

SYSTEMATIC REVIEW

What is the effectiveness of stress interventions for men: a systematic review

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(Eric Barratt)**Abstract**

Background: Men and women have different stress responses, both psychologically and biologically, with men observed to generally have higher rates of maladaptive coping behaviours. They are also more likely than women to take their own lives, which is associated with being less likely to seek help for mental health issues. **Methods:** Interventional studies were examined addressing elevated levels of stress in healthy males. A systematic literature search was conducted across nine databases up to 14 December 2022. Interventional studies involving adult males or reporting male-specific outcomes that addressed and demonstrated a change in stress from baseline, were peer-reviewed, and published in English language were included in the review. An updated surveillance search using the original search strategy and eligibility criteria was conducted across PubMed, MEDical Literature Analysis and Retrieval System Online (MEDLINE), Psychological Information Database (PsycINFO) and Excerpta Medica Database (EMBASE) for studies published between 15 December 2022 and 27 July 2026. **Results:** A total of 2201 studies were identified, of which 16 studies were included in the systematic review. Oral administration of a medication or dietary supplement was the most frequently studied intervention type, with six studies identified. Four studies focused on meditation or mindfulness and two on cognitive behavioural therapy. The remaining intervention categories each had one study: green social prescribing, exercise and lifestyle, manual therapy, and short periods of sleep. The updated surveillance search identified no additional eligible studies. **Conclusions:** Despite a range of interventions being identified, the systematic review suggests a lack of evidence on the effectiveness of stress interventions for men. Although all included studies reported significant results, methodological and analytical limitations were evident across the evidence base and the findings should, therefore, be interpreted with caution. The absence of eligible studies identified through the updated surveillance search further highlights the scarcity of male-specific intervention research in this area. **The PROSPERO Registration:** <https://www.crd.york.ac.uk/PROSPERO/view/CRD42023392091>, CRD42023392091.

Keywords

Stress; Coping; Men's health; Interventions; Systematic review

1. Introduction

Stress has been defined as any physical or psychological stimuli that disrupt homeostasis resulting in a stress response [1]. Stress affects everyone to varying degrees and the way people respond to stress can have important implications for mental health and wellbeing. The human function curve [2] illustrates that increasing levels of stress may initially improve productivity, but beyond a certain point, performance declines alongside the onset of fatigue, exhaustion, ill health and breakdown. Stress is not always harmful; positive forms of stress (eustress) may promote motivation, adaptation and performance, whereas excessive or prolonged stress can become detrimental [3]. Acute stress is typically short-term and may be either

positive or negative, whereas chronic stress is prolonged and has been associated with the development of physical and mental disorders [1, 4].

Men and women may differ in their psychological and biological responses to stress. Men have been observed to exhibit higher rates of maladaptive coping behaviours, including substance misuse, aggression, and susceptibility to disease [5]. Studies have reported higher levels of cortisol and a greater fight-or-flight response in men, whereas women have more commonly demonstrated a tend-and-befriend response [6, 7]. In addition to activation of the hypothalamic-pituitary-adrenal (HPA) axis and cortisol release, stress also stimulates the autonomic nervous system via the sympathetic-adrenal-medullary (SAM) pathway. This response increases heart

rate and blood pressure in preparation for perceived threats. Although adaptive in the short term, prolonged activation may adversely affect cardiovascular and mental health, highlighting the importance of interventions, such as exercise, manual therapy, and sleep, that support recovery and physiological regulation.

Men may also be less likely than women to seek help for stress and mental health concerns. Traditional masculine norms emphasising self-reliance, stoicism, and emotional control have been associated with reduced help-seeking behaviours and a tendency to manage difficulties independently. Consequently, men may delay accessing support until symptoms become more severe, potentially influencing engagement with stress-management interventions. Differences in biological responses, help-seeking behaviours, and treatment preferences may also contribute to variation in intervention effectiveness between men and women, highlighting the importance of examining outcomes specifically within male populations.

Stress interventions are approaches designed to reduce the negative effects of stress through strategies such as mind-

fulness, exercise, social connection, relaxation techniques, and psychological therapies [8]. These interventions aim to eliminate stressors, modify responses to stress, or improve adaptation to challenging situations. Standard treatments for stress in England commonly include cognitive behavioural therapy (CBT), which is widely available through the National Health Services (NHS) Talking Therapies services and other community and workplace-based programmes [9].

Despite increasing recognition of sex differences in stress responses, there remains a lack of research examining gender-specific intervention effects that directly address the unique challenges men may face in managing stress. Therefore, this systematic review aimed to identify and examine the effectiveness of stress interventions for men.

2. Methods

Fig. 1 outlines the systematic review process and provides a transparent framework to support replicability.

