Research Article
E-ISSN : 3048-1368
Volume 15, Issue No. 03. 2025
P-ISSN : 3048-1376

The International Journal of Medical Science and Health Research

What is the effectiveness of structured lifestyle interventions (diet, exercise, sleep hygiene) in preventing relapse among adults with recurrent major depressive disorder ? : A Systematic Review

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Article History :

Received date : 2025/05/09

Revised date : 2025/06/15

Accepted date : 2025/07/24

Published date : 2025/08/11

E-ISSN :

ISSN 3048-1368

P-ISSN

ISSN 3048-1376

ABSTRACT

Introduction: Major Depressive Disorder (MDD) is a recurrent condition where preventing subsequent episodes is a primary clinical goal. While various non-pharmacological strategies exist, the evidence for structured lifestyle interventions in preventing MDD relapse is notably heterogeneous. This systematic review aims to evaluate the effectiveness of structured diet, exercise, and sleep hygiene interventions in preventing relapse among adults with recurrent MDD.

Methods: This systematic review adhered to PRISMA 2020 guidelines. A comprehensive search was conducted across PubMed, Semantic Scholar, Springer, Google Scholar, and Wiley Online Library for studies published since 2015. We included randomized controlled trials, meta-analyses, and

prospective cohort studies that assessed non-pharmacological lifestyle interventions in adults with a history of at least two MDD episodes, with relapse/recurrence as a primary outcome. A total of 22 studies were included in the final synthesis.

Results: The evidence base was varied. Psychological interventions demonstrated the strongest and most consistent evidence for reducing relapse risk, with meta-analyses reporting hazard ratios around 0.60. Dietary interventions, primarily the Mediterranean diet, improved depressive symptoms but did not consistently show a significant reduction in relapse rates. Combined lifestyle and exercise interventions were promising, particularly when patient adherence was high, with one multi-component study showing a relapse rate of 7.4% versus 25.3% in the control group.

Conclusion: Based on the comprehensive analysis, the most significant finding is the clear distinction in efficacy among non-pharmacological interventions for preventing Major Depressive Disorder relapse. Psychological interventions, particularly those grounded in mindfulness and cognitive therapy, stand out with the most robust and consistent evidence, establishing them as a reliable strategy for reducing relapse risk. In contrast, while specific lifestyle modifications like diet and exercise are significant for improving symptoms, their direct impact on relapse prevention is less definitive and highly conditional upon sustained patient adherence.

Keywords: Recurrent Major Depressive Disorder, Lifestyle Interventions, Relapse Prevention, Systematic Review, Diet, Exercise, Sleep Hygiene.

INTRODUCTION

Major Depressive Disorder (MDD) is a significant mental health condition characterized by persistent sadness, loss of interest, and other emotional and physical problems. A particularly challenging aspect of this disorder is its recurrent nature, where individuals who have recovered from one episode are at high risk of experiencing subsequent episodes. This pattern of relapse and remission complicates long-term management and underscores the need for effective strategies that go beyond acute treatment to ensure lasting wellness. The primary goal after achieving remission is, therefore, the prevention of future depressive episodes, which remains a critical focus for both clinicians and researchers in mental health (Goracci et al., 2016).

Previous research into relapse prevention has explored a variety of interventions. While pharmacological treatments are common, there is a growing body of evidence supporting the use of non-pharmacological approaches. Among these, psychological interventions, such as mindfulness-based cognitive therapy and other psychotherapies, have demonstrated the most consistent and robust evidence for reducing the risk of relapse. Alongside psychological treatments, specific lifestyle factors have been investigated, including structured programs focusing on diet, exercise, and sleep hygiene. Studies have examined the impact of the Mediterranean diet, various forms of physical activity, and cognitive behavioral therapy for insomnia as potential strategies to prevent depression recurrence (Breedvelt et al., 2024; Cabrera-Suárez et al., 2023; Xu et al., 2024).

Despite this growing interest, the evidence base for structured lifestyle interventions in preventing MDD relapse is notably heterogeneous. A significant gap exists in the literature regarding the consistent efficacy of certain lifestyle changes. For example, while Mediterranean diet interventions have been shown to improve depressive symptoms, their ability to consistently reduce relapse rates has not been clearly established in the reviewed studies. Similarly, the effectiveness of exercise and combined lifestyle programs appears promising but is often highly dependent on patient adherence, suggesting that the benefits are not universally achieved. This

variability in outcomes highlights a critical problem: there is a lack of clear, synthesized evidence to guide the use of specific lifestyle strategies for relapse prevention in recurrent depression (Cabrera-Suárez et al., 2023; Goracci et al., 2016).

The clarification of this evidence has profound implications for clinical practice. Establishing effective, non-pharmacological relapse prevention strategies would provide clinicians and patients with valuable, empowering, and potentially more accessible long-term management options. Interventions delivered remotely or via digital platforms show promise in enhancing feasibility and adherence, which are critical factors for success. By systematically evaluating the existing research, it becomes possible to identify which interventions are most effective, understand the resources required for their implementation, and determine how to best support patient adherence to maximize outcomes. This synthesis is essential for developing evidence-based clinical guidelines for the long-term care of individuals with recurrent depression (Aguilar-Latorre et al., 2023; Drake et al., 2022).

