太极拳对抑郁症患者的干预效果与作用机制研究

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摘要：目的：抑郁症是一种常见的精神障碍，表现为长期情绪低落或对活动失去兴趣，是社会、心理和生物等多种因素复杂作用的结果，严重影响患者心理社会功能和生活质量。世界卫生组织（WHO）2023 年发布的统计数据显示，全球约有 2.8 亿人患有抑郁症，约占全球总人口的 3.8%，预计到 2030 年，重度抑郁症将成为全球范围内疾病负担的首要原因。在我国，抑郁症的发病率呈逐渐上升趋势。由于抑郁症难以治愈且复发率较高，临床治疗面临着诸多挑战。目前，抑郁症的治疗主要包括药物治疗、心理治疗以及物理治疗等。其中药物治疗作为首选方法，存在副作用明显、依从性低以及经济负担重等诸多局限。同时越来越多临床研究指出，药物治疗在改善抑郁症方面的效果并不理想。因此，探索更加安全、有效且低成本的治疗方法已成为目前学界研究的重点。近年来，传统运动疗法在抑郁症治疗领域受到广泛关注。太极拳作为一种历史悠久的传统运动形式，具有放松身心、调节情绪等多种功效，有助于提升个体身心健康水平。多项研究表明，太极拳干预能在一定程度上改善抑郁症患者的抑郁情绪。然而，现有研究在太极拳干预方案的设计以及抑郁评估工具等方面存在差异，导致相关研究结果缺乏一致性，难以对太极拳干预抑郁症的疗效进行统一评估，且对太极拳干预抑郁症的具体作用机制尚缺乏系统阐释。基于此，本研究对太极拳改善抑郁症患者抑郁情绪的相关研究进行系统梳理及 Meta 分析，旨在系统评价其疗效并探讨太极拳干预抑郁症患者的作用机制，为临床非药物干预抑郁症提供准确的循证依据和新的研究思路。**方法：**（1）文献收集：检索 PubMed、Embase、中国知网、万方、维普等数据库，检索时限截至 2025 年 5 月，收集有关太极拳对抑郁症患者的干预效果与作用机制的研究。1）Meta 分析文献纳入标准：研究类型是太极拳对抑郁症患者疗效的随机对照研究；结局指标为各组研究对象抑郁评分，评估量表包括抑郁自评量表（Self-rating Depression Scale, SDS）、24 项汉密尔顿抑郁量表（24-item Hamilton Depression Scale, HAMD-24）、17 项汉密尔顿抑郁量表（17-item Hamilton Depression Scale, HAMD-17）和 30 项老年抑郁量表（30-item Geriatric Depression Scale, GDS-30）；2）Meta 分析文献排除标准：无对照组的

