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Integrating Acupuncture and Mindfulness for Depression: Clinical Evidence, Mechanistic Understanding, and a Case Study in Adolescent Treatment

Yuhang Qi[1], Haifang Liu[2], Jian Madesen[3] & Ping Gong[4]

[1] Institute of Clinical Acupuncture and Mindfulness, China

[2] American Academy of Health and Wellness, Minnesota, USA

[3] Penny Acupuncture Herbal Medical Massage Clinic, Maryland, USA

[4] New York College of Health Professions, NY, USA

Correspondence: Yuhang Qi, Institute of Clinical Acupuncture and Mindfulness, Henan, China. E-mail: dryuhangqi@outlook.com

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Abstract

Depression represents a significant global health challenge, with conventional treatments limited by efficacy gaps, side effects, and accessibility barriers. This paper investigates the integrative application of acupuncture and mindfulness as a novel, non-pharmacological approach to depression management, leveraging their complementary neurobiological and psychological mechanisms. We synthesize contemporary clinical and neuroscientific evidence supporting each modality individually, propose a theoretical framework for their combined application, and present an illustrative case study of a 15-year-old female with moderate depression (baseline PHQ-9: 12; BDI-II: 25). The patient underwent a 12-week program combining electroacupuncture and mindfulness-based interventions, resulting in significant symptom remission (final PHQ-9: 3; BDI-II: 6), alongside improvements in mood, energy, and daily functioning. The treatment integrated acupuncture's modulation of neurotransmitter systems and stress pathways with mindfulness's enhancement of emotional regulation and neuroplasticity, demonstrating potential synergistic effects. This case provides preliminary evidence of efficacy, particularly for adolescents seeking alternatives to pharmacotherapy. These findings underscore the need for rigorous controlled trials to validate this integrative strategy and establish its role in contemporary depression management, offering a translational framework for future research and clinical practice.

Keywords: depression, acupuncture, mindfulness, electroacupuncture, integrative medicine, neuroplasticity, mindfulness-based interventions

1. Introduction

Depression represents a pervasive global mental health concern and a major source of disability. According to the World Health Organization, approximately 280 million people worldwide suffer from depression, making it a leading contributor to the global burden of disease, projected to rank among the top causes of disability-adjusted life years by 2030 (WHO, 2023). Beyond its prevalence, depression carries profound personal and societal costs – impairing quality of life, productivity, and interpersonal functioning, and in severe cases leading to suicide.

Standard treatments for major depression, principally antidepressant medications and psychotherapy, are effective for many but have notable limitations. A substantial proportion of patients do not achieve full remission with first-line therapies: up to 30–50% of individuals have an inadequate response to initial antidepressant treatment. Antidepressants often take several weeks to exert effects and can cause side effects (such as weight gain, sexual dysfunction, or sleep disturbances) that prompt about one-third of patients to discontinue treatment (Zhang et al., 2022). Psychotherapy modalities like cognitive-behavioral therapy (CBT) can be resource-intensive and are not universally accessible. Consequently, an increasing number of individuals seek complementary and integrative therapies to address these gaps and better manage depressive symptoms.

Among integrative therapies, acupuncture and mindfulness have gained considerable attention due to their demonstrated efficacy, minimal side effects, and favorable safety profiles. Acupuncture, rooted in traditional Chinese medicine, involves the insertion of fine needles at specific body points, influencing neurophysiological

pathways implicated in mood regulation, stress reduction, neurotransmitter modulation, and neuroplasticity (Armour et al., 2019). On the other hand, mindfulness, originating from Buddhist meditative practices, emphasizes cultivating present-moment awareness, non-judgmental acceptance, and emotional regulation. Mindfulness-based interventions (MBIs) have consistently shown effectiveness in reducing depressive symptoms, enhancing cognitive flexibility, and strengthening resilience against stress (Hofmann et al., 2010).

The integrative approach of combining acupuncture with mindfulness practices presents an innovative strategy grounded in their complementary therapeutic mechanisms and potential synergistic effects. Acupuncture can rapidly alleviate physical and emotional distress such as anxiety, fatigue, and sleep disturbances, thereby creating a conducive physiological environment for mindfulness practices. In turn, mindfulness practice can enhance and sustain the therapeutic gains achieved by acupuncture through strengthened emotional regulation, sustained cognitive restructuring, and promotion of enduring neuroplastic changes. Despite the theoretical promise and encouraging preliminary clinical outcomes, rigorous empirical research explicitly examining the integrative use of acupuncture and mindfulness remains limited.

This paper aims to address this gap by: (1) synthesizing existing clinical and neurobiological evidence for acupuncture and mindfulness individually in depression treatment, (2) outlining a clear rationale for their integrative application based on complementary mechanisms of action, and (3) presenting a comprehensive case study illustrating the practical implementation and effectiveness of a combined acupuncture-mindfulness intervention in treating adolescent depression.

2. Evidence for Acupuncture in Depression

2.1 Clinical Efficacy and Research Landscape for Acupuncture

Contemporary evidence supports acupuncture as a beneficial alternative or adjunct treatment for depression, particularly when high-quality studies are considered. A 2019 systematic review and meta-analysis of 29 trials involving 2268 patients found clinically significant improvements in depressive symptoms with acupuncture. Specifically, acupuncture outperformed usual care (Hedges' $g = 0.41$) and sham acupuncture ($g = 0.55$) in reducing depression severity, with even greater benefits when used alongside antidepressant medication ($g = 0.84$). This suggests acupuncture can be effective both as a standalone treatment and as a complement to conventional therapies for this population (Armour et al., 2019).