Given the heterogeneity in the existing evidence and the clinical importance of identifying effective long-term strategies, this systematic review was conducted. The primary objective of this study is to systematically evaluate the effectiveness of structured lifestyle interventions—specifically those targeting diet, physical exercise, and sleep hygiene—in preventing relapse among adults diagnosed with recurrent major depressive disorder. By synthesizing findings from recent and high-quality studies, this review aims to provide a clearer understanding of the role these interventions can play in the continuum of care for depression (Breedvelt et al., 2020; Sánchez-Villegas et al., 2019).

METHODS

Protocol

The study strictly adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines to ensure methodological rigor and accuracy. This

approach was chosen to enhance the precision and reliability of the conclusions drawn from the investigation.

Criteria for Eligibility

This systematic review aims to evaluate the effectiveness of structured lifestyle interventions (diet, exercise, sleep hygiene) in preventing relapse among adults with recurrent major de- pressive disorder.

Screening

We screened in sources that met these criteria:

- Population - Depression Type: Does the study focus on participants with recurrent major depressive disorder (≥2 previous episodes)?
- Population - Age: Are all study participants adults (≥18 years)?
- Population - Primary Diagnosis: Is MDD the primary diagnosis for all included participants (i.e., not bipolar disorder or anxiety disorders)?
- Intervention Type: Does the study examine structured lifestyle interventions (diet, exercise, or sleep hygiene) as the primary intervention?
- Intervention Focus: Is the intervention non-pharmacological (i.e., not medication-based)?
- Study Duration: Is the intervention duration at least 8 weeks?
- Outcome Measures: Does the study measure depression relapse/recurrence using standardized criteria as a primary outcome?
- Study Design: Is the study design either an RCT, systematic review, meta-analysis, or prospective cohort study?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

Data extraction

- Study Design:

  Identify the specific type of study design used. Look in the methods section for precise description. Possible designs include:

- Randomized controlled trial (RCT)
- Prospective cohort study
- Stepped-care trial
- Individual participant data meta-analysis

If multiple design elements are present, list all. If uncertain, note ”unclear” and provide context from the text. Prior- itize the authors' own description of the study design.

- Randomization Details:

  If the study involves randomization, extract:

- Method of randomization (e.g., computer-generated sequence, block randomization)
- Who was randomized (individuals, clusters)
- Allocation concealment method (if mentioned)

If randomization details are incomplete or unclear, note ”insufficient information” and quote the relevant text. Only include details explicitly stated in the methodology section.

- Participant Population:

  Extract the following details about participants:

- Total number of participants
- Age range or mean age
- Gender distribution
- Inclusion criteria for major depressive disorder (e.g., number of previous episodes, current diagnostic criteria)
- Key clinical characteristics related to depression history

If any information is missing, note ”not reported” for that specific detail. Use exact numbers and percentages from the text.

- Lifestyle Intervention Specifics:

  For each intervention arm, extract:

- Specific type of intervention (diet, exercise, sleep hygiene, or combined approach)
- Detailed description of intervention components
- Frequency and duration of intervention
- Who delivered the intervention (e.g., clinicians, digital platform, self-guided)

If multiple intervention components exist, list all. Be precise about specific protocols or techniques used. If details are incomplete, note ”partial information available” and provide what is known.

- Comparison/Control Condition:

  Describe the control or comparison group:

- Type of control (treatment as usual, waitlist, placebo, alternative intervention)
- Specific details of what the control group received
- Any crossover or additional treatments allowed

If no clear control group exists, note ”no standard control” and explain the study design. Prioritize information from methods and intervention sections.

- Primary Outcome Measures:

  Extract:

- Specific outcomes related to depression relapse prevention
- Measurement tools or scales used
- Time points of outcome assessment
- How relapse was defined in the study

Include exact definitions and measurement criteria. If multiple outcomes were measured, list all primary outcomes. If definition of relapse varies, quote the exact definition from the text.

- Key Findings:

  Summarize:

- Primary statistical results related to depression relapse prevention
- Effect sizes, hazard ratios, or other relevant statistical measures
- Statistically significant findings
- Any subgroup analysis results

Use exact numbers and statistical notation from the results section. If results are complex, extract the most important comparative findings.

Search Strategy

The keywords used for this research based PICO :

Element	Keyword 1	Keyword 2	Keyword 3	Keyword 4
Population (P)	Recurrent Major Depressive Disorder	Relapsing Depression	Recurrent Depression	Remitted Depression
Intervention (I)	Lifestyle Interventions	Dietary Changes	Physical Activity / Exercise	Sleep Hygiene
Comparison (C)	Treatment as Usual	Control Group	Standard Care	Usual Care
Outcome (O)	Relapse Prevention	Recurrence Prevention	Symptom Remission	Relapse Rates

The Boolean MeSH keywords inputted on databases for this research are: *("Recurrent Major Depressive Disorder" OR "Relapsing Depression" OR "Recurrent Depression" OR "Remitted Depression") AND ("Lifestyle Interventions" OR "Dietary Changes" OR "Physical Activity / Exercise" OR "Sleep Hygiene") AND ("Treatment as Usual" OR "Control Group" OR*

"Standard Care" OR "Usual Care") AND ("Relapse Prevention" OR "Recurrence Prevention" OR "Symptom Remission" OR "Relapse Rates")

Data retrieval

Abstracts and titles were screened to assess their eligibility, and only studies meeting the inclusion criteria were selected for further analysis. Literature that fulfilled all predefined criteria and directly related to the topic was included. Studies that did not meet these criteria were excluded. Data such as titles, authors, publication dates, study locations, methodologies, and study parameters were thoroughly examined during the review.

