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EFFECT OF PHYSICAL ACTIVITY ON SYMPTOMS OF DEPRESSION-REVIEW OF RANDOMIZED CONTROLLED TRIALS

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ABSTRACT

Depression is one of the most common mental disorders, and its treatment requires a multidimensional approach. Depression affects people of all ages, but in the elderly it poses a greater diagnostic problem due to the overlap of other concomitant diseases on the clinical picture. Traditional treatments include pharmacotherapy and psychotherapy, but there is growing interest in non-drug forms of therapy, including physical activity, as an effective and safe adjunct to depression treatment. Analysis of the results of randomized controlled trials indicates that regular physical activity, including aerobic training, strength training and mixed training, significantly reduces depressive symptoms and improves patients' overall well-being. Mechanisms for this effect include improved blood circulation to the brain, increased neuroplasticity, regulation of neurotransmitters, and positive psychological changes such as increased self-esteem and stress reduction. The results confirm that physical activity is an effective and safe adjunct to traditional treatments for depression, and that its implementation can bring tangible therapeutic benefits.

KEYWORDS

Depression, Physical Activity, Strength Training, Aerobic Training, RCT, Non-Pharmacological Treatment

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1.Introduction

Depression is one of the most common mental disorders in the world. It is estimated that more than 280 million people worldwide suffer from depressive disorders [1]. Depression significantly affects a person's mood, behavior and cognitive function, often co-occurring with other conditions both somatic and psychiatric, such as cardiovascular disease, metabolic syndrome and increased risk of suicidal behavior [14]. Moreover, most cases of depression remain undiagnosed or untreated. This is a result of the fact that depressive disorders are often underdiagnosed in the practice of general practitioners. Meanwhile, accurate and quick diagnosis significantly increases the patient's chance of successful treatment. The main reason for this situation is that many patients are misdiagnosed by family physicians or specialists in other medical fields [2,4]. Approximately 55% of people with depression have contact with primary healthcare or specialist services, of whom only 32% receive appropriate treatment [8]. In addition, the World Health Organization (WHO) notes that "stigma and inadequate availability of treatment are major barriers to effectively combating depression worldwide"[5]. Although the greatest increase in depressive disorders occurs in adolescents and young adults (20-24 years of age), depression also remains a significant problem among older adults (over 60 years of age) [2,3,4]. Risk factors for depression include both biological and environmental aspects. Biological factors include genetic predisposition and dysfunction of neurotransmitter systems, including the serotonin, noradrenergic and dopaminergic systems. Environmental factors include chronic stress, social isolation and external influences[5]. Traditional treatments for depression include pharmacotherapy and psychotherapy, but non-drug forms of therapy-including physical activity-are increasingly gaining attention as safe and effective adjuncts to treatment [6]. Physical activity, unlike pharmacotherapy and psychotherapy, is not associated with high costs or side effects, making it an attractive form of adjunctive treatment for depression[11]. Many studies confirm that regular physical activity has a beneficial effect on depressive symptoms. For example, aerobic exercise has a beneficial effect on the brain by improving its blood supply, stimulating neuroplasticity, and regulating levels of neurotransmitters such as serotonin and dopamine[9]. As a result, they exert a beneficial effect in people with depression. In addition, the activity promotes an increase in self-esteem, improves the quality of sleep and reduces stress and anxiety, which contributes to the alleviation of depressive symptoms from a psychological perspective[13].

Given the growing interest in physical activity as a form of therapy for depression, this article aims to review the current state of scientific knowledge in this area, taking into account the different types of exercise, study populations and recommended training parameters.