干预研究；实验组不以太极拳为主要运动手段，而以多种运动形式相结合进行干预；综述类文献、不完整文献和未能获取完整信息的文献；重复发表的文献。（2）数据提取：每篇文献中提取以下信息：第一作者、发表时间、实验组和对照组的样本量、性别及年龄、太极拳干预时间及周期、抑郁评估工具和结局指标。（3）统计分析与机制梳理：应用统计软件 Review Manager 5.4 和 STATA 18，对文献中采用太极拳干预的实验组与其对照组的抑郁评分进行 Meta 分析，并梳理太极拳对抑郁症患者治疗的作用机制。**结果：**国内外数据库初步检索获得文献 1955 篇。剔除重复文献，排除无关文献与实验数据不符合要求的文献，最终本研究共纳入 20 篇文献进行 Meta 分析，总样本量 1248 人。Meta 分析结果显示，太极拳干预组抑郁症患者的各项抑郁指标均显著低于对照组，其中：（1）抑郁指标采用 SDS 的文献共 7 篇，太极拳干预组 SDS 得分显著低于对照组，差异有统计学意义（MD=-8.72, 95%CI: [-12.66, -4.78], P<0.0001）；（2）抑郁指标采用 HAMD-24 的文献共 6 篇，太极拳干预组 HAMD-24 得分低于对照组，差异有统计学意义（MD=-3.33, 95%CI: [-6.23, -0.42], P=0.02<0.05）；（3）抑郁指标采用 HAMD-17 的文献共 5 篇，太极拳干预组 HAMD-17 得分显著低于对照组，差异有统计学意义（MD=-1.68, 95%CI: [-2.64, -0.71], P=0.0007<0.01）；（4）抑郁指标采用 GDS-30 的文献共 3 篇，太极拳干预组 GDS-30 得分显著低于对照组，差异有统计学意义（MD=-8.26, 95%CI: [-9.03, -7.50], P<0.00001）。基于文献进行梳理，本研究对太极拳干预抑郁症的作用机制总结出以下观点：（1）下丘脑-垂体-肾上腺（Hypothalamic-pituitary-adrenal, HPA）轴是太极拳干预抑郁症作用的核心靶点：HPA 轴功能紊乱与抑郁的关系已得到广泛证明，其中并不少见运动通过恢复 HPA 轴功能介导抑郁缓解的研究证据。太极拳可通过上调瘦素受体（LepRb）表达，促进瘦素（Leptin）发挥作用来调节 HPA 轴功能；同时有研究表明太极拳可能通过脂联素（Adiponectin, APN）、胃饥饿素（ghrelin）、神经肽 Y（Neuropeptide Y, NPY）等其他因子间接调控 HPA 轴功能。（2）神经递质是太极拳干预抑郁的重要介质：神经递质功能的恢复是抑郁治疗的一个重要靶点。多数研究表明，太极拳可通过影响神经递质改善抑郁。太极拳可能通过上调机体 ghrelin 水平，进而使中缝背核神经元的 5-羟色胺（5-hydroxytryptamine, 5-HT）及其受体水平上升；ghrelin 通过与促生长激素释放受体（GHS-R1a）结合，促进谷氨酸能神经元投射以参与多巴胺能神经元放电和多巴胺代谢，恢复机体多巴胺的正常功能。此外，太极拳可能通过提高机体 NPY 的水平，进而增加杏仁核和下丘脑去甲肾上腺素和 5-HT 水平，降低 5-HT 的分解代谢。（3）神经重塑与神经发生是太极拳干预抑郁症的重要作用终点：已有充足的研究证明大脑神经可塑性和神经发生水平与抑郁的关系，其中太极拳可能通过下调 miR-135a-5p，提高 IP3 信号通路的激活水平，促进齿状回神经前体细胞的增殖；通过 Leptin/LepRb 的作用，调节 JAK2/STAT3 与 PI3K/AKT 通路，进而抑制 GSK3β，上调

β-catenin，从而促进神经发生；通过上调 ghrelin 影响一氧化氮合酶活性、上调 BDNF-CREB/p-CREB 通路活性来改善神经可塑性；通过上调脂联素，激活 AMPK 通路与 p38MAPK/GSK3β/β-catenin 通路，促进海马神经发生。（4）肠道微生物菌群重构是太极拳干预抑郁症的重要机制：近年来肠道菌群与抑郁的关系引起学界广泛关注，已有部分证据证明太极拳可通过影响肠道菌群来发挥抗抑郁功效。太极拳可能通过增加抑郁症患者体内双歧杆菌、植物乳酸菌、粪肠球菌等有益菌数量来提高患者体内神经递质水平；同时，太极拳运动可能可以平衡抑郁症患者体内乳酸杆菌和大肠杆菌的比例，减少大肠杆菌代谢产生苯乙酸发挥的神经递质合成酶活性抑制的效果，提高乳酸杆菌对患者内源性大麻素（endocannabinoid, eCB）系统的恢复作用，进而发挥抗抑郁效果；此外，太极拳还可能通过减少肠道中部分革兰氏阴性菌（如脱硫弧菌属等）数量，降低抑郁症患者机体脂多糖（LPS）水平，进而降低全身炎症水平以起到潜在的缓解抑郁功效；最后，太极拳还可能通过上调人体普氏栖粪杆菌与丁酸菌含量，增加其代谢产生的短链脂肪酸（short-chain fatty acids, SCFAs）的含量，并通过 SCFAs 来发挥广泛的抗抑郁效果，如抗炎、调节色氨酸代谢与促进神经再生等。**结论：**研究结果显示，太极拳干预可通过调控 HPA 轴功能、恢复神经递质功能、促进神经重塑与神经发生、重构肠道微生物菌群，对抑郁症治疗产生一定辅助效果。**建议：**本研究认为可将太极拳纳入现有抑郁治疗流程体系，并从优化治疗方案、加强质量控制、适配特殊人群三个方面为临床实践提出建议与参考。（一）优化治疗方案。本研究认为可采用药物配合太极拳干预的治疗方案。选择简化版的 24 式太极拳为运动内容，便于患者逐步适应，训练过程中需要严格控制运动强度，确保运动的安全性和效果。（二）加强质量控制。为了保障治疗质量，可以建立认证教练库，确保参与太极拳干预的教练员均通过精神健康专项培训。再者，可采用便携设备监测患者运动强度，确保其符合 WHO 推荐的抑郁症运动处方标准，以便精确控制干预的效果。此外，渐进式目标体系的设置也至关重要，可以从掌握太极拳的 3 个基本式开始，逐步过渡到完成整套演练，确保患者在不断提升中获得持续的身心益处。（三）适配特殊人群。有关太极拳的辅助治疗可根据不同患者的具体需求进行个性化调整。例如，针对老年患者可设计坐式太极拳课程，减轻其运动负担；针对青少年群体则可以将太极拳与音乐疗法相结合，设计出既具趣味性又有助于心理健康的太极操；而对于产后抑郁患者，可以结合亲子互动元素，增强他们的互动体验和情感连接，从而提高治疗的效果等。综上所述，本研究建议通过构建合理的训练模式、专业的教练队伍、个性化的课程设计等，确保太极拳在临床应用中的安全性和有效性。未来的研究可以聚焦于优化干预方案、具体探讨不同患者群体的个性化需求等，来推动太极拳在抑郁症治疗甚至预防中的广泛应用，为临床治疗提供更为有效和多元化的治疗选择。