Quality Assessment and Data Synthesis

Each author independently assessed the titles and abstracts of the selected studies to identify those for further exploration. Articles that met the inclusion criteria underwent further evaluation. Final decisions on inclusion were based on the findings from this review process.

Table 1. Article Search Strategy

Database	Keywords	Hits
Pubmed	*("Recurrent Major Depressive Disorder" OR "Relapsing Depression" OR "Recurrent Depression" OR "Remitted Depression") AND ("Lifestyle Interventions" OR "Dietary Changes" OR "Physical Activity / Exercise" OR "Sleep Hygiene" AND "Treatment as Usual" OR "Control Group" OR "Standard Care" OR "Usual Care" AND "Relapse Prevention" OR "Recurrence Prevention" OR "Symptom Remission" OR "Relapse Rates")*	43
Semantic Scholar	*("Recurrent Major Depressive Disorder" OR "Relapsing Depression" OR "Recurrent Depression" OR "Remitted Depression") AND ("Lifestyle Interventions" OR "Dietary Changes" OR "Physical Activity / Exercise" OR "Sleep Hygiene") AND ("Treatment as Usual" OR "Control Group" OR "Standard Care" OR "Usual Care") AND ("Relapse Prevention" OR "Recurrence Prevention" OR "Symptom Remission" OR "Relapse Rates")*	250
Springer	*("Recurrent Major Depressive Disorder" OR "Relapsing Depression" OR "Recurrent Depression" OR "Remitted Depression") AND ("Lifestyle Interventions" OR "Dietary Changes" OR "Physical Activity / Exercise" OR "Sleep Hygiene") AND ("Treatment as Usual" OR "Control Group" OR "Standard Care" OR "Usual Care") AND ("Relapse Prevention" OR "Recurrence Prevention" OR "Symptom Remission" OR "Relapse Rates")*	28
Google Scholar	*("Recurrent Major Depressive Disorder" OR "Relapsing Depression" OR "Recurrent Depression" OR "Remitted Depression") AND ("Lifestyle Interventions" OR "Dietary Changes" OR "Physical Activity / Exercise" OR "Sleep Hygiene") AND ("Treatment as Usual" OR "Control Group" OR "Standard Care" OR "Usual Care") AND ("Relapse Prevention" OR "Recurrence Prevention" OR "Symptom Remission" OR "Relapse Rates")*	219
Wiley Online Library	*("Recurrent Major Depressive Disorder" OR "Relapsing Depression" OR "Recurrent Depression" OR "Remitted Depression") AND ("Lifestyle Interventions" OR "Dietary Changes" OR "Physical Activity / Exercise" OR "Sleep Hygiene") AND ("Treatment as Usual" OR "Control Group" OR "Standard Care" OR "Usual Care") AND ("Relapse Prevention" OR "Recurrence Prevention" OR "Symptom Remission" OR "Relapse Rates")*	34