A 2023 meta-analysis of 22 RCTs (2391 participants) further confirmed that acupuncture (particularly electroacupuncture combined with antidepressants) leads to superior outcomes compared to waitlist controls. In that network meta-analysis, electroacupuncture plus antidepressant medication was the highest-ranked intervention for improving depressive symptoms, followed by manual acupuncture plus antidepressant, and then acupuncture alone (Chen et al., 2022). Importantly, the review concluded that acupuncture, either in isolation or as an add-on to pharmacotherapy, has notable clinical benefits and can be considered a safe option for managing depression. Most trials included patients with major depression, making these findings especially relevant. Overall, the current evidence base indicates that acupuncture can produce meaningful improvements in depressive symptoms.

2.2 Mechanistic Pathways and Neurobiological Correlates

Acupuncture for depression can engage multiple neurophysiological pathways, leading to biochemical changes that mirror those of conventional antidepressants. One important mechanism is the modulation of the hypothalamic-pituitary-adrenal (HPA) axis, which is often overactive in depression (producing excess cortisol). Acupuncture has been found to normalize HPA axis hyperactivity. For example, a systematic review reported that electroacupuncture can reduce stress hormone output: acupuncture down-regulates hypothalamic corticotropin-releasing hormone (CRH) and pituitary adrenocorticotropic hormone (ACTH), thereby lowering circulating cortisol levels (Zhao et al., 2021). By calming this chronic stress-response system, acupuncture may help rebalance the body's neuroendocrine response to stress, relieving depressive symptoms linked to HPA overdrive.

Acupuncture also exerts anti-inflammatory effects, which is relevant since elevated inflammatory cytokines (e.g. IL-6, TNF-α) have been implicated in depression. There is evidence that acupuncture can shift the immune system toward an anti-inflammatory profile. A recent meta-analysis of acupuncture in depressed rodent models found significant reductions in pro-inflammatory cytokines: acupuncture treatment lowered interleukin-6 and tumor necrosis factor-alpha levels relative to untreated depressed controls (Guo et al., 2024). (Notably, some anti-inflammatory cytokines like IL-4 increased after acupuncture, reflecting a restorative balance.) These findings support the idea that acupuncture attenuates the neuroinflammatory component of depression, which could in turn improve neurotransmitter function and neuroplasticity. Preliminary clinical studies likewise suggest decreases in

inflammatory markers (e.g. C-reactive protein, IL-1) in depressed patients receiving acupuncture, though results are still emerging (Zhao et al., 2022). By reducing peripheral and central inflammation, acupuncture may alleviate mood symptoms and fatigue associated with cytokine elevations.

Another mechanistic pathway is the modulation of neurotransmitters and other neurochemicals involved in mood regulation. Acupuncture appears to influence the same monoamine systems targeted by antidepressant drugs. Preclinical studies have shown that acupuncture can increase serotonin (5-HT) and norepinephrine (NE) levels in the brain. For instance, in a study of rats with induced depression-like behavior, the contents of 5-HT and NE in the cerebral cortex were significantly higher after acupuncture treatment (and similar to levels seen with antidepressant medication). Acupuncture also affected genes regulating these neurotransmitters; the expression of the serotonin transporter (5-HTT) in key brain regions (hippocampus, raphe nucleus, locus coeruleus) was up-regulated by acupuncture, potentially enhancing serotonergic transmission. There is some evidence that dopamine pathways are modulated as well. Electroacupuncture in chronically stressed rats can normalize dysfunction in the dopaminergic system of the prefrontal cortex (PFC) – for example, restoring the balance of dopamine transporters and increasing the activity of dopamine-related signaling (TAAR1, cAMP/PKA pathways) in the frontal cortex (Sun et al., 2024). These changes correspond with improvements in motivated behavior and anhedonia in animal tests, suggesting a role for acupuncture in boosting dopamine-related reward circuits.

Beyond monoamines, acupuncture may influence other neurochemicals that impact mood and anxiety. Animal studies indicate acupuncture can raise gamma-aminobutyric acid (GABA) levels in the brain, contributing to anxiolytic and mood-stabilizing effects. It can also increase levels of glutamate (the primary excitatory neurotransmitter) in regions implicated in depression, potentially correcting stress-induced imbalances. Additionally, acupuncture has been linked to enhanced expression of brain-derived neurotrophic factor (BDNF) in the hippocampus and PFC in depression models. Higher BDNF supports neuroplasticity and neuron survival, which is beneficial since depression is associated with low BDNF and neural atrophy. In summary, acupuncture's biochemical impact is multi-faceted: it increases key neurotransmitters (serotonin, norepinephrine, dopamine, GABA) and neurotrophic factors while decreasing stress hormones and inflammatory cytokines, thereby addressing several pathophysiological contributors to depression simultaneously (Zhang et al., 2021).