关键词：太极拳；抑郁症；Meta 分析

Effectiveness of Tai Chi intervention for Major Depressive Disorder: a systematic review and meta-analysis

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Abstract: Depression is a common mental disorder characterized by persistent low mood or loss of interest in activities, resulting from complex interactions among social, psychological, and biological factors, severely impairing patients' quality of life and psychosocial functioning. By 2030, depression is projected to become the leading cause of disease burden globally. Current treatments for depression primarily include pharmacotherapy, psychotherapy, and physiotherapy. Among these, pharmacological interventions are the most widely used but limited by its adverse effects, poor adherence, and high economic burden, making the exploration of safer, more effective, and lower-cost treatment methods a key research focus. Tai Chi, as a traditional exercise form with a long history, offers various benefits including regulating emotions and relaxing the body and mind, contributing to the enhancement of individual physical and mental health. Based on the importance of traditional exercise therapy, this study systematically evaluated the efficacy and mechanisms of Tai Chi interventions for depressed patients through literature review and meta-analysis, aiming to provide accurate evidence-based basis and novel insights for clinical depression intervention. By searching databases including PubMed, Embase, CNKI, Wanfang, and VIP, 20 studies involving 1,248 patients were included in the meta-analysis. The meta-analysis results showed that the Tai Chi intervention group had significantly lower scores than the control group on the SDS (MD=-8.72, 95%CI: [-12.66, -4.78], P<0.0001), HAMD-24 (MD=-3.33, 95%CI: [-6.23, -0.42], P=0.02<0.05), HAMD-17 (MD=-1.68, 95%CI: [-2.64, -0.71], P=0.0007<0.01), and GDS-30 (MD=-8.29, 95% CI: [-9.01, -7.57], P<0.0001). The literature review results indicated that Tai Chi interventions may aid depression treatment through four mechanisms: modulating HPA axis function, restoring neurotransmitter function, promoting neuroplasticity and neurogenesis, and reconfiguring the gut microbiota. Synthesizing these findings, this study concludes that Tai Chi intervention has a certain adjunctive effect on depression treatment and can be utilized as an important supplementary approach for

depression. Based on this, the study offers recommendations and references for clinical practice from three aspects: optimizing treatment plans, strengthening quality control, and adapting for special populations, aiming to promote the widespread application of Tai Chi in the treatment and even prevention of depression. **Objective:** Depression is a common mental disorder characterized by persistent low mood or loss of interest in activities, resulting from complex interactions among social, psychological, and biological factors, severely impairing patients' quality of life and psychosocial functioning. According to the World Health Organization (WHO), approximately 280 million people worldwide were affected by depression in 2023, accounting for about 3.8% of the global population. By 2030, major depression is projected to become the leading cause of disease burden in the world. In China, the incidence of depression has shown a gradual upward trend. The management of depression remains challenging due to its chronic course and high relapse rate. Current treatment primarily relies on pharmacotherapy, psychotherapy, and physiotherapy. Among these, pharmacological interventions are the most widely used but limited by its adverse effects, poor adherence, and high economic burden. Moreover, growing clinical evidence suggests that the effectiveness of antidepressants is often suboptimal. Therefore, identifying safer, more effective, and economically viable alternatives has become a key research focus. In recent years, traditional exercise therapies have gained increasing attention in the treatment of depression. Tai Chi, a traditional mind-body practice, has been shown to promote relaxation and emotional regulation, thereby enhancing both physical and mental well-being. Several studies have reported that Tai Chi can alleviate depressive symptoms to some extent. However, variations in intervention protocols and assessment tools across studies have led to inconsistent findings, hindering the comprehensive evaluation of its therapeutic efficacy. Furthermore, the mechanisms underlying Tai Chi’s antidepressant effects remain insufficiently elucidated. So, this study aims to systematically review existing literature on the use of Tai Chi in alleviating depressive symptoms, assess its clinical efficacy, and explore potential mechanisms of its antidepressant effects. The findings are expected to provide an evidence-based foundation and offer new insights into non-pharmacological approaches to depression treatment. **Methods:** (1) Literature collection: By searching PubMed, Embase, CNKI, Wanfang, VIP and other databases, the search time limit is up to May 2025, to collect studies on the intervention effect and mechanism of Tai Chi’s antidepressant effects on patients with Major Depressive Disorder. 1) Inclusion criteria for meta-analysis : The type of study was a randomized controlled trial (RCT) study on the efficacy of Tai Chi on patients with depression; the outcome measures were the depression