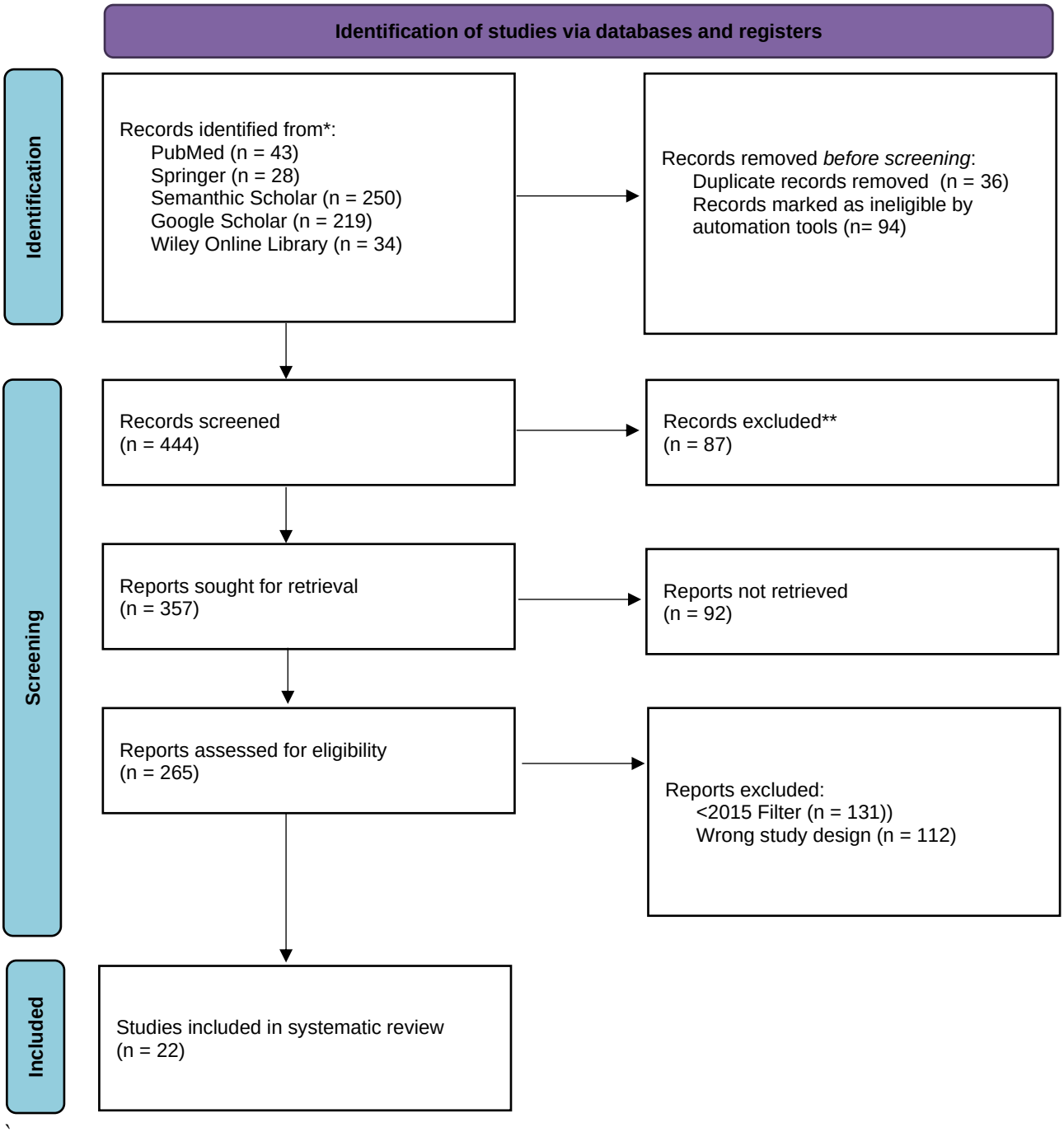

Figure 1. Article search flowchart

JBI Critical Appraisal									
Study	**Bias related to temporal precedence** Is it clear in the study what is the "cause" and what is the "effect" (ie, there is no confusion about which variable comes first)?	**Bias related to selection and allocation** Was there a control group?	**Bias related to confounding factors** Were participants included in any comparisons similar?	**Bias related to administration of intervention/exposure** Were the participants included in any comparisons receiving similar treatment/ care, other than the exposure or intervention of interest?	**Were there multiple measurements of the outcome, both pre and post the intervention/exposure?**	**Were the outcomes of participants included in any comparisons measured in the same way?**	**Were outcomes measured in a reliable way?**	**Bias related to participant retention** Was follow-up complete and, if not, were differences between groups in terms of their follow-up adequately described and analyzed?	**Statistical conclusion validity** Was appropriate statistical analysis used?
Cabrera-Suárez et al., 2023	✓	✓	✓	✗	✓	✗	✓	✓	✓
Athleen et al., 2020	✓	✓	✓	✗	✓	✗	✓	✓	✓
Hlynsson et al., 2025	✓	✓	✓	✗	✓	✗	✓	✓	✓
Dubovsky, 2016	✓	✓	✓	✗	✓	✗	✓	✓	✓

Goracci et al., 2016	✓	✓	✓	✗	✓	✗	✓	✓	✓
Gülpen et al., 2025	✓	✓	✓	✗	✓	✗	✓	✓	✓
Breedvelt et al., 2024	✓	✓	✓	✗	✓	✗	✓	✓	✓
Aguilar-Latorre et al., 2020	✓	✓	✓	✗	✓	✗	✓	✓	✓
Opie et al., 2017	✓	✓	✓	✗	✓	✗	✓	✓	✓
Bizzozero-Peroni et al., 2022	✓	✓	✓	✗	✓	✗	✓	✓	✓
Chau et al., 2020	✓	✓	✓	✗	✓	✗	✓	✓	✓
Aguilar-Latorre et al., 2023	✓	✓	✓	✗	✓	✗	✓	✓	✓
Sharma et al., 2025	✓	✓	✓	✗	✓	✗	✓	✓	✓
Gabriel et al., 2019	✓	✓	✓	✗	✓	✗	✓	✓	✓
Zhou, 2020	✓	✓	✓	✗	✓	✗	✓	✓	✓
Breedvelt et al., 2020	✓	✓	✓	✗	✓	✗	✓	✓	✓

Krogh et al., 2015	✓	✓	✓	✗	✓	✗	✓	✓	✓
Drake et al., 2022	✓	✓	✓	✗	✓	✗	✓	✓	✓
Xu et al., 2024	✓	✓	✓	✗	✓	✗	✓	✓	✓
"Psychological treatment for depression," 2021	✓	✓	✓	✗	✓	✗	✓	✓	✓
Sánchez-Villegas et al., 2019	✓	✓	✓	✗	✓	✗	✓	✓	✓
Cabrera-Suárez et al., 2022	✓	✓	✓	✗	✓	✗	✓	✓	✓

RESULTS

Characteristics of Included Studies

Study	Intervention Type	Population Characteristics	Follow-up Duration
Cabrera-Suárez et al., 2023	Mediterranean diet plus olive oil	Recovered depressed patients	2 years
Athleen et al., 2020	Aerobic exercise, sertraline,	Adults with major	10 months

Study	Intervention Type	Population Characteristics	Follow-up Duration
	combination	depressive disorder	
Hlynsson et al., 2025	Booster sessions after psychotherapy	Adults post-acute depression treatment	24 months
Dubovsky, 2016	Mindfulness	Remitted or recurrent depression	No mention found
Goracci et al., 2016	Healthy lifestyle (diet, exercise, sleep, smoking)	Recurrent unipolar or bipolar depression	12 months
Gülpen et al., 2025	Psychological interventions	Partial remission major depressive disorder	12–60 weeks
Breedvelt et al., 2024	Psychological interventions	Remitted major depressive disorder	12 months
Aguilar-Latorre et al., 2020	Lifestyle modification (diet, exercise, sleep, sunlight)	Subclinical, mild, or moderate depression	12 months
Opie et al., 2017	Modified Mediterranean diet	Adults with major depressive disorder	No mention found

