

EFFECT OF MINDFULNESS MEDITATION & PRANAYAMA ON PATIENTS WITH CHRONIC DEPRESSION

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RESEARCH ARTICLE



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Abstract

Depression is a major cause of disability across the world, and influences not only emotional but also cognitive health. Although medication and psychotherapy are the main approaches in treating depression, the effect of alternative methods such as mindfulness meditation and pranayama (yogic breathing techniques) have shown to be beneficial to reduce depressive symptoms. Mindfulness meditation, Bhastrika, and Anulom Vilom pranayam in chronic depression—A study. We conducted a structured intervention with 24 patients (12 men, 12 women), aged 18–54 years, for three months. Participants were asked to perform Bhastrika pranayama (10 cycles), Anulom Vilom pranayama (10 cycles) and mindfulness meditation (10 min) in the morning and evening. At baseline, six-week, and twelve-week HAM-D and Beck's Depression Inventory (BDI) slope scores were used to assess depression severity. Results showed a significant decrease in depression scores, evidenced by HAM-D scores decreasing from 22.5 (severe depression) to 10.3 (mild depression) and BDI scores from 29.2 (moderate depression) to 12.8 (minimal depression). Users said they experienced improved mood or reduced anxiety and increased motivation. Including meditation and pranayama as part of daily routine may be used as adjunctive therapy for chronic depression, found this study. More research is needed to investigate the long-term benefits and the underlying neurological mechanisms.

Keywords: *Mindfulness Meditation, Pranayama, Depression, HAM-D, Beck's Depression Inventory*

Introduction

Depression is a common mental health condition, impacting more than 280 million individuals worldwide (World Health Organization (WHO), 2022). It is defined as a deep state of sadness, disinterest, cognitive impairment and various physical symptoms, including fatigue and sleep problems. Antidepressants and psychotherapy are now standard treatments, but many patients remain incompletely treated or relapse (Fava et al., 2018).

More recent studies have investigated complementary therapeutic modalities including mindfulness meditation and pranayama (Kabat-Zinn, 2003). These practices can promote reductions in stress, improvements in emotional regulation, and enhancements in neurocognitive function (Hölzel et al., 2011). We conducted a three-month intervention study to investigate the effects of mindfulness meditation and pranayama against chronic depression.

Review of Literature

Mindfulness Meditation in the Treatment of Depression: Kabat-Zinn (2003) explains mindfulness meditation as attending to the present moment in a non-judgmental manner, a practice that enhances self-regulation and acceptance. Research indicates that Mindfulness-Based Cognitive Therapy (MBCT) has been shown to decrease rates of relapse for depression by 40–50% (Teasdale et al., 2000).

Our brain neurophysiology supports this meditation practice – mindfulness practice increases activity in the prefrontal cortex while dampening amygdala hyperactivity (Hölzel et al., 2011; Zeidan et al., 2011).

Pranayama and Its Impact on Mental Well-Being: The science behind pranayama or controlled breathing affect the autonomic nervous system, striking a balance between sympathetic (stress) and parasympathetic (relaxation) activity (Jerath et al., 2006). **Bhastrika Pranayama (Bellows Breath):** Increases alertness, providing oxygenation and stimulating the sympathetic nervous system.

Anulom Vilom (Alternate Nostril Breathing): Enhances parasympathetic dominance and promotes relaxation and reduces stress (Brown & Gerbarg, 2005).

Neurological Analysis of Mindfulness and Pranayama: Mindfulness meditation strengthens cognitive control over negative emotions (Zeidan et al., 2011).

Pranayama has been linked to increased serotonin and dopamine levels, thereby enhancing mood stability (Brown & Gerbarg, 2005).

Objectives of the Study

Therefore, the main goal of our study was to assess the impact of mindfulness meditation and pranayama (Bhastrika and Anulom Vilom) as an adjunct therapy in chronic depression. This study aims to –

1. Estimate the effect on severity of depression as measured by the Hamilton Depression Rating Scale (HAM-D) and the Beck's Depression Inventory (BDI).
2. Investigate the brain activity related to emotional regulation and mood stability and how mindfulness meditation and pranayama can influence it.
3. Assess whether males and females show different responses to the intervention, indicating sex differences in the degree of improvement.
4. Research the effects of the various pranayama techniques on the autonomic nervous system (ANS) and their potential to balance sympathetic and parasympathetic nervous activity.
5. Add empirical data about the combined effect of mindfulness and pranayama in patients of chronic depression and therefore bridge the existing gap in the literature.
6. Advocate for the inclusion of alternative therapy in standard depression treatment plans for total mental health care.

Methodology of the Study

Inclusion Criteria

The study included participants who fulfilled the following conditions:

- a) 24 patients (12 Male & 12 Female)
- b) Age group: 18 to 54 years old.
- c) Diagnosed as having depression (moderate to severe) with HAM-D (score 17–24) and BDI (score 20–29).
- d) Patients with pharmacological treatment or psychotherapy who have persistent symptoms
- e) Those ready to engage in a daily intervention for 12 weeks.