scores of the study subjects in each group, and the assessment scales included the Self-rating Depression Scale (SDS), the 24-item Hamilton Depression Scale (HAMD-24), 17-item Hamilton Depression Scale (HAMD-17) and 30-item Geriatric Depression Scale (GDS-30); 2) Exclusion criteria for meta-analysis: intervention studies without a control group; experimental groups that did not use Tai Chi as the main means of exercise, but used a combination of multiple forms of exercise for intervention; reviews, incomplete literature, and literature that failed to obtain complete information; repetitively published literature.(2) Data extraction: The following information was extracted from each piece of literature: first author, publication time, sample size of the experimental and control groups, gender and age, duration and period of Tai Chi intervention, depression assessment tools and outcome indicators. (3) Statistical analysis and mechanism sorting: Applying the statistical software Review Manager 5.4 and STATA 18, meta-analysis was conducted to analyze the depression scores of the experimental group using Tai Chi intervention and its control group in the literature, and to sort out the mechanism of Tai Chi intervention on the treatment of depressed patients. **Results:** The preliminary search of databases obtained 1,955 pieces of literature. Duplicate literature, irrelevant literature and literature with experimental data that did not meet the requirements was excluded, and finally a total of 20 papers were included in this study for meta-analysis, with a total sample size of 1,254.The results of meta-analysis showed that all the depression indicators of depressed patients in the Tai Chi intervention group were significantly lower than those of the control group, among which:(1) Using the SDS as the depression indicator was found in 7 papers, and the SDS scores of the Tai Chi intervention group were significantly lower than those of the control group, and the difference was statistically significant (MD=-8.72, 95%CI: [-12.66, -4.78], P<0.0001);(2) Using the HAMD-24 as the depression indicator was found in 6 papers, and the HAMD-24 score of the Tai Chi intervention group was lower than that of the control group, with a statistically significant difference (MD=-3.33, 95%CI: [-6.23, -0.42], P=0.02<0.05);(3) Using the HAMD-17 as the depression indicator was found in 5 papers, and the HAMD-17 score of the Tai Chi intervention group was significantly lower than that of the control group, with a statistically significant difference (MD=-1.68, 95%CI: [-2.64, -0.71], P=0.0007<0.01);(4) Using the GDS-30 as the depression indicator was found in 3 papers, and the GDS-30 scores of the Tai Chi intervention group were significantly lower than those of the control group, with a statistically significant difference (MD=-8.26, 95%CI: [-9.03, -7.50], P<0.00001).Based on literature review, this study summarizes the following perspectives on the mechanisms of Tai Chi intervention for