Neuroimaging studies of depressed patients provide direct evidence of how acupuncture alters brain activity in regions and networks relevant to mood regulation. Functional MRI (fMRI) and other imaging modalities show that acupuncture can normalize aberrant neural activity seen in depression. One consistent finding is that acupuncture modulates the brain's default mode network (DMN) (which includes midline structures like the precuneus/posterior cingulate and medial prefrontal cortex). In depression, the DMN often exhibits hyperconnectivity and hyperactivity correlated with ruminative thought. Acupuncture appears to recalibrate this network. A systematic review of 22 MRI studies reported that acupuncture increased the amplitude of low-frequency fluctuations (ALFF) in the precuneus (a core DMN node), while decreasing ALFF in frontal regions (e.g. the inferior frontal gyrus) that may be abnormally active in depression. By adjusting activity in the DMN and frontal cortex, acupuncture could reduce the neural correlates of excessive self-focus and rumination. Supporting this, specific acupoint stimulation (e.g. GV20 at the top of the head) has been shown to modulate DMN connectivity in depressed patients, bringing it closer to patterns seen in healthy individuals (Zhang et al., 2021).

Acupuncture also engages brain regions involved in emotional processing and regulation. For example, it influences the limbic system – the network of structures such as the amygdala, hippocampus, insula, and cingulate that govern emotion and memory. Neuroimaging research has found that acupuncture can affect functional connectivity of the amygdala, a key limbic region for emotional reactivity. In depression, the amygdala often shows heightened reactivity to negative stimuli; acupuncture may help normalize this by altering its connections with regulatory regions. Indeed, studies using seed-based connectivity analyses observed that acupuncture increases connectivity between the ACC (an area with direct links to limbic structures) and other brain regions. The ACC itself is sometimes considered a part of the limbic system and is crucial for integrating emotional signals with cognitive control. Enhanced ACC connectivity after acupuncture implies stronger top-down regulation of emotion – the ACC connects with areas like the amygdala and orbitofrontal cortex to modulate emotional and reward processing. These changes could underlie patients' reported improvements in mood and anxiety after acupuncture. Some MRI studies have also noted increased activity in regions like the insula and middle temporal gyrus, or changes in the caudate nucleus, following acupuncture, suggesting widespread effects on both cortical and subcortical areas involved in mood. However, findings can vary depending on the acupoints used and the patient population. Overall, the neuroimaging evidence indicates that acupuncture engages multiple depression-related neural circuits: it can calm hyperactive limbic regions, bolster connectivity in prefrontal regulatory

networks, and modulate large-scale networks (DMN, salience, etc.) that underlie mood and self-referential thinking (Zhang et al., 2021).

In addition to central effects, acupuncture's impact on the nervous system extends to autonomic regulation. Studies measuring heart rate variability (HRV) and other indicators show that acupuncture can shift the autonomic balance in favor of parasympathetic activity (rest-and-digest). For instance, depressed patients often have low HRV (reflecting high sympathetic tone); acupuncture treatments have been observed to increase HRV and decrease the elevated sympathetic drive (lowering the stress-related low-frequency HRV component and LF/HF ratio). This autonomic calming complements the HPA-axis modulation and further helps relieve physical symptoms of anxiety and tension that often accompany depression (Pei et al., 2024).

Through neurochemical modulation (HPA axis inhibition, reduced inflammation, monoamine enhancement) neural circuit modulation (altering activity in limbic and default-mode networks, increasing cortico-limbic connectivity) and autonomic regulation, acupuncture therapy creates a more balanced neurobiological state conducive to improved mood. These mechanistic insights provide robust support for the clinical observation that acupuncture can be a viable multi-faceted treatment for depression, improving depressive symptoms via several interrelated pathways.

3. Evidence for Mindfulness in Depression

3.1 Clinical Efficacy and Research Landscape for Mindfulness

High-quality research from the past ten years also underscores the efficacy of MBIs in treating depression. A broad 2018 meta-analysis encompassing 142 RCT samples (over 12,000 participants across various psychiatric disorders) found that MBIs led to significant reductions in depression compared to no-treatment or minimal interventions. The effect sizes were moderate: for example, mindfulness treatments were superior to waitlist controls (effect size $d \approx 0.55$) and other placebo-like controls. Critically, this review noted that mindfulness interventions were about as effective as established evidence-based treatments (like standard therapy or antidepressants) for depression – there was no significant difference in outcomes between MBIs and those active treatments (Goldberg et al., 2017). This suggests that for individuals with depression, adding mindfulness can achieve symptom reduction on par with conventional approaches.

More targeted evidence comes from recent studies focusing on MBCT, which is a structured mindfulness program specifically designed to prevent depressive relapse and treat current depression. A 2023 systematic review of 13 RCTs investigating MBCT in patients with recurrent depression showed significant improvements in depressive symptom severity and even reductions in suicidal ideation compared to control conditions. The authors concluded that MBCT is a convenient, effective therapy for alleviating depression, reinforcing its value as a non-pharmacological option (Tseng et al., 2023). These benefits were observed in populations largely composed of patients with depressive episodes, aligning with our focus. Furthermore, mindfulness-based therapies tend to be low-risk and well-tolerated, making them appealing for those either unable or unwilling to use medication. Overall, the updated evidence base – prioritizing recent meta-analyses and rigorous trials – supports mindfulness interventions as an effective treatment strategy for depression. MBIs not only outperform waitlist and passive controls in reducing depressive symptoms, but they also hold their own against standard treatments, offering a viable, evidence-backed approach to improving mental health and preventing relapse in this population.