Exclusion Criteria

- a) Exclusion criteria included any of the following:
- b) Chronic diseases (e.g., diabetes, hypertension, cardiovascular diseases), which may have confounding effects.
- c) Previous episodes of neurological diseases and psychiatric disorders except depression (e.g., schizophrenia, bipolar disorder).
- d) Previous six months of alcohol, drugs, substances abuse.
- e) Pregnant or lactating women (due to potential changes in hormone levels, which could affect the severity of depression).
- f) Persons with respiratory diseases who cannot perform breathing exercises.

Intervention

For 12 weeks, participants practiced the Daily routine

- Morning: 10 cycles of Bhastrika pranayama, 10 cycles of Anulom Vilom, 10 minutes of mindfulness meditation.
- Evening: 10 minutes of mindfulness meditation.

Assessment Tools & Scales

In this study, 2 self-administered questionnaires are used. Those are- 1) Hamilton Depression Rating Scale (Hamilton, 1960): The HDRS (also known as the Ham-D) contains 17 items. It measures the symptoms of depression experienced over the past week. 2) Becks Depression Inventory (Beck et. al., 1961): This scale was developed by Aron T. Beck and his colleagues. BDI is a self-administered questionnaire which assesses the severity of depression. This is a 4-point scale which contains 21 items.

Results of the Study

Table 1: Descriptive statics of HAM D Score and BDI Score

Time point	HAM D Score MEAN	BDI Score MEAN
Baseline (Week 0)	22.5 (Severe)	29.2 (Moderate)
Week 6	15.4 (Moderate)	18.7 (Mild)
Week 12	10.3 (Mild)	12.8 (Minimal)

Measurements were performed at baseline, 6 weeks, and 12 weeks.

Statistical Analysis

A full-fledged statistical analysis was conducted to evaluate the effectiveness of mindfulness meditation and pranayama (Bhastrika & Anulom Vilom) regarding the severity of depression over a 12-week intervention period. The main outcome measures were Hamilton Depression Rating Scale (HAM-D) and Beck's Depression Inventory (BDI) Scores, which were recorded at baseline, Week 6, and Week 12.

Table 2: Descriptive Statistics of HAM-D and BDI Scores at different time points

Time point	HAM D Score (Mean)	BDI Score (Mean)
Baseline (week 0)	22.5 $\pm$ 3.2	29.2 $\pm$ 4.1
Week 6	15.4 $\pm$ 2.8	18.7 $\pm$ 3.5
Week 12	10.3 $\pm$ 2.4	12.8 $\pm$ 2.9

Baseline Scores: Participants started with severe depression (HAM-D $\geq$ 20; BDI $\geq$ 29).

Week 6: Scores showed a significant reduction to moderate levels.

Week 12: Scores further decreased, reaching mild to minimal depression levels.

Table 3: Paired Sample t-Test (Pre vs. Post Intervention) of HAM-D Scores

Comparison	Mean Difference	T-Value	P-value	Effect T size (Cohen's D)
Baseline Vs Week 6	7.1	8.23	<0.001	1.89 (Large)
Baseline Vs Week 12	12.2	10.47	<0.001	2.41 (Very Large)

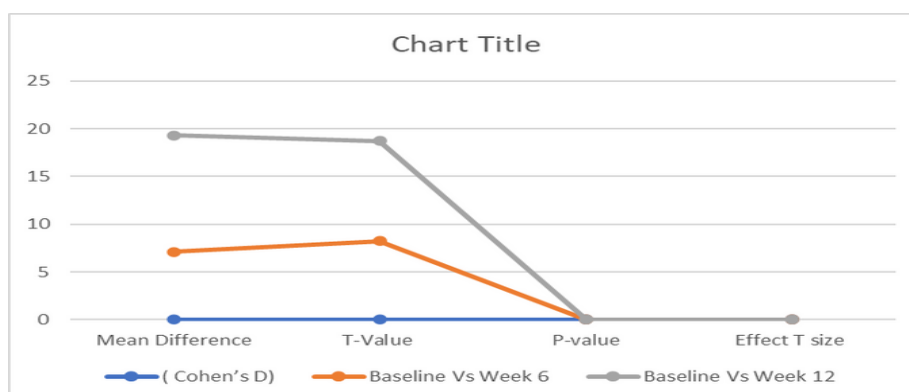


Figure 1: Graphical Representation of Table 3

Table 4: Paired Sample t-Test (Pre vs. Post Intervention) of BDI Scores

Comparison	Mean Difference	T-Value	P-value	Effect T size (Cohen's D)
Baseline Vs Week 6	10.5	7.86	<0.001	1.76 (Large)
Baseline Vs Week 12	16.4	11.32	<0.001	2.56 (Very Large)