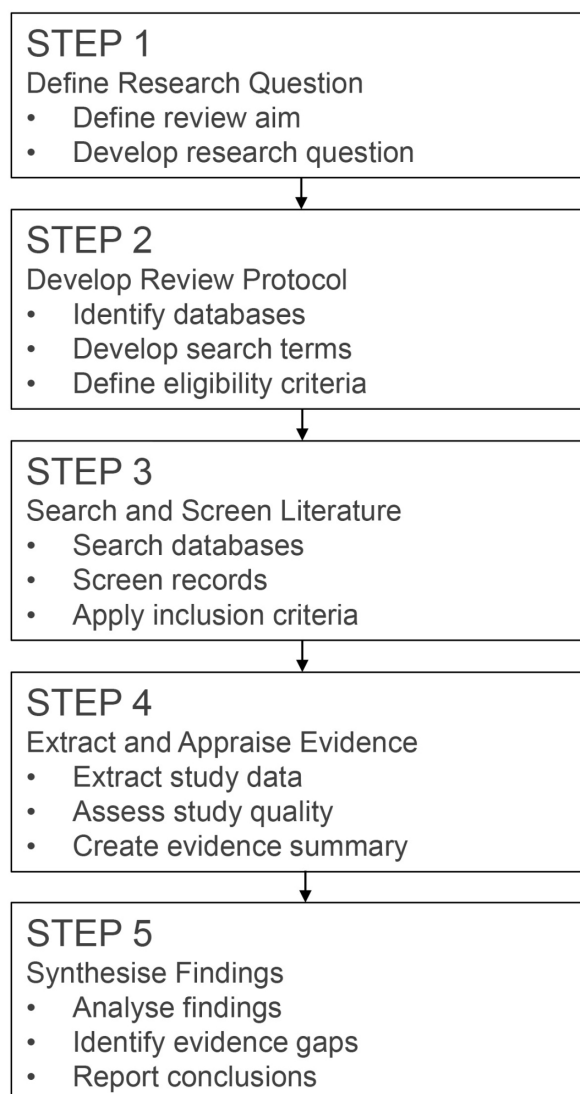


FIGURE 1. Systematic review process flowchart. The review was conducted in five stages: defining the research question, developing the review protocol, searching and screening the literature, extracting and appraising the evidence, and synthesising findings to identify evidence gaps and report conclusions.

2.1 Search strategy

This review was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement [10]. The completed PRISMA 2020 Checklist is provided in **Supplementary material 1**. The review protocol was registered with the International Prospective Register of Systematic Reviews (PROSPERO) on 17 January 2023 (Registration ID CRD42023392091). Although literature searches were completed prior to registration, the protocol was registered before completion of study screening, data extraction, quality appraisal and synthesis. No substantive changes were made to the eligibility criteria, search strategy or review methodology following registration.

The PICO (Patient/Population/Problem, Intervention, Comparison/Control and Outcome) framework informed the development of the research question and search strategy [10]. A systematic search was undertaken by the first author (EBa) in Allied and Complementary Medicine Database (AMED), Excerpta Medica Database (EMBASE), Excerpta Medica Care (EMCARE) and Health Management Information Consortium (HMIC), British Nursing Index (BNI) and Psychological Information Database (PsycINFO), Cumulative Index to Nursing and Allied Health Literature (CINAHL) and MEDical Literature Analysis and Retrieval System Online (MEDLINE), and PubMed for peer-reviewed journal articles published up to 14 December 2022.

Search terms included combinations of stress, burnout, men, male, masculinity, intervention, programme, support, management, efficacy, effectiveness, and outcome measures. Full search strategies are provided in the **Supplementary material 2**.

An updated surveillance search was conducted across PubMed, MEDLINE, PsycINFO, and EMBASE using the original search strategy and eligibility criteria to identify studies published between 15 December 2022 and 27 July 2026. This yielded 792 records, of which 10 articles underwent full-text review.

2.2 Eligibility criteria, study selection, screening, data extraction and quality

Studies were eligible for inclusion if they involved healthy adult males with elevated stress, evaluated a stress-management intervention, and reported outcomes demonstrating a change in stress from baseline. Mixed-sex studies were eligible if male-specific outcomes or separate analyses for male participants were reported.

Studies were excluded if they were not published in English language, were not peer-reviewed, were not original research articles, involved participants younger than 18 years, or were conducted exclusively in female or clinical patient populations. Studies including participants with pre-existing conditions were considered where they otherwise met the review criteria. Moreover, studies recruiting from general population samples were eligible where some participants had pre-existing health conditions.

Two authors (EBa and EBe) independently screened retrieved studies. Inter-rater agreement was 92.8% (Cohen's κ = 0.596), indicating moderate agreement [11]. Disagreements

were resolved through discussion and consensus. Search results were entered into Microsoft Excel, where duplicates were removed.

Data extraction and quality appraisal were undertaken independently by both reviewers using a pilot-tested extraction form. Extracted information included study characteristics, participant details, intervention type, stress measures, outcome assessment timeframes, and findings. Discrepancies were resolved by discussion and consensus.