3.2 Mechanistic Underpinnings and Cognitive-Emotional Processes

MBIs produce measurable changes in brain structure and function that correlate with improved mood regulation. Notably, regular mindfulness practice is associated with increased cortical thickness in the PFC and anterior cingulate cortex (ACC), regions involved in executive function, attention, and self-regulation. These changes suggest enhanced top-down control over stress and emotional responses. Concurrently, mindfulness training can down-regulate limbic activity. For example, studies have found reduced size and reactivity of the amygdala (a key brain region for fear and stress) after mindfulness practice. This decrease in amygdala reactivity is linked to better regulation of emotion, yielding a calmer, more resilient emotional state. Mindfulness meditation also alters functional connectivity between brain networks: it increases connectivity between the PFC and the DMN while decreasing excessive DMN activity associated with self-referential rumination. In experienced meditators, DMN activity is lowered during meditation, which corresponds to reduced mind-wandering and rumination processes that typically fuel depressive thinking (Calderone et al., 2024).

MBIs additionally induce changes in neurochemistry and autonomic regulation that underpin their antidepressant effects. Regular mindfulness practice has been linked to increased inhibitory neurotransmitter levels, such as GABA, which calms neural activity. Higher GABA in meditators is associated with reduced anxiety and improved

mood stability. Mindfulness may also boost monoamine neurotransmitters like serotonin, a neurotransmitter crucial for mood and well-being; indeed, practitioners show evidence of elevated serotonin production. These neurochemical shifts go hand-in-hand with enhanced neurotrophic support: mindfulness has been associated with increased levels of brain-derived neurotrophic factor (BDNF), which promotes neuroplasticity, learning, and emotional resilience. Simultaneously, MBIs reduce markers of stress in the body, notably lowering cortisol (the end-product of the hypothalamic-pituitary-adrenal stress axis) and shifting autonomic balance toward parasympathetic dominance. For example, mindfulness practice is known to activate the vagus nerve and increase heart rate variability, indicating greater parasympathetic (calming) activity and reduced "fight-or-flight" arousal (Calderone et al., 2024). Collectively, these neurobiological changes – strengthened PFC/ACC control, dampened amygdala reactivity, optimized neurotransmitter levels, and calmer autonomic nervous system activity – support better emotional regulation, cognitive function, and resilience to stress.

In tandem with neurobiological shifts, MBIs engage several cognitive-emotional processes that alleviate depression. Key therapeutic mechanisms proposed for mindfulness-based treatments include:

Attentional control: Mindfulness meditation trains sustained attention to the present moment. This enhanced attentional control is reflected in greater activation of brain regions like the ACC (involved in attention and error monitoring). By anchoring attention (e.g. to breath or body sensations), individuals become less prone to attentional biases toward negative stimuli, thereby reducing depressive worry and mind-wandering (Calderone et al., 2024). Improved attentional regulation helps interrupt the automatic drift into rumination, giving patients more cognitive flexibility.

Cognitive restructuring through decentering: MBIs foster a metacognitive skill known as decentering or viewing one's thoughts and feelings as transient mental events rather than absolute truths. This perspective shift is analogous to cognitive restructuring in that it reduces the believability of negative thoughts. By observing thoughts non-judgmentally, patients learn to "let go" of self-critical or hopeless thinking patterns instead of over-engaging with them. In fact, increases in decentering during MBCT have been linked to subsequent reductions in depressive symptoms and lower relapse rates (Moore et al., 2022). Thus, mindfulness practice changes one's relationship to negative thoughts, undermining ruminative thinking styles characteristic of depression.

Reduction of rumination: A well-established outcome of MBIs is a decrease in ruminative thinking. Rumination – repetitive, passive focus on negative feelings – perpetuates depression. Mindfulness training consistently reduces rumination levels in depressed individuals (Calderone et al., 2024). A 2022 meta-analysis of 19 RCTs found that MBIs led to a significant reduction in rumination compared to controls (SMD ≈ -0.46) along with improvements in depressive severity (Moore et al., 2022). By learning to gently redirect attention away from repetitive negative thoughts and by accepting experiences without overanalysis, individuals spend less time trapped in rumination, which alleviates depressive mood.

Emotion regulation and exposure: Mindfulness cultivates an attitude of acceptance and non-reactivity toward emotional experiences. This leads to more adaptive emotion regulation. Neuroimaging shows that mindfulness practitioners have increased prefrontal engagement coupled with decreased limbic reactivity when processing emotions, indicating a shift from reactive emotion processing to a more reflective style. Practically, mindfulness exercises (such as observing a feeling without judgment) provide a form of exposure to transient emotional states. Instead of avoiding or suppressing difficult feelings, patients learn to tolerate and observe them, which paradoxically diminishes the intensity of those feelings over time. This process prevents escalation of sadness or anxiety into full depressive episodes. Indeed, MBIs are associated with enhanced emotional regulation abilities, with participants reporting better ability to manage stress and a greater sense of calm during adversity (Calderone et al., 2024). By breaking automatic reactive habits (e.g. impulsive anger or withdrawal), mindfulness helps individuals respond to stressors more skillfully, reducing depressive reactions.

4. Conceptual Framework and Integrative Rationales for Acupuncture and Mindfulness

Acupuncture and mindfulness exhibit shared neurobiological mechanisms as well as distinct contributions that make them complementary interventions for depression. A major shared mechanism is limbic system modulation and neuroplasticity. Both interventions target the limbic circuitry underlying emotion: acupuncture's clinical effects are mediated in part by the amygdala, hippocampus, and ACC, and mindfulness training leads to structural and functional changes in these same regions (e.g. smaller, less reactive amygdala and stronger ACC function). Each stimulates the brain's capacity to reorganize: by elevating BDNF and fostering new neural connections, both acupuncture and mindfulness promote neuroplastic remodeling of mood-regulating circuits (Calderone et al., 2024; Yang et al., 2021).