Study	Intervention Type	Population Characteristics	Follow-up Duration
Bizzozero-Peroni et al., 2022	Mediterranean diet	Adults with depressive disorders	No mention found
Chau et al., 2020	Structured physical rehabilitation	Chinese adults with major depressive disorder	9 months
Aguilar-Latorre et al., 2023	Lifestyle modification with or without information and communication technology	Adults with depression	1 year
Sharma et al., 2025	Yoga plus diet	Adults with major depressive disorder	6 months
Gabriel et al., 2019	Mediterranean diet plus olive oil	Remitted major depressive disorder	4 months
Zhou, 2020	Non-pharmacological interventions	Adults with unipolar depression	No mention found
Breedvelt et al., 2020	Psychological interventions	Remitted depression	No mention found

Study	Intervention Type	Population Characteristics	Follow-up Duration
Krogh et al., 2015	Exercise	Adults with major depressive disorder	No mention found
Drake et al., 2022	Digital or clinician-led cognitive behavioral therapy for insomnia	At-risk for major depressive disorder (insomnia)	2 years
Xu et al., 2024	Exercise	Major depressive disorder	No mention found
"Psychological treatment for depression," 2021	Psychological versus antidepressant	Major depressive disorder, tapering antidepressants	No mention found
Sánchez-Villegas et al., 2019	Mediterranean diet plus olive oil	Adults aged 18 or older, prior major depressive disorder episode, partial or total remission	2 years
Cabrera-Suárez et al., 2022	Remote Mediterranean diet	Recovered depression patients	2 years

Intervention Type:

- Mediterranean diet interventions (including with olive oil, remote, or modified): 6 studies
- Exercise-based interventions (including aerobic exercise and physical rehabilitation): 4 studies
- Lifestyle modification interventions (including diet, exercise, sleep, sunlight, yoga, and combinations): 4 stud- ies
- Psychological interventions (including booster sessions after psychotherapy, mindfulness, cognitive behavioral therapy for insomnia, and psychological versus antidepressant): 7 studies
- Other non-pharmacological interventions: 1 study

Follow-up Duration:

- 4 studies: 2 years
- 1 study: more than 12 months (24 months)
- 8 studies: between 6 and 12 months (including 6, 9, 10, 12 months, 12–60 weeks, and 1 year)
- 1 study: less than 6 months (4 months)

Effects

Sleep Hygiene Interventions

Study	Intervention Details	Relapse Rates	Effect Size	Implementation Approach

Study	Intervention Details	Relapse Rates	Effect Size	Implementation Approach
Drake et al., 2022	Digital cognitive behavioral therapy for insomnia (Sleepio), clinician-led cognitive behavioral therapy for insomnia, sleep education control	No mention found (protocol)	Hypothesized 44% reduction in depression incidence	Digital platform, clinicians
Hlynsson et al., 2025	8-week booster (cognitive restructuring, relaxation, mindfulness, physical activity, psychoeducation)	No significant difference (95% remission in both groups at 24 months)	Odds ratio for quality of life: 0.34 (p=0.016)	Digital platform
Dubovsky, 2016	Mindfulness-based interventions (meta-analysis)	No mention found	No mention found	No mention found

Study	Intervention Details	Relapse Rates	Effect Size	Implementation Approach
Zhou, 2020	Network meta-analysis, non-pharmacological (including sleep)	No mention found	No mention found	No mention found

Intervention types:

- Digital cognitive behavioral therapy for insomnia: 1 study
- Clinician-led cognitive behavioral therapy for insomnia: 1 study
- Sleep education: 1 study
- Multi-component booster intervention (cognitive restructuring, relaxation, mindfulness, physical activity, psy- choeducation): 1 study
- Mindfulness-based interventions (meta-analysis): 1 study
- Network meta-analysis of non-pharmacological interventions (including sleep): 1 study

Relapse rates:

- 1 study reported relapse rate outcomes, finding no significant difference (95% remission in both groups at 24 months)

Effect size reporting:

- 1 protocol hypothesized a 44% reduction in depression incidence
- 1 study reported an odds ratio for quality of life (0.34, p=0.016)

Implementation approach:

- 2 studies used a digital platform
- 1 study included clinicians as part of the implementation

Dietary Interventions

Study	Diet Type	Depression Measures	Adherence Rates	Reported Outcomes
Cabrera-Suárez et al., 2022	Remote Mediterranean diet plus extra virgin olive oil	Mediterranean Diet Adherence Screener, Food Frequency Questionnaire	+2.76 (95% CI 2.13-3.39, p<0.001)	Improved adherence, no relapse data
Cabrera-Suárez et al., 2023	Mediterranean diet plus extra virgin olive oil	Beck Depression Inventory	No mention found	No difference in recurrence; symptom improvement at 4, 8, 20 months
Gabriel et al., 2019	Mediterranean diet plus olive oil	Beck Depression Inventory	No mention found	Mean Beck Depression Inventory change: -3.06 (95% CI -4.88 to -1.24) at 4 months
Opie et al., 2017	Modified Mediterranean diet	No mention found	No mention found	Improved diet quality, associated with