Methodological quality were assessed using the Critical Appraisal Skills Programme (CASP) Randomised Controlled Trial Checklist [12]. Assessments were conducted independently by two reviewers (EBa and EBe) and summarised.

A meta-analysis was not considered appropriate because of substantial heterogeneity in stress types, participant characteristics, intervention approaches, and outcome measures.

3. Results

3.1 Study selection

The primary searches yielded 2201 studies. After removal of duplicates ($n = 185$), 2016 studies were screened by title and abstract, and full-text articles were retrieved and screened for 159 studies. Of these, 143 full-text articles did not meet our inclusion and/or exclusion criteria and were excluded. This left 16 studies that were included in the systematic review. A flow diagram summarising article inclusion/exclusion is provided (Fig. 2).

A subsequent surveillance search covering 15 December 2022 to 27 July 2026 identified 792 records, of which 10 articles underwent full-text review and all were excluded due to the absence of male-specific outcomes.

3.2 Study overview

Study characteristics details are presented in Table 1 (Ref. [13–28]) and interventions, results, and conclusions of the 16 studies are included in Table 2 (Ref. [13–28]). Six studies were published in 2018 [13–18], five in 2019 [19–23], one in 2020 [24], three in 2021 [25–27], one in 2022 [28].

3.2.1 Intervention type

Six studies examined oral administration of a medication or dietary supplement [14–17, 19, 24], four focused on meditation or mindfulness [18, 21, 25, 27], and two on CBT [20, 28]. One study each investigated green social prescribing [13], exercise and lifestyle [26], manual therapy [22], and short periods of sleep [23].

3.2.2 Intervention setting

Interventions were delivered in a range of settings including universities [15, 20, 22], clinics [17, 24], parks [13], participants' homes [19], research laboratories [23], online platforms and mobile applications [18, 21, 25, 28], or participant-selected locations [26]. Two studies did not report the intervention setting [14, 27].