Another shared pathway is attenuation of chronic stress responses – both reduce cortisol and sympathetic output, and both decrease markers of inflammation and oxidative stress in depression (Calderone et al., 2024; Yang et al., 2021). By alleviating neurotoxic stress effects, they create a neurochemical milieu where recovery is possible. Despite these overlaps, each therapy also makes distinct contributions. Mindfulness primarily engages top-down cognitive control circuits: it increases activity and thickness in the dorsal PFC and ACC that underlie attention, emotion regulation, and metacognitive awareness. This leads to improved executive control over negative thinking and enhanced ability to "step back" from depressive ruminations. Mindfulness also uniquely strengthens interoceptive awareness via the insula and somatosensory cortex, helping individuals recognize and let go of bodily tension and early emotional cues. In contrast, acupuncture provides a bottom-up somatosensory stimulation that can directly influence subcortical regions and neurochemical release. By stimulating peripheral nerves at specific acupoints, acupuncture triggers central cascades (via the spinal cord, brainstem, and midbrain) that release endogenous opioids, serotonin, and dopamine, thereby re-balancing neurochemistry in ways mindfulness does not directly achieve. Acupuncture's influence on the cortico-striatal reward circuit can help address anhedonia (loss of pleasure) in depression by improving dopamine-mediated motivation – a domain less directly targeted by mindfulness. Moreover, acupuncture may normalize aberrant network connectivity in depression, for instance by modulating the default mode network as shown in neuroimaging studies (Yang et al., 2021; Xu et al., 2025; Deng et al., 2016). Mindfulness, on the other hand, teaches the patient skills to volitionally disengage the DMN (e.g., through focused attention training) even outside of meditation sessions, building long-term resilience against depressive thought patterns. In sum, the two modalities converge on key therapeutic targets (limbic system, neuroplasticity, stress regulation) but via complementary routes: mindfulness refines internal self-regulation and cognitive-emotional processing, while acupuncture biochemically and neurologically primes the brain for improved mood balance.

Considering the above, a neuroscience-based model of integrating acupuncture and mindfulness for depression can be formulated. In depression, pathophysiology spans multiple levels – abnormal brain network dynamics (hyperactive default-mode and limbic networks, hypoactive cognitive control networks), neurotransmitter dysregulation (serotonin, dopamine, GABA deficits), and autonomic/HPA axis overdrive leading to chronic stress effects. An integrated acupuncture-mindfulness intervention would simultaneously address these interrelated dysfunctions. Acupuncture sessions can induce immediate changes in the depressed brain's connectivity and chemistry – for example, calming overactive limbic regions and boosting serotonin/endorphin release to improve mood (Yang et al., 2021; Xu et al., 2025). This creates a neurological "fertile ground" for mindfulness training, in which the patient, now in a more relaxed and neurochemically balanced state, engages in meditation practices that further reinforce functional reorganization of the brain. During mindfulness practice, frontal executive regions are exercised and strengthened, which can reinforce the regulation of limbic activity initiated by acupuncture. Over time, repeated coupling of these therapies could synergistically enhance neuroplastic changes: acupuncture-driven BDNF upregulation may facilitate the synaptic changes and learning that mindfulness induces as patients develop new thought patterns. Meanwhile, mindfulness can prolong and generalize the benefits of acupuncture by teaching patients to intentionally activate calming parasympathetic responses and cognitive reframing in their daily life, extending the neural benefits between acupuncture sessions. The central nervous system thus undergoes a coordinated retraining – sensory-driven modulation via acupuncture and mental training via mindfulness – leading to rebalanced network connectivity (stronger fronto-limbic coupling, reduced DMN dominance), normalized neurotransmitter levels, and lower autonomic stress load (Yang et al., 2021; Xu et al., 2025). Recent research supports components of this model: for instance, acupuncture's effect of increasing limbic-prefrontal connectivity and reward circuit engagement complements mindfulness-based enhancement of prefrontal control and reduction of limbic hyperactivity (Calderone et al., 2024). By integrating both, the brain is targeted from multiple angles, aligning biological and psychological healing processes. This framework is strongly grounded in neuroscience findings from the past decade and provides a rationale for combined treatment of depression that is currently being explored in integrative medicine.

By engaging overlapping but distinct CNS pathways, acupuncture and mindfulness are posited to have synergistic effects that enhance overall therapeutic outcomes in depression. Importantly, the integration is not merely additive (one plus one), but potentially multiplicative: each modality may amplify the effects of the other. Neuroscientists have begun to suggest that combining mindfulness meditation with acupuncture could boost efficacy, as the interventions "speak to" the brain in different languages – electrical/chemical signals in one case and conscious mental training in the other (He et al., 2023). This means, for example, that when treating a depressed patient, acupuncture might rapidly alleviate initial symptoms (e.g. improving sleep and reducing anxiety within a few sessions), creating a window of opportunity for mindfulness therapy to take hold (since a rested, less anxious mind can engage better with therapy). Conversely, as the patient's mindfulness practice deepens, they may become more

sensitive and responsive to acupuncture treatments, possibly experiencing stronger or more targeted effects (through better body awareness and placebo enhancement via expectation). Ultimately, the goal of integration is to produce remission of depression more reliably and sustainably than single modalities. Early clinical observations and pilot studies suggest improved patient satisfaction and symptom reduction when these therapies are combined, likely because patients feel their "whole self" is being treated – mind, brain, and body. Moreover, an integrative approach aligns with patients' growing interest in non-pharmacological treatments and self-empowerment in healing. By providing acupuncture for immediate neuro-biological support and mindfulness for ongoing self-management, this approach can reduce relapse rates and foster long-term resilience. In summary, the rationale for integrating acupuncture and mindfulness is rooted in their evidence-based ability to target multiple depressive pathways, provide complementary healing experiences, and mutually reinforce positive changes in the central nervous system, offering a comprehensive and synergistic strategy for depression management (Calderone et al., 2024; Yang et al., 2021).

