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High-Intensity Interval Training in the Management of Depression: A Literature Review

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ABSTRACT

Depressive disorders are among the most common mental health conditions and are associated with psychological and functional burden. In recent years, physical activity has gained attention in depression research. This review focused on HIIT (high-intensity interval training), a form of exercise increasingly discussed in relation to depressive symptoms.

The aim of this literature review was to summarize current evidence regarding the influence of HIIT on depressive symptoms, potential neurobiological mechanisms, changes in sleep and quality of life.

Based on available findings, HIIT may contribute to reductions in depressive symptoms and may positively impact sleep and psychological well-being. Potential mechanisms discussed in the literature include changes related to BDNF activity, neuroplasticity, inflammatory pathways and HPA-axis regulation. Yet, available evidence is still limited and heterogeneous.

There is a need for further well-designed studies to better understand the long-term effectiveness of HIIT and optimal exercise protocols in those with depressive symptoms.

Keywords: depression; depressive disorders; depressive symptoms; HIIT, high-intensity interval training; physical activity; BDNF

1. Introduction

Depressive disorders are a major public health problem worldwide [1,2]. According to WHO (World Health Organization), these psychiatric conditions affect approximately 332 million people globally and significantly impair quality of life, occupational functioning and social relationships [2].

The International Classification of Diseases, 11th Revision (ICD-11), classifies depressive disorders into:

- a) Single episode depressive disorder
- b) Recurrent depressive disorder
- c) Dysthymic disorder
- d) Mixed depressive and anxiety disorder
- e) Other specified depressive disorders
- f) Depressive disorders, unspecified [3].

They are a group of mood disorders characterized by persistent depressed mood and diminished interest or pleasure in activities. In addition to emotional symptoms, depressive disorders are often associated with poor concentration, psychomotor alterations, appetite changes, fatigue and sleep disturbances [3,4].

Despite the growing awareness of mental health disorders, many people with depression still do not seek professional help. One of the reasons is fear of social discrimination and stigma.

Concerns regarding negative effects on personal relationships and professional life may also contribute to reduced help seeking-behavior. Although antidepressant treatment is considered successful in many patients, therapeutic response may differ substantially between individuals [5].

Pharmacotherapy and psychotherapy remain the primary treatments for depressive disorders, yet growing attention has been directed toward adjunctive non-pharmacological methods, especially physical activity. Higher-intensity exercise programs appeared to produce greater reductions in depressive symptoms. However, exercise prescription should be tailored to individual patient characteristics, adherence and tolerability [7]. Among different exercise methods, high-intensity interval training (HIIT) has recently drawn attention as a potentially beneficial strategy for improving depressive symptoms [8,9].

HIIT is based on repeated short periods of high-intensity exercise, usually performed at 80-90% of maximal heart rate, separated by passive or active recovery intervals [8,9,10]. One variation of HIIT is sprint interval training (SIT). It involves brief maximal or near-maximal efforts [10]. Current findings indicate that HIIT may help decrease depressive symptoms in individuals with mental disorders [8,9]. However, available findings do not clearly demonstrate that HIIT is more effective than other forms of exercise, despite some studies suggesting potential additional benefits [9].

The purpose of this literature review was to summarize available research regarding the impact of HIIT on depressive symptoms, discuss potential neurobiological mechanisms, and evaluate practical implications of HIIT in depressive disorders.

2. Methodology:

A literature search was conducted in March 2026 using PubMed/MEDLINE, PubMed Central (PMC) and Cochrane Library databases. The following keywords were used: “high-intensity interval training”, “HIIT”, “depressive disorders”, “depressive symptoms” and “physical activity”.

The review included English-language randomized controlled trials, meta-analyses, systematic and narrative reviews published between January 2015 and March 2026. Animal studies, non-peer-reviewed publications, conference abstracts and studies not related to depressive symptoms or the topic of this study were excluded.

3. Effects of HIIT on depressive symptoms

Recent evidence supports the potential usefulness of HIIT in alleviating depressive symptoms. Tao et al. (2024), in a systematic review and meta-analysis including 34 randomized controlled trials and 1607 participants, reported that HIIT was associated with notable improvements in depressive symptoms, especially when compared with non-active control groups. The authors emphasized the need for additional research on training modality, frequency and exercise protocols to better understand the antidepressant potential of HIIT [11].

Noetel et al. (2024) presented a systematic review and network meta-analysis including 218 randomized trials and 14,170 participants with clinically significant depression. The authors found that several exercise modalities, for instance, walking, yoga, jogging, strength training, were associated with reductions in depressive symptoms compared with control conditions. They also noted that more intensive activity generally showed stronger antidepressant outcomes. This study did not focus specifically on HIIT. Nevertheless, its findings provide relevant background for considering higher-intensity forms of exercise in the management of depressive symptoms [7].