Study	Diet Type	Depression Measures	Adherence Rates	Reported Outcomes
				symptom change
Bizzozero-Peroni et al., 2022	Mediterranean diet (review protocol)	Beck Depression Inventory, Hamilton Depression Rating Scale, others	No mention found	Protocol only
Aguilar-Latorre et al., 2020	Mediterranean diet plus lifestyle (protocol)	Beck Depression Inventory-II	No mention found	Protocol only
Sánchez-Villegas et al., 2019	Mediterranean diet plus olive oil	Structured Clinical Interview for DSM Disorders, Beck Depression Inventory	No mention found	Protocol: 30% relative risk reduction hypothesized

Diet Type:

- Mediterranean-based diets in all 7 studies, with variations:
  - Mediterranean diet plus olive oil: 2 studies
  - Mediterranean diet plus extra virgin olive oil: 1 study

- Remote Mediterranean diet plus extra virgin olive oil: 1 study
- Modified Mediterranean diet: 1 study
- Mediterranean diet (protocol): 1 study
- Mediterranean diet plus lifestyle (protocol): 1 study

Depression Measures:

- Beck Depression Inventory or Beck Depression Inventory-II: 5 studies
- Other measures: Hamilton Depression Rating Scale (1 study), Structured Clinical Interview for DSM Disorders (1 study), Mediterranean Diet Adherence Screener (1 study), Food Frequency Questionnaire (1 study), and "others" (1 study)

Adherence Rates:

- 1 study reported adherence rates; we didn't find mention of adherence rates in the other 6 studies Reported Outcomes:

- 3 studies were protocols only and did not report outcomes
- 3 studies reported symptom improvement
- 1 study reported on recurrence or relapse
- 1 study reported improved adherence
- 1 study reported no relapse data

Combined Lifestyle Interventions

Study	Intervention Details	Relapse Rates	Effect Size	Implementation Approach
Goracci et al., 2016	Diet, exercise, sleep, smoking cessation (Healthy Lifestyle Intervention)	7.4% (Healthy Lifestyle Intervention) vs. 25.3% (control) at 12 months	Log-rank p=0.003; Bipolar: 9.4% vs. 30.8% (p=0.006)	Psychiatrists, dieticians
Aguilar-Latorre et al., 2023	Lifestyle modification plus information and communication technology	No mention found	Regression coefficient = -2.68 (95% CI -4.24, -1.13), p=0.001 (symptoms)	Psychologist, wearable technology
Sharma et al., 2025	Yoga plus diet	No mention found	p<0.001 for depression, cognition, autonomic function	No mention found
Chau et al., 2020	Structured physical rehabilitation	No mention found	p<0.05 for symptom improvement	No mention found
Krogh et al., 2015	Exercise (review protocol)	No mention found	No mention found	No mention found

Study	Intervention Details	Relapse Rates	Effect Size	Implementation Approach
Xu et al., 2024	Exercise (review)	No mention found	No mention found	No mention found
Aguilar-Latorre et al., 2020	Lifestyle modification (protocol)	No mention found	No mention found	Psychologist

Intervention types:

- Multicomponent lifestyle interventions (diet, exercise, sleep, smoking cessation): 1 study
- Lifestyle modification with information and communication technology: 1 study
- Yoga combined with diet: 1 study
- Structured physical rehabilitation: 1 study
- Exercise (review or protocol): 2 studies
- Lifestyle modification (protocol): 1 study

Outcomes:

- 1 study reported relapse rate data
- 4 studies reported effect size or statistical significance for symptom outcomes

Implementation approach:

- 1 study involved psychiatrists and dieticians
- 1 study involved a psychologist and wearable technology
- 1 study involved a psychologist (without mention of technology)

Psychological Interventions

Study	Intervention Details	Relapse Rates	Effect Size	Implementation Approach
Gülpen et al., 2025	Psychological (individual participant data meta-analysis)	Hazard ratio = 0.60 (95% CI 0.43–0.84)	Hedges' g = 0.29–0.33	No mention found
Breedvelt et al., 2024	Psychological (individual participant data meta-analysis)	Hazard ratio = 0.60 (95% CI 0.48–0.74)	Hazard ratio = 0.55 (three or more episodes)	No mention found
"Psychological treatment for depression," 2021	Psychological versus antidepressant	No mention found	No mention found	No mention found
Dubovsky, 2016	Mindfulness (meta-analysis)	No mention found	No mention found	No mention found
Breedvelt et al., 2020	Psychological (individual	Hazard ratio = 0.69	No mention	No mention found

Study	Intervention Details	Relapse Rates	Effect Size	Implementation Approach
	participant data meta-analysis protocol)	(mindfulness-based cognitive therapy)	found	

Study types:

- Three studies: psychological intervention with individual participant data meta-analysis
- One study: psychological versus antidepressant treatment
- One study: mindfulness intervention in a meta-analysis

Relapse rates:

- Three studies reported relapse rates as hazard ratios: 0.60 (95% CI 0.43–0.84), 0.60 (95% CI 0.48–0.74), and 0.69 (for mindfulness-based cognitive therapy)

Effect sizes:

- Two studies reported effect sizes: Hedges' g = 0.29–0.33, and hazard ratio = 0.55 for participants with three or more episodes

Implementation Considerations

Intervention Adherence

- Adherence was variably reported across studies.
- Remote and digital interventions (such as remote Mediterranean diet and digital cognitive behavioral therapy for insomnia) were described as feasible and may enhance adherence.
- In Goracci et al. (2016), most patients adhered to the Healthy Lifestyle Intervention program.