5. Integrative Treatment of Moderate Depression in a 15-Year-Old Female: A Case Study

5.1 Clinical Presentation and Assessment

A 15-year-old girl presents with a two-month history of depressive symptoms. She reports persistent low mood, loss of interest in hobbies, fatigue, and occasional tearfulness. Her sleep is mildly disturbed (difficulty falling asleep a few nights per week) and she feels worthless and irritable, though she denies any suicidal thoughts. There is no prior psychiatric treatment; at the encouragement of her parents and psychiatrist, she is pursuing alternative therapies. Standardized assessments confirm moderate depression: her Patient Health Questionnaire (PHQ-9) score is 12 and Beck Depression Inventory-II (BDI-II) score 25, both in the moderate range of severity (Kneipp et al., 2010). These validated scales establish a baseline for her condition and will be used to monitor progress. Her psychiatrist has approved a 12-week trial of acupuncture combined with mindfulness practices as a holistic intervention for her depression, given her preference to avoid medication at this stage.

5.2 Intervention Protocol - Acupuncture

The primary treatment modality is electroacupuncture, supplemented by manual body acupuncture and auricular (ear) acupuncture. This approach was chosen to address both the physical and emotional aspects of her depression. The patient receives acupuncture sessions of ~30 minutes, initially twice weekly for 6 weeks, then weekly for another 6 weeks (total = 18 sessions over 12 weeks). This frequency and duration are consistent with expert guidance for moderate depression – many individuals show positive changes after about 8–12 treatments over 4–6 weeks, and extended courses yield more sustained improvement (Chen et al., 2022). During each session, sterile single-use acupuncture needles were inserted at specific points and connected to an electrical stimulation device for approximately 20 minutes, with settings adjusted to produce a comfortable tingling sensation. Between and after electrical stimulation, the practitioner manually manipulated needles to reinforce the treatment. Additionally, ear seeds or fine needles were applied to auricular points to extend therapeutic effects between sessions.

Key points were carefully selected: GV20 (Baihui), located at the top of the head on the Governing Vessel meridian, is traditionally used to "lift" mood and clear the mind, making it one of the most frequently utilized points in depression treatments for its centering and uplifting effect to relieve persistent sadness. Yintang (EX-HN3), an extra point between the eyebrows sometimes called the "third eye," was chosen for its calming properties, helping to alleviate anxiety, insomnia, and rumination, and along with GV20, it is often targeted in acupuncture protocols for depression to soothe the spirit. HT7 (Shenmen), on the wrist crease at the ulnar side, known as the "Spirit Gate" (not to be confused with the ear point of the same name), was needled to calm the heart and mind, easing anxiety, irritability, and insomnia to address the emotional turbulence of depression. PC6 (Neiguan), on the inner forearm, was indicated for chest tightness, palpitations, and anxiety, aiding in relieving the somatic stress symptoms often accompanying depression and promoting emotional balance. ST36 (Zusanli), below the knee, a famous tonic point for energy and vitality, was commonly used for patients with fatigue and poor appetite, helping counteract the lethargy and low energy associated with her depression. SP6 (Sanyinjiao), above the inner ankle where three yin meridians intersect, was used for insomnia, hormonal regulation, and grounding energy, supporting restorative sleep and relaxation to assist with her mild sleep disturbance and overall stress reduction. LR3 (Taichong), between the first and second toes, a key point for stress and emotional regulation, was paired with LI4 (Hegu), located in the web between thumb and index finger, a powerful point for pain and stress, to form the "Four Gates," known to release overall body tension, open circulation throughout the body, calm the nervous system, and alleviate irritability and mood swings in depressed patients by relieving Liver Qi stagnation, while in this case LI4 also improved the patient's stress tolerance. Auricular points Shen Men, a tranquilizing point in the upper ear, and Point

Zero, a central ear point for homeostasis, were stimulated with ear seeds between sessions to reinforce calming effects and extend the therapeutic benefits of the treatment.

5.3 Intervention Protocol - Mindfulness

To address the psychological dimension of depression, mindfulness meditation was integrated with acupuncture treatment. The intervention included both in-session practice and daily home exercises.

In-Session Meditation: During each acupuncture session, once the needles are in place and the patient is resting, the practitioner guides her through a 10-minute mindfulness meditation. This typically involves focusing on her breath and bodily sensations while the needles stimulate her acupuncture points. The meditation can be done softly in the background as the patient lies on the treatment table. The goal is to cultivate a state of relaxed awareness – helping her observe physical sensations (like the tingling from electroacupuncture) non-judgmentally and letting go of intrusive thoughts. This not only enhances her relaxation during acupuncture but also teaches her a skill she can use outside of sessions. After needle removal, the practitioner often ends with a brief mindful breathing exercise, reinforcing the calm state. For example, they practice a simple diaphragmatic breathing or a counted breath technique (such as 4-7-8 breathing) to solidify a sense of centered calm before she leaves the session.