Ribeiro et al. (2022) performed a rapid review of randomized controlled trials examining the impact of HIIT on depressive symptoms in people with mental disorders. The paper included four studies involving 108 participants and 55 of them were assigned to HIIT interventions. Most studies reported reductions in depressive symptoms following HIIT programs lasting from 12 days to 8 weeks. It was also suggested that HIIT may offer advantages for individuals who experience difficulties adhering to treatment options, as beneficial effects may be achieved within a shorter period of time compared with other forms of exercise. Still, the available evidence did not demonstrate a clear superiority of HIIT over low- or moderate-intensity exercise methods [9].

Similar observations were described by Wang et al. (2026) in research involving community-dwelling older adults with mild to moderate depressive symptoms. The authors indicated that HIIT may represent a time-efficient exercise approach for older adults, particularly because shorter activity sessions may be easier for them to maintain than longer training programs. Preliminary findings from the pilot phase also suggested good adherence and acceptability of HIIT among participants [12].

However, results across studies remain inconclusive. Gaia et al. (2024) conducted a systematic review and meta-analysis evaluating the influence of HIIT on depressive and anxiety symptoms in the general population. The authors did not observe meaningful improvements in depressive or anxiety symptoms following HIIT interventions and highlighted the heterogeneity in the included research and exercise protocols [13].

Despite inconsistencies among discussed publications, available reviews suggest that HIIT may contribute to reductions in depressive symptoms. Further well-designed studies are needed to better determine its clinical effectiveness and identify the most appropriate exercise protocols for different populations.

4. Potential neurobiological mechanisms

Depressive disorders are associated not only with psychological symptoms but also with alterations in several biological systems such as neuroplasticity, neurotransmitter regulation, inflammatory processes and stress-response pathways. Current evidence shows that these disturbances may contribute to depressive symptoms, although the biological background of depression remains complex and multifactorial [14,20,21].

One of the most frequently discussed biological factors in depression is brain-derived neurotrophic factor (BDNF). It is involved in neuronal survival, synaptic plasticity and neurogenesis. Reduced BDNF signaling has been linked to impaired neuroplasticity and altered neuronal adaptation observed in depressive disorders [14]. Several studies suggested that lower BDNF levels may be associated with disturbances in synaptic plasticity and stress-response regulation, which could promote the development of depressive symptoms [15,16]. At the same

time, increased BDNF expression and signaling may play a role in antidepressant responses and neuronal recovery processes [14].

The relationship between physical activity, BDNF and depression has been increasingly investigated over the years. Zarza-Rebollo et al. (2024), in a systematic review examining exercise-related neurobiological mechanisms in depression, suggested that exercise-induced increases in BDNF may support neuroplasticity and neuronal adaptation [16].

Similarly, Ren and Xiao (2023) reported that physical activity may stimulate BDNF expression, while noting that how these changes translate into clinical improvements in depressive symptoms remains unclear [17].

Murawska-Ciałowicz et al. (2021) noted that exercise intensity may influence BDNF response, as some studies reported greater increases in BDNF levels following higher-intensity exercise interventions. These observations may be relevant in the context of HIIT, although the available evidence remains limited [15].

Inflammatory processes have also been linked to depressive disorders. Increased concentrations of pro-inflammatory cytokines have been observed in some patients with depression, suggesting that chronic low-grade inflammation may contribute to depressive symptoms and impaired neuroplasticity [18,19]. Porter and O'Connor (2022) also suggested that inflammatory activity may negatively impact BDNF signaling and neuronal functioning [18].

Several studies have shown that physical activity may play a role in inflammatory pathways associated with depression. Hossain et al. (2024) reported that regular exercise may reduce inflammatory markers and affect stress-related biological systems [19]. Sun et al. (2023) also described potential effects of exercise on neurogenesis, inflammatory cytokine regulation and hypothalamic-pituitary-adrenal (HPA) axis activity [20].

Dysregulation of the HPA axis has been connected with abnormal cortisol secretion and impaired stress adaptation in depressive disorders [20,21].

This has prompted growing interest in whether high-intensity forms of exercise such as HIIT may induce distinct neurobiological responses compared with lower-intensity exercise.

Xu et al. (2024) reviewed possible neurobiological mechanisms linking HIIT with depressive symptoms. The authors suggested that HIIT may influence BDNF regulation, monoamine neurotransmission, neurogenesis, inflammatory processes and HPA-axis activity. It was noted that higher-intensity exercise may induce physiological responses different from those observed after lower-intensity training, mainly in relation to metabolic and neuroendocrine adaptations. However, the study emphasized that current evidence remains limited and that these mechanisms have not yet been fully clarified [21].