2.Methods

To explore the relationship between activity and symptoms of depression, we conducted a comprehensive literature review using databases such as PubMed, PMC, Web of Science, Scopus and supplemented with information from peer-reviewed academic book. The search focused on English-language articles published between 2000 and 2025 and academic book published in 2002. We included clinical trials, systematic reviews, and meta-analyses that examined how physical activity may influence depression symptoms. Studies that were not relevant to the topic, lacked methodological rigor, or were not published in English were excluded. All studies used depression assessment tools that allowed quantification of therapeutic effects, such as: Hamilton Depression Rating Scale (HAM-D), Hospital Anxiety and Depression Scale (HADS), Quick Inventory of Depressive Symptomatology (QIDS-16). The purpose of this review was to identify and summarize the results of scientific studies evaluating the effects of various forms of physical activity, including aerobic exercise, strength training and integrated exercise programs on the severity of depressive symptoms in patients of different ages. All of the Randomized Controlled Trial RCTs reviewed indicate a positive effect of exercise on reducing depressive symptoms, both as an adjunct to standard treatment and as a stand-alone form of intervention in milder cases of mood disorders.

3. Results of the Literature Review

One of the first studies to describe the effects of physical activity on depressive symptoms was conducted by Babyak et al..It evaluated the effectiveness of physical exercise compared to pharmacotherapy (sertraline) and a combination of medication and exercise in treating an episode of major depression in 156 adult patients. Participants were randomly assigned to three groups: aerobic exercise (3 times a week for 30 minutes each), pharmacotherapy (sertraline, up to 200 mg/day) or a combination group of exercise and sertraline. After 16 weeks of intervention, all groups achieved comparable reductions in depressive symptoms, as measured by HAM-D, with remission rates of 60.4% (exercise), 68.8% (sertraline) and 65.5% (combination therapy). Differences between groups were not statistically significant, suggesting equivalent efficacy of the three approaches in the short-term treatment of depression. However, analysis of the results after 10 months of follow-up showed significant differences in the maintenance of the therapeutic effect. The exercise group had a rate of depression relapse of only 8%, while the pharmacotherapy group had a 38% relapse rate and the combined group had a 31% relapse rate. These results suggest that exercise may not only have a therapeutic effect, but also a long-term protective effect against the recurrence of depressive symptoms[12].

In one randomized controlled trial, the authors examined the effects of a six-week exercise program on depression and anxiety levels in psychiatrically hospitalized adolescents. The study included 52 patients aged 12-18 with moderate to severe depression who were randomly assigned to one of two groups: intervention (n=28) and control (n=29). The experimental group participated in a 6-week exercise program that included 3-4 sessions per week, conducted in the form of engaging group physical activity. In total, patients completed an average of 18 sessions. The control group participated in relaxation and social sessions, which did not include a physical component, only standard drug treatment. The HADS scale, where depression (HADS-D) and anxiety (HADS-A) were assessed, among others, was used to evaluate effectiveness. Measurements were taken before and after the program. The results of the study showed that those in the exercise group had a significant improvement in their mental state in terms of depression-the average HADS-D score decreased by 3.8 points, while in the control group the improvement was only 0.7 points and was not clinically significant. In addition, some of the participants who exercised regularly experienced full remission of depressive symptoms, indicating a clinically significant therapeutic effect. The results of the study support the thesis that physical activity, even when used as an adjunctive therapy, can significantly affect the course of treatment for depression, improving both the mood and general well-being of patients. However, the effect of exercise on anxiety levels has not been conclusively demonstrated[7].

Another randomized controlled trial compared the effects of eight weeks of resistance exercise training (RET) with a control group in a population of young adults with depressive symptoms. The study included 55 young adults aged 26±5 years who were diagnosed with major depressive disorder (MDD) or Analogue Generalized Anxiety Disorder (AGAD). After three weeks of preparation, participants were randomly assigned to either the intervention group, which implemented strength training sessions twice a week for eight weeks,

or the control group. The effects of therapy were assessed using the QIDS-16. Observations after the eight-week training period showed a significant reduction in depressive symptoms: the treatment effect was strong in the entire group (Hedges' $d=1.01$; 95 percent CI: 0.44-1.57), and very strong in those with MDD ($d=1.71$; 95 percent CI: 0.96-2.46). Participants with AGAD also reported a large effect ($d=1.39$; 95 % CI: 0.55-2.24). The results showed that RET participants experienced a statistically and clinically significant reduction in depressive symptoms after just 8 weeks, compared to the control group, demonstrating that RET is an effective and safe therapeutic method for alleviating depression in young people[8].