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases and registers only

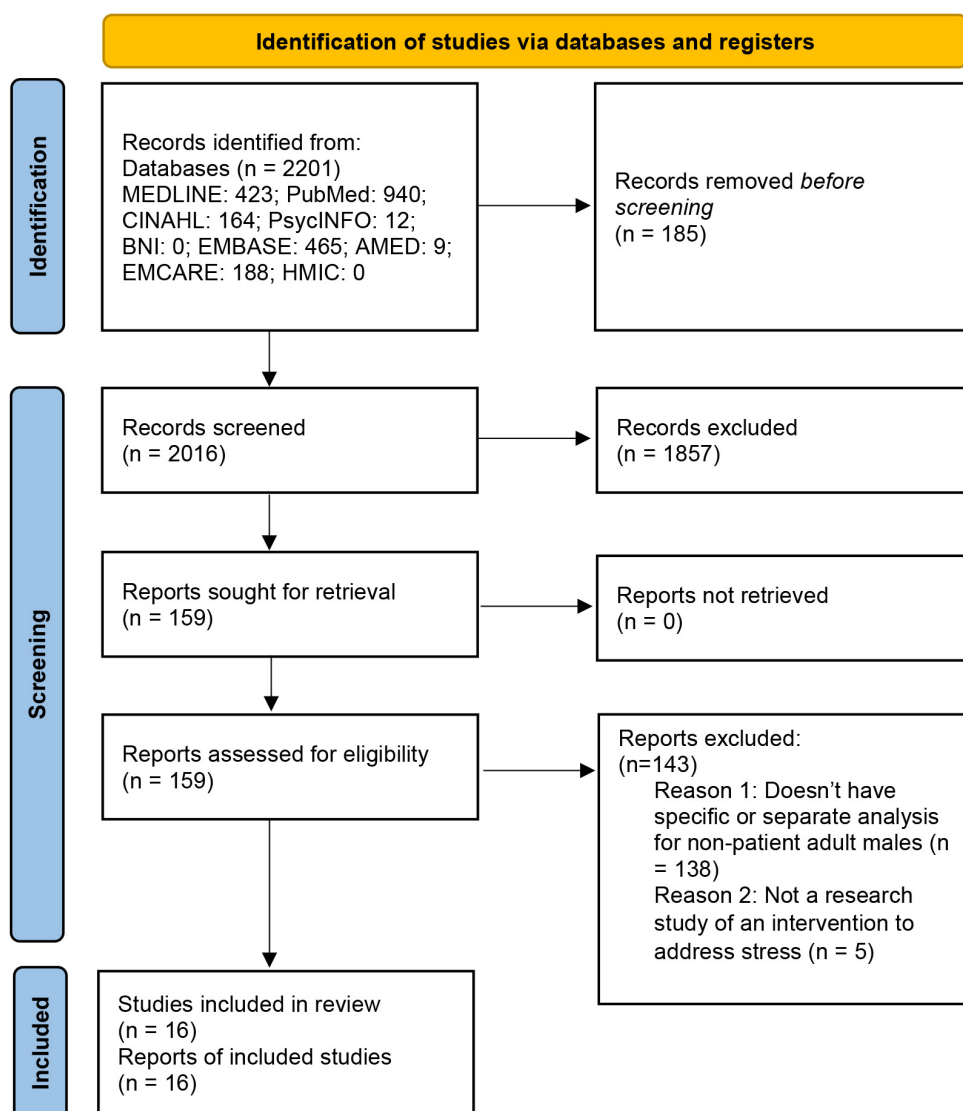


FIGURE 2. PRISMA flow diagram. Showing studies identified, screened, excluded and included in this systematic review. MEDLINE, MEDical Literature Analysis and Retrieval System Online; CINAHL, Cumulative Index to Nursing and Allied Health Literature; PsycINFO, Psychological Information Database; BNI, British Nursing Index; EMBASE, Excerpta Medica Database; AMED, Allied and Complementary Medicine Database; EMCARE, Excerpta Medica Care; HMIC, Health Management Information Consortium.

3.2.3 Stress type

The interventions addressed a range of stress types including perceived stress [15, 22, 26, 28], parental stress [13], general stress [18, 19], psychosocial stress [14], psychological distress [16], multi-modal stress [17], psychological stress [20], occupational stress [21], mental stress [23], chronic stress [24], environmental stress [25], and burnout [27].

3.2.4 Stress status

Baseline stress status was elevated in four studies [15–18], unspecified in two [23, 26], and mixed or non-specific in the remainder [13, 14, 19–22, 24, 25, 27, 28]. Outcome assessment periods ranged from 30 minutes following intervention to six months post-intervention. All studies included post-test as-

sessments and eight included additional mid-point assessments [13–19, 26].

3.2.5 Stress measures

Ten studies used the Perceived Stress Scale [29] or Perceived Stress Questionnaire [13, 15, 16, 18–22, 25, 26, 28, 30]. Other measures included salivary cortisol [15, 19], the Profile of Mood States [31], the Positive and Negative Affect Scale [32], General Health Questionnaire [33], Jefferson Scale of Empathy [34], Maslach Burnout Inventory [35], Five Facet Mindfulness Questionnaire [36], Multi-Modal Stress Questionnaire [37], Kessler Psychological Distress Scale [38], Hooper MacKinnon Questionnaire [39], and Trier Inventory for Chronic Stress [40].

TABLE 1. Study characteristics of included studies.

Author, Country	Study design	Study setting	No. of participants (sample % male)	Stress type	Baseline stress status	Outcomes measured	When outcomes assessed
Razani <i>et al.</i> [13] USA	Prospective randomised trial	Neighbour- hood parks	78 (13%)	Parental stress	Non-specific	PSS	Baseline, 1 and 3 mon
Armbrorst <i>et al.</i> [14] Germany	Randomised placebo-controlled, double-blind clinical trial	University	62 (29%)	Perceived stress and chronic stress	Moderate to high	PSQ, salivary cortisol	Baseline, 8 and 12 wk
Bershad <i>et al.</i> [15] USA	Randomised double-blind, placebo-controlled trial	Not reported	50 (60%)	Psychosocial stress	Non-specific	Levels of stress and physiological indices	Baseline, 30, 60 and 90 min
Lew <i>et al.</i> [16] Malaysia	Randomised double-blind, placebo-controlled study	Not reported	103 (23%)	Psychological distress	Moderate	PSS	4, 8 and 12 wk
George <i>et al.</i> [17] Malaysia	Randomised double-blind, placebo-controlled parallel study	Clinic	93 (45%)	Multi-modal stress	Moderate	MMSQ	6, 12 and 24 wk
Champion <i>et al.</i> [18] UK	Repeated-measures, randomised controlled design	Mobile app	62 (40%)	General stress	Average to high	PSS	Baseline, 10 and 30 d
Kell <i>et al.</i> [19] Australia	Double-blind randomised clinical trial	Home	97 (29%)	General stress	Non-specific	PSS, PANAS, Salivary cortisol	Baseline, 4 and 8 wk
Nakao <i>et al.</i> [20] Japan	Randomised controlled Trial	Shogi plaza	61 (100%)	Psychological stress	Non-specific	K6+	6 wk
O'Driscoll <i>et al.</i> [21] Ireland	Randomised controlled trial	Online	52 (23%)	Occupational stress	Non-specific	PSS, GHQ, JSE, MBI, FFMQ	4 wk
Naruse & Moss [22] UK	Pseudo randomised two group design	University	38 (44%)	Perceived stress	Non-specific	RISCI	6 wk
Hsouna <i>et al.</i> [23] Tunisia	Randomised controlled trial	Research laboratory	20 (100%)	Mental stress	Not specified	HMQ	Within 3 h
Patterson <i>et al.</i> [24] Finland	Randomised double-blind placebo-controlled parallel clinical trial	Clinic and home	118 (50%)	Perceived stress and chronic Stress	Moderate to high	TICS, biomarkers and self-report scales	Within 5 wk
Ritvo <i>et al.</i> [25] Canada	Randomised controlled trial	Online	154 (23%)	Environmental stress	Non-specific	PSS	8 wk
Wang & Boros [26] Hungary	Cross-over study design	At choice of participant	54 (Not reported)	Perceived stress	Not specified	PSS	4 wk
Weitzman <i>et al.</i> [27] USA	Prospective randomised crossover trial	Not reported	18 (72%)	Work-related burnout	Non-specific	MBI	Within 16 wk
Young <i>et al.</i> [28] China	One group pre- post-test design	Internet and/or phone app	84 (27%)	Perceived stress	Varied	PSS	2 wk