Daily Home Practice: The patient is instructed to practice mindfulness meditation every day at home for around 10–15 minutes. To facilitate this, the practitioner provides her with recorded guided meditations (tailored for teenagers, with simple language and relatable themes). She listens to these recordings in a quiet place at home, practicing exercises such as mindful breathing, body scan, and visualization of thoughts floating by. Her parents help by reminding her and providing a calm environment in the evenings for this routine. The aim is to make mindfulness a habit, so she can gradually develop greater awareness of her thoughts and feelings throughout the day. By regularly practicing, she learns to recognize negative thought patterns (like self-criticism or hopelessness) and gently redirect her attention to the present moment. Over time, this reduces rumination and strengthens her ability to self-soothe during emotional distress.

By engaging in mindfulness, the patient is essentially learning a lifelong coping skill. The breathing and meditation exercises help downregulate her physiological stress (for example, lowering heart rate and cortisol when anxious) and improve her mental outlook by increasing feelings of calm and control. As weeks progress, she reports that during upsetting situations at school she's able to use deep breathing to steady herself, and that she's becoming more aware of negative thoughts without immediately believing them. These are signs that the mindfulness component is taking effect, complementing the acupuncture's direct mood-lifting effects.

5.4 Treatment Progress and Outcomes

Week 0 (Baseline): Before starting treatment, the patient's PHQ-9 was 12 and BDI-II was 25, confirming moderate depressive severity. She described her mood as "4/10 most days," with 10 being very happy. Her energy was low and she struggled with motivation. These baseline measures and subjective reports were recorded to compare against future progress.

Week 2: After four acupuncture sessions (twice weekly in the first two weeks) combined with daily mindfulness practice, early improvements were noted. The patient's PHQ-9 dropped to 10 (still moderate, but improved) and she reported feeling slightly less exhausted. She noted that on a couple of days she "felt a bit lighter" and had fewer crying spells. Sleep improved on some nights. Importantly, she was becoming comfortable with the treatment routine – no longer anxious about the needles and actually looking forward to the relaxation during sessions.

Week 4: By the end of week 4 (8 acupuncture sessions in), her PHQ-9 score fell to 8 and BDI-II to 18, which are in the mild depression range. This marked a significant improvement. She reported 50% improvement in mood (rating her mood ~6/10 now). She was engaging more in activities: for example, she went out with a friend to the mall for the first time in months. Her parents observed that she was more communicative at home and her teachers noted better class participation. Symptom-wise, she still had some lingering negative thoughts and low motivation on certain days, but the frequency and intensity had decreased. At this stage, we saw a clear positive response – consistent with clinical observations that a 50% reduction in PHQ-9 or BDI-II scores represents a meaningful improvement in depression. The patient also expressed that the mindfulness exercises were helping; she said, "I'm not getting as stuck in my head – when bad thoughts come, I breathe and let them pass." Such feedback indicated she was internalizing the mindfulness coping strategies.

Week 6: Midway through the 12-week plan, her depression continued to improve steadily. PHQ-9 was 6 and BDI-II 14 (borderline mild/minimal). She reported having "more good days than bad." Notably, her sleep normalized (she was falling asleep easily most nights) and her concentration at school was better – reflected in a slight uptick

in her grades. Because of the improvement, we transitioned to weekly acupuncture sessions from this point (weeks 7–12) to reinforce gains and move toward maintenance. The patient remained diligent with her daily meditation, finding it "easier to do now" and even increasing sessions to 20 minutes occasionally.

Week 8: At the two-month mark, her PHQ-9 scored 4 and BDI-II 11, indicating she had reached the minimal depression range (remission). She essentially no longer met criteria for a depressive disorder. In sessions, she appeared noticeably brighter in affect – she smiled and joked more, a stark contrast to her flat demeanor at intake. She described herself as feeling "like my old self." Objective measures echoed this recovery: her PHQ-9 of 4 is within the 0–4 minimal range and BDI-II of 11 is well below the threshold for moderate depression. We continued treatment through week 12 to solidify these improvements and prevent relapse, but at this point both patient and parents were very encouraged by the outcome.

Week 12 (Final Outcome): By the end of 12 weeks, the patient maintained her gains. Her final PHQ-9 was 3 and BDI-II 6, confirming sustained remission of depression symptoms. Comparing before-and-after, the transformation was dramatic: initially she had moderate depressive symptoms affecting her daily life, and now she scored in the asymptomatic range on both scales. Qualitatively, she reported feeling happy and motivated – she had resumed playing on her school's soccer team, was spending time with friends on weekends, and described her outlook as hopeful. Her self-esteem improved as well, saying she "feels proud for getting through this without medications." Throughout the treatment, she kept a journal (as suggested by the practitioner) and her entries in the final weeks reflected positive themes and resilience, whereas early entries were full of sadness.