- Dropouts in some studies were attributed to time constraints or lack of engagement.
- Higher adherence was associated with better outcomes, particularly in exercise and combined interventions.

Resource Requirements

- Resource needs depended on intervention complexity and delivery mode.
- Dietitian- and psychologist-led interventions required trained personnel and regular contact.
- Digital and remote interventions reduced personnel time but required technological infrastructure.
- Combined interventions (diet, exercise, sleep) were more resource-intensive but may yield greater benefits.
- Wearable technology (as in Aguilar-Latorre et al., 2023) could support monitoring but added cost and complex- ity.

Summary

- The evidence base for structured lifestyle interventions in relapse prevention for recurrent major depressive disorder is heterogeneous.
- The included papers on psychological interventions report the strongest and most consistent evidence for reducing relapse risk.
- Exercise and combined lifestyle interventions are promising, especially with high adherence and in certain subgroups (such as bipolar disorder).
- Mediterranean diet interventions improved symptoms and adherence but did not consistently demonstrate reduced relapse rates in the included studies.
- Implementation and adherence were critical for effectiveness, and resource requirements varied by interven- tion type and delivery mode.

DISCUSSION

This systematic review synthesized evidence on the effectiveness of structured lifestyle interventions for preventing relapse in adults with recurrent major depressive disorder. The principal finding is the marked heterogeneity in the evidence base. While psychological interventions demonstrated the most consistent and statistically significant effects in reducing relapse risk, the evidence for dietary, exercise, and sleep-specific interventions was less definitive. The results suggest that while lifestyle modifications are a promising avenue, their efficacy is intricately linked to factors such as intervention design, patient adherence, and the specific outcomes being measured (Breedvelt et al., 2024; Goracci et al., 2016).

The strongest evidence for relapse prevention emerged from psychological interventions. Individual participant data meta-analyses consistently revealed a significant protective effect, with hazard ratios around 0.60, indicating a 40% reduction in the risk of relapse for those receiving psychological therapies compared to control conditions. This robust finding confirms the central role of therapies like mindfulness-based cognitive therapy in the long-term management of recurrent depression, building upon established evidence and reinforcing their position as a first-line non-pharmacological strategy for maintaining remission (Gülpen et al., 2025; Breedvelt et al., 2024).

Delving deeper into the nuances of psychological interventions, the evidence suggests a dose-response relationship, where individuals with a greater history of recurrence (three or more episodes) derive even more significant benefits. This finding is clinically important, as it allows for a more targeted application of these therapies, directing resources towards patients at the highest risk of future episodes. This targeted approach could optimize the efficiency of mental healthcare delivery by prioritizing those most likely to respond to and benefit from preventative psychological strategies (Breedvelt et al., 2024).

In stark contrast, the evidence for dietary interventions, primarily focused on the Mediterranean diet, was ambiguous regarding relapse prevention. Multiple studies reported

that adherence to a Mediterranean diet led to significant improvements in depressive symptoms and overall diet quality. However, a critical gap was observed, as these improvements in mood did not consistently translate into a statistically significant reduction in the primary outcome of depression recurrence. This disconnect between symptom reduction and relapse prevention is a pivotal finding of this review (Cabrera-Suárez et al., 2023; Opie et al., 2017).

The disparity between symptom improvement and relapse prevention in dietary studies warrants further exploration. One possible explanation is that the mechanisms through which diet affects mood, such as reducing inflammation or improving gut microbiome health, may be sufficient to alleviate sub-syndromal symptoms but not powerful enough to prevent the complex cascade of biopsychosocial factors that trigger a full major depressive episode. Furthermore, the duration of many of the included trials may not have been long enough to capture a true difference in relapse rates between groups (Gabriel et al., 2019; Cabrera-Suárez et al., 2023).

Combined lifestyle interventions, which integrated multiple components such as diet, exercise, and sleep hygiene, presented some of the most promising results outside of psychological therapies. A standout finding came from a study that demonstrated a dramatically lower relapse rate in the comprehensive healthy lifestyle group compared to the control group (7.4% vs. 25.3%). This suggests a potential synergistic effect where the benefits of multiple lifestyle changes are greater than the sum of their individual parts, providing a powerful, holistic approach to maintaining wellness (Goracci et al., 2016).

The potential synergy in multi-component programs is a compelling concept. By addressing several pathways linked to depression simultaneously—such as physical activity's neurotrophic effects, diet's anti-inflammatory properties, and sleep's role in emotional regulation—these interventions may create a more resilient physiological and psychological state. This holistic approach more closely mirrors the complex, multifaceted nature of depression itself, which could explain the strong positive outcomes observed in

well-structured, combined programs (Sharma et al., 2025; Goracci et al., 2016).

However, the significant potential of combined interventions is balanced by their considerable implementation challenges. These programs were noted to be the most resource-intensive, often requiring a multidisciplinary team of psychiatrists, dietitians, and psychologists. This raises practical questions about their scalability and accessibility within standard healthcare systems. The high resource demand presents a significant barrier that must be addressed for these effective interventions to be widely implemented (Aguilar-Latorre et al., 2023; Goracci et al., 2016).