PSS, Perceived Stress Scale; PSQ, Perceived Stress Questionnaire; MMSQ, Multi-Modal Stress Questionnaire; PANAS, Positive and Negative Affect Schedule; K6+, Kessler Psychological Distress Scale; GHQ, General Health Questionnaire; JSE, Jefferson Scale of Empathy; MBI, Maslach Burnout Inventory; FFMQ, Five Facet Mindfulness Questionnaire; RISCI, Rhode Island Stress and Coping Inventory; TICS, Trier Inventory for Chronic Stress; HMQ, Health Measurement Questionnaire.

TABLE 2. Study intervention description, results, and conclusions.

Author, Country	Intervention description	Result/conclusions
Razani <i>et al.</i> [13] USA	Park prescription with nature resources; intervention group also received reminders.	Stress decreased overall, but no significant between-group differences. Park prescriptions may help reduce parental stress.
Armborst <i>et al.</i> [14] Germany	Daily amino acid and micronutrient supplementation.	Greater improvements than placebo after 12 weeks; effects may have been influenced by overall nutritional intake.
Bershad <i>et al.</i> [15] USA	Opioid and non-opioid analgesics administered before a psychosocial stress task.	Opioid analgesics reduced stress responses; limited benefit observed for non-opioid analgesics.
Lew <i>et al.</i> [16] Malaysia	Daily probiotic (<i>L. plantarum</i> P8) versus placebo.	Reduced stress and anxiety symptoms; findings support probiotic use as a potential natural intervention.
George <i>et al.</i> [17] Malaysia	<i>Eurycoma longifolia</i> plus multivitamins versus placebo.	Improved quality of life, mood and stress after 12 weeks.
Champion <i>et al.</i> [18] UK	Self-guided mindfulness app (10 or 30 days) versus waitlist control.	Improved self-reported psychosocial outcomes and stress.
Kell <i>et al.</i> [19] Australia	<i>Caralluma fimbriata</i> supplement versus placebo.	Reduced anxiety and stress in healthy adults.
Nakao <i>et al.</i> [20] Japan	Six-session shogi-assisted CBT programme.	Improved stress-related problem-solving and wellbeing.
O'Driscoll <i>et al.</i> [21] Ireland	Four-week online mindfulness-based intervention.	Participants reported reduced stress and increased emotional awareness.
Naruse & Moss [22] UK	Three-week positive massage programme.	Improved wellbeing, coping and perceived stress.
Hsouna <i>et al.</i> [23] Tunisia	Nap opportunities of varying durations.	All naps reduced stress; a 45-minute nap produced the greatest benefit.
Patterson <i>et al.</i> [24] Finland	Lpc-37 probiotic versus placebo.	Reduced perceived stress overall; no significant stress benefit observed in men.
Ritvo <i>et al.</i> [25] Canada	Eight-week virtual mindfulness programme.	Reduced perceived stress among university students.
Wang & Boros [26] Hungary	Daily walking programme monitored by pedometers.	Improved sleep quality, stress and life satisfaction.
Weitzman <i>et al.</i> [27] USA	Weekly virtual reality-guided mindfulness meditation.	Reduced emotional exhaustion; greater benefit observed in men.
Young <i>et al.</i> [28] China	Self-guided online CBT programme.	Reduced anxiety, depression and perceived stress.

CBT, cognitive behavioural therapy.

3.2.6 Study participants

Across 15 studies reporting participant numbers, 402 male participants were included. One study did not report the number or proportion of male participants [26]. Two studies involved male-only samples [20, 23], although neither was explicitly designed as a gender-tailored intervention [41]. Of the remaining studies, three reported samples comprising at least 50% men [14, 24, 27], while the remainder were predominantly female [15–19, 21, 22, 25, 28].

3.2.7 Design

Study designs included parallel [13, 20, 21, 25], placebo-controlled parallel [14–17, 19], crossover [23, 26–28], placebo crossover [24] and waitlist control designs [18, 22]. Studies were conducted across Europe, North America, Asia, and Australia. Summaries of the CASP appraisal are presented in Table 3 (Ref. [13–28]).

3.2.8 Updated surveillance search

The updated surveillance search identified 792 records across PubMed, MEDLINE, PsycINFO, and Embase. Following title and abstract screening, 10 articles were assessed at full text.