depression:(1) The hypothalamic-pituitary-adrenal (HPA) axis is the core target of Tai Chi's mechanism for depression intervention: The relationship between depression and HPA axis dysfunction is widely established, with considerable evidence showing exercise mediates depression alleviation by restoring HPA axis function. Tai Chi may regulate HPA axis function by upregulating leptin receptor (LepRb) expression to enhance leptin efficacy. Studies also suggest Tai Chi may indirectly regulate HPA axis function through other factors like adiponectin, ghrelin, and neuropeptide Y (NPY). (2) Neurotransmitters serve as crucial mediators for Tai Chi's antidepressant effects: Restoring neurotransmitter function is a key target in depression treatment. Most studies indicate Tai Chi improves depression through neurotransmitter modulation. Tai Chi may elevate ghrelin levels, thereby increasing serotonin (5-HT) and its receptor levels in the dorsal raphe nucleus; ghrelin binds to growth hormone secretagogue receptor (GHS-R1a), promoting glutamatergic neuronal projections to participate in dopaminergic neuronal firing and dopamine metabolism, restoring normal dopamine function. Additionally, Tai Chi may increase NPY levels, elevating norepinephrine and 5-HT in the amygdala and hypothalamus while reducing 5-HT catabolism. (3) Neuroplasticity and neurogenesis constitute critical endpoints of Tai Chi's antidepressant effects: Substantial evidence demonstrates the relationship between brain neuroplasticity/neurogenesis and depression. Tai Chi may promote dentate gyrus neural precursor cell proliferation by downregulating miR-135a-5p and enhancing IP3 signaling pathway activation; through Leptin/LepRb signaling, Tai Chi regulates JAK2/STAT3 and PI3K/AKT pathways to inhibit GSK3β, upregulate β-catenin, and thereby facilitate neurogenesis; by upregulating ghrelin, it influences nitric oxide synthase activity and enhances BDNF-CREB/p-CREB pathway activity to improve neuroplasticity; through adiponectin upregulation, it activates AMPK pathway and p38MAPK/GSK3β/β-catenin pathway to promote hippocampal neurogenesis. (4) Gut microbiota remodeling represents a significant mechanism of Tai Chi's antidepressant function: Recent years have seen growing attention to the relationship between gut microbiota and depression, with emerging evidence suggesting Tai Chi exerts antidepressant effects via gut microbiota modulation. Tai Chi may increase beneficial bacteria (e.g., *Bifidobacterium*, *Lactobacillus plantarum*, *Enterococcus faecalis*) to elevate neurotransmitter levels; it may balance *Lactobacillus*/*Escherichia coli* ratios in depressed patients, reducing neurotoxic phenylacetic acid metabolites from *E. coli* that inhibit neurotransmitter synthase activity, while enhancing *Lactobacillus*-mediated restoration of the endocannabinoid (eCB) system; it may decrease Gram-negative

bacteria (e.g., *Desulfovibrio*) to lower lipopolysaccharide (LPS) levels, thereby reducing systemic inflammation; finally, it may upregulate *Faecalibacterium prausnitzii* and *Butyricicoccus* to increase short-chain fatty acids (SCFAs) production, which exert broad antidepressant effects including anti-inflammation, tryptophan metabolism regulation, and neuroregeneration. **Conclusions:** Tai Chi intervention could have some adjunctive effects on the treatment of depression by modulating HPA axis function, restoring neurotransmitter function, promoting neural remodeling and neurogenesis, and reconfiguring the gut microbiota. **Suggestions:** This study suggests that Tai Chi can be incorporated into the existing depression treatment process system and offers references for clinical practice from three aspects: optimizing treatment plans, strengthening quality control, and adapting to special populations. (1) Optimizing treatment plans: This study suggests adopting a treatment plan that combines medication with Tai Chi intervention. The simplified 24-form Tai Chi can be selected as the exercise content, which is easy for patients to gradually adapt to. During the training process, the exercise intensity should be strictly controlled to ensure the safety and effectiveness of the exercise. (2) Strengthening quality control: To ensure treatment quality, a certified coach database can be established to ensure that all coaches involved in Tai Chi intervention have received specialized training in mental health area. Additionally, portable devices can be used to monitor patients' exercise intensity to ensure it meets the WHO-recommended exercise prescription standards for depression, thereby precisely controlling the intervention effect. Moreover, the establishment of a progressive goal system is also crucial. Patients can start by mastering the three basic postures of Tai Chi and gradually progress to completing the entire set of movements, ensuring they continuously gain physical and mental benefits through continuous improvement. (3) Adapting to special populations: The Tai Chi intervention can be personalized based on the specific needs of different patients. For example, for elderly patients, Tai Chi in sitting form courses can be designed to reduce their exercise burden. For the adolescents, Tai Chi can be combined with music therapy to become a Tai Chi dance that are both fun and beneficial for mental health. For postpartum depression patients, elements of mother-child interaction can be incorporated to enhance their interaction experience and emotional connection, thereby improving the treatment effect. In conclusion, it is recommended to establish an intervention plan with a reasonable training model, a professional coaching team, and personalized course designs to ensure its safety and effectiveness in clinical applications. Future research could focus on optimizing intervention plans and specifically exploring the individualized needs of different patient

groups to promote the wide application of Tai Chi in the treatment and even prevention of depression, providing more effective and diverse treatment options for clinical practice.

Keywords: Tai Chi; Depression; Meta-analysis