In the other hand, a study conducted by La Rocque CL, et al. analyzed the effects of Bikram yoga (high-temperature exercise) and aerobic training on depressive symptoms in women. The study included 53 women diagnosed with unipolar depression who were randomly assigned to one of three groups: yoga, aerobic exercise or a waiting list (control group). After eight weeks of intervention, it was noted that more than 60% of participants in both the yoga (61.1%) and aerobic (60.0%) groups achieved $\geq 50\%$ reduction in depressive symptoms (as measured by the HAM-D scale), compared to only 6.7% in the control group ($p=0.001$). This study indicates that yoga may be comparably effective to classical exercise in treating depression, providing additional benefits through elements of mindfulness and regulation[10]. The optimal frequency or length of sessions has not been clearly defined, but available research suggests that as little as one session of 60 minutes per week can produce a noticeable reduction in depressive symptoms [15].

4. Discussion

The results of the Babyak M et al. study provide valuable data supporting the effectiveness of exercise in the treatment of depression, both in the short and long-term. Although there were no significant differences in efficacy between the exercise, pharmacotherapy and combination therapy groups after 16 weeks of intervention, long-term results (after 10 months) revealed the superiority of physical activity as a protective factor against recurrence of depression. The work of Philippot A et al. underscores that physical exercise together with pharmacotherapy significantly improves well-being in patients with depression compared to those whose treatment consists of pharmacotherapy alone. Regular exercise contributed to a significant improvement in mood and a reduction in depressive symptoms, and in some subjects even a complete abolition of symptoms[7]. The results of another study describe that in addition to classical aerobic exercise, resistance training is a valuable adjunct to therapy for depression, positively influencing the mental state of patients. The authors also note the beneficial effects of strength training on physiological aspects and overall quality of life, which may contribute to increased motivation and maintenance of regular physical activity in the long term. On the other hand, a study conducted by Cherie L La Rocque concludes that Bikram Yoga may be an apt benchmark for aerobic exercise, as both forms of activity offer potential psychological and physical benefits by modifying the body's response to stress, including by reducing perceived stress, reducing the tendency to ruminate, and improving concentration[10]. The analysis of the presented studies confirms that physical activity is an effective method of reducing depressive symptoms in adult patients. All of the aforementioned studies indicate a significant decrease in the severity of depressive symptoms following exercise intervention, as evidenced by results assessed using recognized scales such as HAM-D, HADS, and QIDS-16. This makes physical activity an attractive alternative or adjunct to pharmacotherapy, especially for patients concerned about the side effects of medications. One important aspect of the studies discussed here is the variety of forms of physical activity-from aerobic to strength training to mixed training-which suggests the possibility of flexibly tailoring therapeutic programs to individual patient preferences and abilities. Such personalized selection may promote better motivation and longer maintenance of regular activity, which is crucial for the sustainability of therapeutic effects.

5. Conclusions

Physical activity shows a clear positive effect on reducing depressive symptoms, as confirmed by the results of the randomized trials analyzed. Both aerobic training, strength training and yoga have proven effective in reducing the severity of depressive symptoms, indicating that the form of activity can be tailored to individual patients' needs and preferences. The measurement tools used in the study, such as the HAM-D, HADS, and QIDS-16, confirmed statistically significant improvements in mental health after exercise intervention. Given the low risk of side effects and additional health benefits, physical activity should be recommended as an integral part of depression therapy for both treatment and prevention. Nonetheless, further research is needed on the optimal selection of the type, intensity and duration of physical activity, as well as on methods for maintaining long-term activity after the therapeutic program has ended. Particular attention should be paid to studies involving diverse patient populations, including the elderly, patients with treatment-resistant depression and comorbidities, in order to develop personalized and effective interventions.

Author Contributions

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