All 10 articles were excluded as they did not report male-specific outcomes and therefore did not meet the predefined eligibility criteria. Consequently, no additional studies were included and the findings of the review remained unchanged.

3.3 Synthesis of results

Across the included studies, all intervention categories reported improvements in at least one stress-related outcome. The largest body of evidence related to dietary supplements and mindfulness-based interventions. Although positive findings were reported across intervention types, comparisons were limited by small sample sizes, mixed-sex populations, inconsistent outcome measures, and limited male-specific analyses. Consequently, no intervention category could be identified as consistently more effective than another for reducing stress in men.

3.3.1 Green social prescribing

Razani *et al.* [13] reported reduced parental stress following park prescriptions, with male gender associated with greater improvement. However, only 13% of participants were male.

TABLE 3. CASP randomised controlled trial standard checklist quality assessments.

CASP question	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
(1) Did the study address a clearly focused research question?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
(2) Was the assignment of participants to interventions randomised?	Y	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y
(3) Were all participants who entered the study accounted for at its conclusion?	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	C	Y	Y	Y	Y	Y
(4a) Were the participants blind to intervention they were given?	Y	N	Y	N	Y	Y	Y	Y	C	N	N	Y	Y	Y	N	N
(4b) Were the investigators blind to the intervention they were giving to participants?	Y	N	Y	N	Y	Y	C	C	C	N	N	Y	Y	C	N	N
(4c) Were the people assessing/analysing outcome/s blinded?	C	N	Y	N	C	N	C	C	C	N	C	C	C	N	N	N
(5) Were the study groups similar at the start of the randomised controlled trial?	Y	Y	Y	C	Y	Y	Y	Y	N	Y	C	C	Y	Y	Y	Y
(6) Apart from the experimental intervention, did each study group receive the same level of care?	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	N	N	Y
(7) Were the effects of intervention reported comprehensively?	Y	N	Y	Y	Y	Y	Y	Y	N	Y	N	Y	Y	Y	Y	Y
(8) Was the precision of the estimate of the intervention or treatment effect reported?	N	N	Y	N	Y	N	Y	Y	Y	Y	N	Y	Y	Y	N	N
(9) Do the benefits of the experimental intervention outweigh the harms and costs?	C	Y	C	C	C	N	C	Y	C	Y	C	Y	C	C	C	C
(10) Can the results be applied to your local population/in your context?	Y	N	Y	N	N	C	N	Y	N	C	Y	Y	C	C	N	C
(11) Would the experimental intervention provide greater value to the people in your care than any of the existing interventions?	C	Y	C	N	Y	C	C	Y	C	Y	Y	Y	C	C	N	C
Total out of 4 (8–11)	1	2	3	0	2	0	1	4	1	3	2	4	1	1	0	0

Key: Y, Yes; N, No; C, Can't Tell; 1, [13]; 2, [14]; 3, [15]; 4, [16]; 5, [17]; 6 [18]; 7, [19]; 8, [20]; 9, [21]; 10, [22]; 11, [23]; 12, [24]; 13, [25]; 14, [26]; 15, [27]; 16, [28].

3.3.2 Oral administration of a medication or dietary supplement

Six studies examined medications or dietary supplements [14–17, 19, 24]. Overall, findings suggested potential benefits for perceived stress, anxiety, and wellbeing. Armbrorst *et al.* [14] reported improvements in perceived stress and HPA-axis regulation in men, while Lew *et al.* [16] observed reductions in stress and anxiety with stronger effects in men for learning and memory outcomes. George *et al.* [17] and Kell *et al.* [19] reported reductions in stress-related symptoms, although no male-specific findings were identified. Patterson *et al.* [24] found reduced perceived stress in females, but not males. Bershad *et al.* [15] reported stress-dampening effects of opioid analgesics, with similar effects observed in men and women.

3.3.3 App/virtual-based meditation or mindfulness

Four studies investigated app-based, online or virtual mindfulness interventions [18, 21, 25, 27]. All reported reductions in stress or burnout-related outcomes. However, two studies found greater improvements among females [18, 21], one lacked sufficient male representation for meaningful comparison [25], and one reported reduced emotional exhaustion among men [27].

3.3.4 CBT

Both CBT studies reported positive findings [20, 28]. Nakao *et al.* [20] found shogi-assisted CBT improved problem-solving skills for stress management in older men, while Young *et al.* [28] observed reductions in anxiety, depression, and perceived stress following online CBT. Female participants experienced greater reductions in stress than males in the latter study.

3.3.5 Exercise and lifestyle

Wang and Boros [26] found that a walking intervention improved sleep quality, stress, and life satisfaction, with no significant differences between men and women.

3.3.6 Manual therapy

Naruse and Moss [22] reported improvements in wellbeing, coping, and perceived stress following a positive massage programme. Sex-specific analyses were limited by the small sample size.