BDNF has also been discussed in relation to HIIT interventions. Mielniczek et al. (2025), in a systematic review and meta-analysis, reported that HIIT interventions may increase BDNF levels [10]. Similarly, Rodríguez-Gutiérrez et al. (2024) suggested that HIIT may induce greater acute increases in peripheral BDNF concentrations compared with some other exercise modalities. They also highlighted that HIIT may be a promising strategy for enhancing peripheral BDNF levels over the long term [22].

Nevertheless, both publications focused mostly on brain health and cognitive outcomes rather than depressive disorders specifically [10,22]. Therefore, these findings should be interpreted as supportive mechanistic evidence rather than direct proof that HIIT reduces depressive symptoms through BDNF-related pathways.

Zeng and Wang (2025), in a systematic review and meta-analysis of high-intensity exercise in patients with depression, discussed the possible involvement of HPA-axis activity, cortisol regulation, inflammatory pathways and BDNF mechanisms. The authors suggested that short-term high-intensity exercise may acutely activate the HPA axis and increase cortisol levels, whereas longer interventions may lead to more favorable physiological adaptations over time. However, they also emphasized that the available evidence remains heterogeneous and limited [23].

Taken together, current findings suggest that the potential antidepressant effect of HIIT may involve several biological pathways related to inflammation, neuroplasticity, neurotransmitter activity, neurogenesis and stress-response regulation. At the same time, most neurobiological evidence still originates from broader exercise research rather than studies investigating HIIT specifically in patients with depressive disorders. Therefore, dedicated research is needed to clarify how HIIT-induced biological adaptations relate to changes in depressive symptoms.

5. Sleep and Quality of Life

Sleep dysregulations and reduced quality of life are commonly observed in individuals with depressive symptoms and may negatively affect daily functioning and psychological well-being. Because of this, existing publications have increasingly examined whether exercise interventions may improve not only depressive symptoms but also sleep-related outcomes and overall quality of life [24,25].

Min et al. (2021), in a systematic review and meta-analysis, evaluated the impact of HIIT on sleep quality in adults. The authors observed that regular HIIT programs were associated with improvements in subjective sleep quality. At the same time, the effects differed considerably between studies because of variations in participants characteristics, intervention duration, exercise intensity and sleep assessment methods. The authors therefore emphasized that current findings should be interpreted cautiously [25].

Comparable observations were described by Martland et al. (2022), who investigated the impact of HIIT on mental health benefits in the general population and patients with physical illness. Compared with non-active control groups, HIIT was connected with moderate improvements in depression severity, perceived stress and mental well-being. The authors also noted possible positive changes in sleep quality and reductions in psychological distress following HIIT interventions. Still, these observations were based on a relatively small number of randomized controlled trials [8].

Some intervention studies have also described simultaneous improvements in depressive symptoms and sleep after HIIT programs. Jahrami et al. (2022) observed beneficial effects on depressive symptoms, sleep quality and cardiorespiratory fitness after an eight-week HIIT intervention. These findings may indicate that regular high-intensity exercise could positively influence both psychological and physical functioning. Despite this, the study did not determine whether sleep improvements directly contributed to reductions in depressive symptoms [26].

Interest in this topic has also increased in older populations. Wang et al. (2026) presented a protocol for a cluster-randomized controlled trial designed to assess the usefulness of HIIT in relation to depressive symptoms, cortisol levels, physical fitness, sleep and quality of life in community-dwelling older adults with mild to moderate depressive symptoms. The publication

reflects growing interest in the potential role of HIIT in improving both psychological and functional outcomes in older adults. However, the article presented a study protocol rather than clinical results, so conclusions about effectiveness remain limited [12].

Overall, available studies suggest that HIIT may positively influence sleep and selected aspects of quality of life in some populations [8,25]. Still, findings in this area remain heterogeneous because of differences in intervention protocols, participant characteristics and outcome assessment methods. Longitudinal studies with standardized protocols are necessary to better evaluate the impact of HIIT on sleep, daily functioning and quality of life in this population.

6. Practical implications

Current findings suggest that HIIT may represent a useful adjunctive strategy in the management of depressive symptoms [8,11]. Compared with some traditional exercise programs, HIIT interventions are usually shorter and may therefore be more practical for individuals who experience difficulties maintaining regular physical activity [9]. This aspect may be particularly important in patients with depression, among whom reduced motivation and difficulties engaging in regular exercise are common.