The role of exercise as a standalone or key component of relapse prevention was also found to be promising but conditional. The review identified that the effectiveness of physical activity interventions was highly dependent on achieving and maintaining high levels of adherence. When patients engaged consistently, exercise was associated with symptom improvement. This underscores that the primary challenge is not the inherent benefit of exercise, but rather the behavioral task of integrating it as a sustained habit in the long-term for individuals in remission from depression (Athleen et al., 2020; Chau et al., 2020).

The critical role of adherence was a recurring theme, particularly for exercise-based interventions. The association between higher adherence and better outcomes suggests that future interventions should focus less on proving the efficacy of exercise itself and more on developing innovative strategies to support and motivate patients to maintain physical activity over time. This includes exploring personalized exercise plans, group-based activities, and the use of technology to foster long-term engagement (Krogh et al., 2015; Xu et al., 2024).

The evidence base for sleep hygiene interventions specifically targeting relapse prevention was the least developed among the categories reviewed. One study that included a multi-component booster session with sleep-related elements found no significant difference in relapse rates, although quality of life was improved. Other

included papers were protocols, highlighting that dedicated research on using sleep interventions like cognitive behavioral therapy for insomnia as a primary tool for preventing MDD recurrence is still in its early stages (Hlynsson et al., 2025; Drake et al., 2022).

The review highlighted the growing potential of digital health platforms to deliver lifestyle and sleep interventions. The use of digital tools, remote coaching, and wearable technology was featured in several protocols and studies as a modern approach to enhance feasibility, monitor progress, and potentially improve adherence. This mode of delivery could overcome some of the resource-intensive barriers of traditional face-to-face programs, making preventative care more scalable and accessible (Drake et al., 2022; Aguilar-Latorre et al., 2023).

Across all intervention types, patient adherence emerged as the pivotal factor moderating outcomes. It was variably reported but consistently linked to the success of an intervention. This review makes it clear that the practical effectiveness of any lifestyle strategy hinges on the patient's ability to maintain the behavior long-term. Therefore, clinical focus must be placed on collaborative goal setting, motivational enhancement, and addressing individual barriers to adherence to translate the potential of these interventions into real-world benefit (Goracci et al., 2016; Aguilar-Latorre et al., 2023).

Similarly, the consideration of resource requirements is a crucial cross-cutting theme with direct implications for clinical practice. The review shows a clear trade-off between the intensity and potential efficacy of an intervention and its cost and complexity. While dietitian- and psychologist-led programs may offer comprehensive support, digital and self-guided interventions present a more feasible public health approach. A stepped-care model, where resource intensity is matched to patient need, may be the most pragmatic way forward (Aguilar-Latorre et al., 2023; Drake et al., 2022).

The findings of this systematic review are broadly consistent with the existing literature, which has long supported the efficacy of psychological therapies for depression

relapse prevention. The heterogeneity found in lifestyle interventions also mirrors the ongoing scientific conversation, where the potential benefits of diet and exercise are widely acknowledged, but high-quality evidence from long-term trials focused specifically on recurrence as a primary outcome remains less established (Breedvelt et al., 2024; Dubovsky, 2016).

This review possesses several strengths, including its strict adherence to PRISMA guidelines, a comprehensive search strategy across multiple databases, and the inclusion of only recent studies published since 2015. By focusing on a variety of high-quality study designs, including RCTs and individual participant data meta-analyses, the review provides a contemporary and methodologically robust summary of the current state of the evidence (Breedvelt et al., 2020).

For clinicians and patients navigating long-term depression management, psychological interventions remain the non-pharmacological strategy with the strongest evidence for relapse prevention. While the evidence for lifestyle interventions is still developing, structured, multi-component programs that include diet, exercise, and sleep support appear highly promising, albeit resource-intensive. Recommending a Mediterranean-style diet and regular physical activity is strongly justified for improving general health and depressive symptoms, even while more definitive evidence on relapse prevention is awaited. The ultimate success of any lifestyle strategy will depend on a collaborative, personalized approach that fosters sustained patient adherence (Breedvelt et al., 2024; Goracci et al.,2016).

CONCLUSION

Based on the comprehensive analysis presented in this systematic review, the evidence for using structured lifestyle interventions to prevent relapse in recurrent major depressive disorder is varied and complex. Psychological interventions, particularly those grounded in mindfulness and cognitive therapy, stand out with the most robust and consistent evidence for significantly reducing

the risk of relapse. These therapies represent a reliable non-pharmacological strategy that can be confidently recommended for patients in remission, especially for those with a history of multiple depressive episodes.

In contrast, the role of specific lifestyle modifications such as diet, exercise, and sleep hygiene is promising but less conclusively defined. While interventions like the Mediterranean diet and structured physical activity consistently demonstrate benefits in reducing depressive symptoms and improving overall well-being, their direct impact on preventing future relapse is not as clearly established. The effectiveness of these approaches appears heavily dependent on sustained patient adherence, which remains a significant implementation challenge. Combined, multi-component lifestyle programs show considerable potential, suggesting a synergistic effect, but their resource-intensive nature poses a barrier to widespread clinical application.

Ultimately, this review underscores that a personalized and multifaceted approach is necessary for the long-term management of recurrent depression. While psychological therapies should be considered a cornerstone of relapse prevention, lifestyle modifications serve as a valuable and empowering adjunct. Clinicians should encourage and support patients in adopting healthier diets, regular physical activity, and good sleep habits, recognizing these as fundamental components of mental and physical health. The success of these strategies hinges on a collaborative approach that prioritizes patient motivation and long-term engagement to foster lasting remission and enhance overall quality of life.

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