3.3.7 Short periods of sleep

Hsouna *et al.* [23] found that all nap opportunities (25, 35 and 45 minutes) reduced stress compared with no nap, with the greatest benefit observed following a 45-minute nap.

3.4 Study quality

The CASP checklist [12] was used to assess study quality. Although the tool does not provide a formal scoring system, the CASP frequently asked questions (FAQs) [42] indicate that studies not achieving “Yes” responses to the first two or three questions may represent lower-quality evidence. In the present review, 14 of the 16 studies answered “Yes” to questions one to three, while the remaining two studies answered “Yes” to two of the first three questions, suggesting at least moderate

methodological quality across all included studies.

As CASP is not designed to generate quantitative scores, studies were categorised pragmatically to facilitate comparison of methodological quality and applicability. These categories should be interpreted as a narrative summary of study quality rather than a formal risk-of-bias assessment.

Particular attention was given to the precision of intervention effects, the balance of benefits and harms, and the applicability of findings to practice (CASP Questions 8–11). The results of the CASP appraisal are presented in Table 3.

4. Discussion

Although a range of interventions were identified, this review highlights a lack of robust evidence regarding the effectiveness of stress interventions specifically for men. This is largely due to the small number of studies reporting male-specific or male-only analyses, together with considerable heterogeneity in outcome measures and intervention types. While the included studies identified approaches beyond those typically used to manage stress, no intervention category could be considered consistently superior.

Dietary supplements, mindfulness-based interventions, and CBT-based interventions were the most frequently studied approaches. Although positive findings were reported across all intervention categories, methodological limitations and limited male-specific evidence restrict confidence in their comparative effectiveness.

To ensure the review reflected the current evidence base, an updated surveillance search covering publications from 15 December 2022 to 27 July 2026 was undertaken. Although several potentially relevant studies were identified, none met the inclusion criteria requiring male-specific outcome data. This reinforces one of the principal findings of the review, namely the continued scarcity of intervention studies reporting outcomes specifically for men.

Future research should investigate whether men and women differ in both their preferences for and responses to stress-management interventions. Biological factors, help-seeking behaviours, and treatment preferences may influence intervention uptake, engagement, and effectiveness, and should therefore be considered when designing and evaluating future interventions for men.

4.1 Green social prescribing

The single study in this category [13] found that park prescriptions may be a promising approach for reducing parental stress. However, generalisability to men is uncertain given that 87% of participants were female. Furthermore, both study groups received physician counselling about nature, limiting the ability to determine which component of the intervention was responsible for the observed effects.

4.2 Oral administration of a medication or dietary supplement

The sole study to involve a medication was Bershad *et al.*'s [15] simulated stressful situation to test the impact of the intervention, which raises questions as to the effectiveness

of the medication *in vivo*. Outcomes were assessed in the immediacy following the application of the stressor leaving the longer-term outcomes on stress unknown and the study lacked power to compare men and women systematically.

Five studies investigated alternative and complementary supplements for stress reduction, making this the largest grouping of studies in this review. On review of the findings from Patterson *et al.* [24] it was noted that there was no intervention effect when specifically looking at males.

Daily supplementation with a specific amino acid composition with micronutrients [14] showed promising findings for male participants in relieving perceived stress. However, being a pilot study with a small sample size, the results need to be treated cautiously. Another natural therapy which shows promise is a probiotic called *Lactobacillus plantarum* P8 which was found to alleviate stress and anxiety in participants with moderate perceived stress [16]. These findings suggest the supplement may represent a feasible approach to managing stress and anxiety, particularly in men. Further research is thought to be needed to understand its benefits specifically for men with stress and its effects combined with other interventions, such as those provided as standard treatment.

The water extract plus multivitamins supplement study [17] noted particular benefits in reducing physical stress related symptoms, but given no significant reduction was observed for behavioural or cognitive stress and no findings reported specifically for males, its potential impact in addressing stress in men is uncertain. Similarly, Kell *et al.* [19] did find their tested supplement to reduce stress and anxiety, but no findings were reported that were specific to males in this study. The small sample size also presents a serious limitation to any claim that the intervention acts on cortisol.

The interventions within this category are biologically diverse and may act through different mechanisms. For example, amino acid supplementation may support neurotransmitter synthesis and regulation of the stress response, whilst probiotic interventions have been proposed to influence stress through modulation of the gut-brain axis. Herbal and nutritional supplements may also act through effects on neuroendocrine and inflammatory pathways. However, the underlying mechanisms remain incompletely understood and require further investigation, particularly in male populations.

4.3 App/virtual-based meditation or mindfulness

An app-based mindfulness [18] and online mindfulness course [21] found beneficial effects were enhanced for females more so than for men. However, both found overall benefits in their interventions in addressing stress. Similarly, an online mindfulness programme [25] was found to be effective in reducing stress, but did not have enough male participants take part to stratify their sample.

