CPAP therapy, with potential implications for the whole well-being of couples affected by OSA.

## 8 | CONCLUSION

Our study contributes valuable insights into the intricate interplay of CPAP therapy, couple dynamics and sexual function in the context of OSA. As OSA continues to be a prevalent health concern, addressing its broader implications on couples' relationships and well-being remains a critical area for future research and clinical considerations. The observed improvements in conflict resolution, emotional well-being and sexual function underscore the potential global benefits of CPAP therapy.

### AUTHOR CONTRIBUTIONS

**Poletti Valentina:** Conceptualization; investigation; writing – original draft; methodology; writing – review and editing; software; data curation; validation; formal analysis; project administration; visualization. **Battaglia Elvia Giovanna:** Writing – review and editing; supervision; data curation. **Banfi Paolo:** Supervision; conceptualization. **Volpato Eleonora:** Methodology; writing – original draft; supervision; formal analysis; writing – review and editing; conceptualization; investigation.

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### CONFLICT OF INTEREST STATEMENT

The authors declare no conflict of interest related to this work.

### DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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