In summary, over the 12-week integrative treatment, the patient's depression scores steadily decreased week by week, and her overall well-being markedly improved. She experienced relief from core symptoms (mood, energy, sleep, concentration) and gained new skills (mindfulness techniques) to manage stress. The combination of objective scale improvements and subjective reports paints a consistent picture of a successful outcome. At discharge, a before-and-after comparison was discussed with the patient and her family: on the PHQ-9, she went from moderate depression (score 12) to no depression (score 3), and on the BDI-II from moderate (25) to minimal (6) (Kneipp et al., 2010). Equally important, her functioning in daily life (school performance, social interactions, family relationships) rebounded to normal. The patient and her parents expressed satisfaction with the treatment plan, and they arranged for monthly maintenance acupuncture sessions and continued mindfulness practice to help sustain the benefits. This case demonstrates a positive trajectory, with each stage of treatment yielding incremental improvements and ultimately a full remission of depressive symptoms by week 12.

5.5 Clinical Discussion

Effectiveness Analysis: This case illustrates how a combined acupuncture and mindfulness approach can effectively treat moderate depression. From a clinical perspective, the integrative plan worked on multiple levels. The electroacupuncture provided rapid physiological relief – within a few weeks the patient's sleep and energy improved, which likely gave her the boost needed to re-engage with life. At the same time, mindfulness training equipped her with psychological tools to handle negative thoughts and stress. The synergy of these modalities addresses both body and mind: acupuncture directly influences neurochemical balances and calms the nervous system, while mindfulness cultivates mental resilience and emotional regulation. By week 4, we saw significant symptom reduction, aligning with the typical time course of acupuncture's effect (often observable by 4–6 weeks) and with the patient's growing skill in mindfulness. Because she had no prior treatment, the improvements can be attributed to this integrative therapy rather than confounded by medications or psychotherapy. Clinically, it's also important that she was an active participant in her healing (through home practice of meditation), which may enhance the overall efficacy due to a greater sense of agency. The lack of side effects (aside from a brief mild headache after one session, which resolved) made adherence easy, especially compared to potential antidepressant side effects she hoped to avoid. By the end of 12 weeks, she not only was free of depressive symptoms, but also had learned self-care techniques (breathing exercises, meditation) to maintain her wellness – a valuable outcome for long-term prevention.

Synergistic Effects: While formal studies on combining acupuncture with mindfulness meditation are limited, it is reasonable to infer a complementary effect. Acupuncture sessions inherently promote relaxation and many patients enter a meditative, calm state during treatment. By adding structured mindfulness guidance, we likely amplified this relaxation response and taught the patient to carry it into daily life. Both modalities engage the parasympathetic nervous system – acupuncture through somato-autonomic reflexes and mindfulness through focused breathing and relaxation – thus together they reinforced a parasympathetic (rest-and-digest) dominance, counteracting the sympathetic overdrive often seen in stress and depression. In effect, acupuncture may have "opened the door" physiologically (reducing her acute distress), making her more receptive to learning

mindfulness. Conversely, her mindfulness practice may have enhanced the durability of acupuncture's effects by continually reducing stress between appointments. The end result was a holistic improvement in her condition.

5.6 Limitations and Research Implications

As a single case study, this report has inherent limitations. Without a control condition, spontaneous remission cannot be definitively ruled out, though the temporal correlation between intervention and symptom improvement suggests a treatment effect. Additionally, non-specific factors such as therapeutic alliance, expectancy effects, and regular supportive contact likely contributed to outcomes. This case highlights the need for controlled trials investigating: (1) the efficacy of combined acupuncture-mindfulness interventions compared to each modality alone and to standard treatments; (2) optimal protocols for integration, including treatment sequencing, frequency, and duration; and (3) predictors of response to help identify which patients are most likely to benefit from this integrative approach.

6. Conclusion

The present investigation advances our understanding of integrative approaches to depression treatment by examining the synergistic application of acupuncture and mindfulness meditation. Our review of neurobiological mechanisms, coupled with the illustrative adolescent case study, suggests that this integrative model offers a promising alternative for patients seeking non-pharmacological interventions. The complementary nature of these modalities—acupuncture's rapid modulation of neurochemical systems and stress pathways alongside mindfulness' enhancement of emotional regulation and cognitive restructuring—appears to create a therapeutic synergy that addresses depression's multifaceted pathophysiology more comprehensively than either approach alone.

The case study of a 15-year-old female with moderate depression demonstrates the potential clinical viability of this combined approach. Her progression from moderate depression (PHQ-9: 12; BDI-II: 25) to remission (PHQ-9: 3; BDI-II: 6) over 12 weeks illustrates how acupuncture may provide immediate neurobiological support while mindfulness training builds sustainable self-regulation skills. This complementary strategy not only achieved symptom remission but also equipped the patient with enduring coping mechanisms that may reduce relapse vulnerability—a critical consideration for adolescent depression management.

While acknowledging the limitations inherent in case study methodology, this paper establishes a neurobiologically-grounded conceptual framework for future research. Large-scale randomized controlled trials are now warranted to systematically evaluate the efficacy of combined acupuncture-mindfulness interventions compared to monotherapies and conventional treatments. Such studies should explore optimal treatment protocols, dosing parameters, and patient selection criteria to refine clinical applications. Additionally, neuroimaging investigations examining the neural correlates of combined treatments would further elucidate the proposed mechanisms of synergy.

As healthcare systems increasingly emphasize personalized, integrative approaches to mental health, this combined acupuncture-mindfulness model represents a clinically feasible, evidence-informed strategy that may expand treatment options, particularly for patients with preferences or indications for non-pharmacological care. By bridging traditional healing practices with contemporary neuroscience and psychology, this integrated approach exemplifies translational medicine that respects both biological mechanisms and patient-centered values—ultimately advancing our capacity to address the complex challenge of depression through complementary pathways of healing.

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