The study by Weitzman *et al.* [27] used only a small sample which lacked blinding and therefore findings could have been subject to the Hawthorne effect in which research participants modify their behaviour while they are being observed.

Virtual delivery offers advantages including greater accessibility and reduced delivery costs. However, the available ev-

idence suggests these interventions may provide more limited benefits for men than women.

4.4 CBT

Two studies with a primary focus on CBT were identified. Nakao *et al.*'s [20] study included only elderly men with amateur skills at shogi. Although findings were promising, the non-blinded design and highly specific participant group limit generalisability. In terms of generalisability, participants were all elderly men who were familiar with shogi, and they may already have had a shogi social network, which could distinguish them from elderly people who engage in no recreational activities.

In contrast, Young *et al.*'s [28] study included university students sampled specifically during the COVID-19 pandemic to investigate the CBT intervention's effect in addressing pandemic-related stress. Participants were counselling students and may therefore have been more receptive to psychological interventions than the wider population. Some methodological limitations of this study include the generalisability of the research results as is limited by the small sample size, dominance of female participants, adopting convenience sampling, and the lack of a control group for comparison. Additionally, an attrition rate of 39.3% was reported in this study which may give rise to biased estimation of intervention effects.

4.5 Exercise and lifestyle

Wang & Boros [26] included a mix of student and non-student participants. Participants who were not students at Eötvös Loránd University were provided with a free yoga course voucher, resulting in differential treatment between participants. This introduces a potential source of bias and represents a threat to the study's internal validity, as any effects observed may have been influenced by additional wellbeing support rather than the walking intervention alone.

The intervention also involved issuing pedometers to track the daily data of participants. With such devices, there was potential that they acted as an external motivation to exercise, also, the devices can encounter problems such as inaccurately recording activity levels. Additionally, while pedometers may encourage physical activity, they do not measure exercise intensity. Consequently, it is unclear whether reductions in stress were related to the amount of activity performed or the physiological demands of the exercise itself.

The study also encountered a relatively high dropout rate, which may relate to the efficacy and experience of the intervention. Furthermore, the intervention lacked standardisation of key exercise variables such as intensity, frequency, and duration. As a result, the observed improvements in stress cannot be confidently attributed to the exercise programme itself, limiting the strength of the study's conclusions.

4.6 Manual therapy

The positive massage study [22] did not identify any male-specific benefits. Although participant blinding was not feasible due to the nature of the intervention, this increased the

potential for demand characteristics and expectation effects.

4.7 Short periods of sleep

The study of the effect of different nap opportunity durations by Hsouna *et al.* [23] had a number of limiting factors, including relying primarily on subjective measures of stress. The absence of objective measures of stress and recovery limited the ability to corroborate participants' self-reported outcomes. Other issues include the allocation of participants to randomised groups not being specified in terms of group size or baseline characteristics, and no details of blinding being provided. Although only a matter of minutes, the post-intervention questionnaires were completed at the same time; therefore, the later the nap intervention, the less time participants had for their post-intervention follow-up interval.

The finding that longer nap durations were associated with greater reductions in stress may suggest that sufficient sleep duration enables more effective physiological recovery and fatigue management. However, further research is needed to establish the optimal duration and mechanisms through which napping influences stress-related outcomes.

5. Conclusions

With men having distinct stress responses, higher rates of maladaptive coping, being less likely to seek help, and having higher rates of suicide compared with women, there is a critical need for effective, male-specific interventions. However, this systematic review identified a significant lack of robust evidence on the effectiveness of stress interventions specifically for men. This is despite a range of study types being identified, including dietary supplements, mindfulness-based interventions, and CBT.

Although the 16 included studies reported positive findings, methodological and analytical limitations were evident across the evidence base. This means the findings must be viewed with caution, and a clear, evidence-based path for effective stress intervention for men is currently not available. Further rigorous male-focused studies are therefore needed to address this important evidence gap.

6. Limitations of the review

This systematic review has several known limitations. Firstly, only English-language literature was included. Secondly, a meta-analysis could not be conducted owing to the heterogeneity of the included studies, with stress being measured using a variety of assessment tools, variations in the type of stress being addressed, and differences in stress status of participants at baseline. Thirdly, although an updated surveillance search (15 December 2022 to 27 July 2026) identified additional potentially relevant studies, none met the inclusion criteria due to the absence of male-specific outcome reporting. Nevertheless, future updates may be warranted as the evidence base continues to evolve.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this systematic review are available from EBa upon reasonable request.

AUTHOR CONTRIBUTIONS

EBa—designed the research and conducted a systematic search of databases; wrote the manuscript. EBa and EBe—reviewed titles and/or abstracts of studies retrieved using the search strategy; independently conducted data extraction and quality and bias assessment for the included studies, with discrepancies resolved through discussion and consensus. JH—provided support and advice on the design and delivery of the research. All authors were given opportunity to contribute to editorial changes in the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at <https://oss.jomh.org/files/article/2105119028206813184/attachment/Supplementary%20material.zip>.

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