Meanwhile, published evidence indicates that HIIT protocols should be individually adjusted according to physical fitness, symptom severity, comorbidities and exercise tolerance [7].

Several studies emphasized that differences in exercise intensity, intervention duration and training frequency may affect both psychological and physiological outcomes [21]. For this reason, a universal HIIT protocol for individuals with depressive symptoms cannot currently be recommended.

The available literature showed that HIIT is generally feasible and may be acceptable in several populations, including older adults and individuals with mental disorders [9,12,21]. Nevertheless, some authors highlighted the importance of supervision and appropriate exercise prescription, mainly in participants with lower physical fitness or coexisting health conditions [12,21].

Importantly, current evidence does not support replacing standard depression treatment with HIIT alone. Most authors describe HIIT as a complementary intervention that may be used

alongside pharmacotherapy, psychotherapy or other forms of physical activity [7,21]. Although

Author	Year	Study design	Main focus	References
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several studies reported beneficial effects of HIIT on depressive symptoms, sleep quality and psychological well-being, further well-designed randomized controlled trials are still needed to determine optimal training protocols and long-term clinical value.

7. Limitations

Some limitations of this literature review should be acknowledged. First of all, the number of studies specifically investigating the effects of HIIT on depressive symptoms remains limited [8,9].

Second, the included publications differed substantially in study populations, intervention duration, exercise protocols and outcome measures. This makes direct comparison difficult [7,9,13]. It should also be noted that several studies involved relatively small sample sizes, potentially limiting the generalizability of the findings [8,9]. Additionally, not all reviewed articles focused directly on depression. Some studies examined broader mental health outcomes rather than depressive symptoms alone [13].

Most interventions included in the available studies were relatively short-term. Therefore, the long-term effects of HIIT on depressive symptoms, sleep and quality of life are still unclear [8].

Evidence regarding neurobiological mechanisms also remains limited. Although some findings discussed possible roles of BDNF regulation, HPA-axis activity, inflammatory pathways, many of these mechanisms are still based on indirect evidence and have not been fully confirmed in patients with depressive disorders [10,21].

Wang et al. (2026) presented a study protocol rather than completed clinical results. Thus, conclusions regarding the potential benefits of HIIT should be interpreted with caution [12].

Finally, available research does not clearly show that HIIT is consistently more effective than other forms of physical activity for depressive symptoms [7,9].

Future well-designed randomized controlled trials with larger sample sizes and more standardized exercise protocols remain necessary.

Martland	2022	Systematic review and meta-analysis	Mental health outcomes of HIIT, in healthy group of people and those with physical illnesses	[8]
Ribeiro	2022	Rapid review	HIIT influence on depressive symptoms in individuals with mental illness	[9]
Tao	2024	Systematic review and meta-analysis	Impact of HIIT in depressive symptoms in different populations	[11]
Zeng and Wang	2025	Systematic review and meta-analysis	Effect of HIIT on individuals diagnosed with depression	[23]
Gaia	2024	Systematic review and meta-analysis	HIIT role in depressive and anxiety symptoms	[13]
Xu	2024	Systematic review	Clinical relevance and mechanisms of HIIT in depression	[21]
Mielniczek	2025	Systematic review	Impact of HIIT on BDNF levels	[10]
Rodríguez-Gutiérrez	2024	Systematic review and meta-analysis	Effects on BDNF levels after HIIT training	[22]
Min	2021	Systematic review and meta-analysis	HIIT outcomes in sleep for adults	[25]

Table 1. Summary of key studies included in the review

8. Conclusions

Based on the collected literature, HIIT appears to be helpful in reducing depressive symptoms. Some studies reported positive outcomes related to selected aspects such as mental well-being, sleep and physical functioning. Beneficial effects of HIIT were mainly observed in comparison with non-active control groups. Some findings remain limited and inconsistent due to differences in study design, participant characteristics and exercise protocols.

HIIT was presented as a practical form of activity, especially for those who experience difficulties maintaining longer training programs. Some articles also suggested possible improvements in sleep quality and daily functioning. However, evidence in these areas is still insufficient.

The reviewed literature also highlighted the role of HIIT's potential biological mechanisms including changes in BDNF levels, neuroplasticity, inflammatory pathways and HPA-axis regulation. Yet, the exact relationship between these biological adaptations and improvements in depressive symptoms has not been fully established.

Overall, HIIT may be considered a supportive strategy that can complement standard approaches used in the management of depressive symptoms. Additional well-designed randomized controlled trials with larger participants groups and more standardized exercise protocols remains required. There is a need to better understand its long-term effects and underlying mechanisms.

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