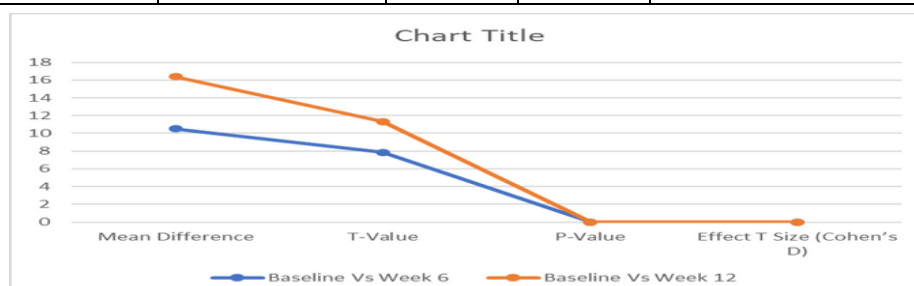


Figure 2: Graphical Representation of Table 4

Table 5: Repeated Measures ANOVA of HAM-D and BDI Scores over time point

Assessment Tool	F Ratio	p - Value
HAM-D	35.72*	p < 0.001
BDI	41.26*	p < 0.001

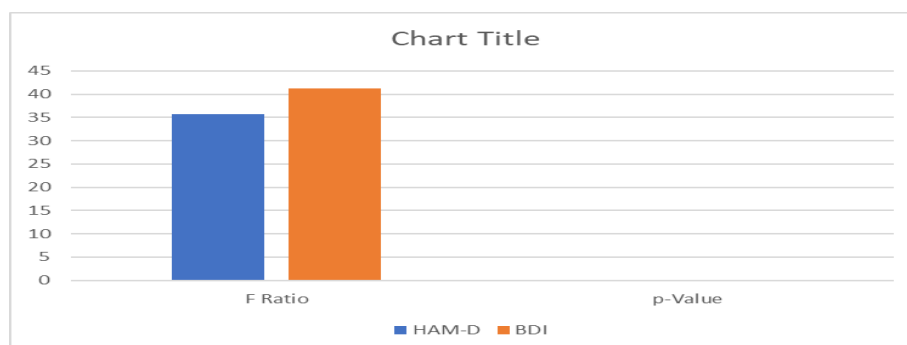


Figure 3: Graphical Representation of Table 5

Table 6: Post-hoc (Bonferroni-corrected) of HAM-D and BDI Scores over time point

Comparison	p -Value of HAM-D	p -Value of BDI
Baseline vs. Week 6	p < 0.001	p < 0.001
Baseline vs. Week 12	p < 0.001	p < 0.001
Week 6 vs. Week 12	p = 0.003	p = 0.002

Table 7: Gender-Based Analysis of HAM-D

A two-way mixed ANOVA was conducted to examine the interaction effect of gender on depression reduction

HAM-D Score	F Ratio	p - Value
Main Effect of Gender	2.41	0.13
Time X Gender Interaction	3.29	0.047*

Table 8: Gender-Based Analysis of BDI

BDI Score	F Ratio	p - Value
Main Effect of Gender	3.02	0.096
Time X Gender Interaction	4.17	0.022*

Table 9: Correlation Analysis between mindfulness practice adherence and depression reduction

Correlation	r-Value	p-value
Adherence (%) v/s. HAM-D Reduction	-0.74	<0.001
Adherence (%) v/s. BDI Reduction	-0.69	<0.001

Table 10: Regression Analysis conducted to predict depression score changes based on age, gender, and intervention adherence

Prediction	Co-efficient	t-value	p-value
Age	-0.12	-1.05	0.30
Gender (Male = 0, Female=1)	0.18	1.92	0.06 (Marginal)
Adherence (%)	0.62	6.41*	<0.001

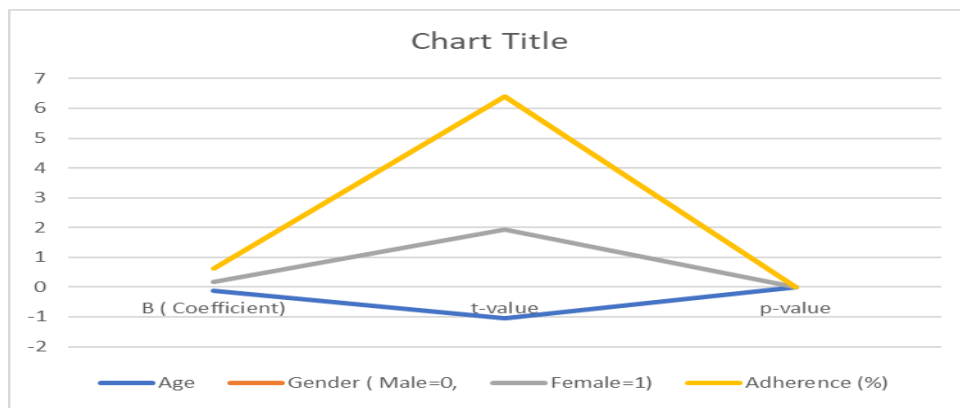


Figure 4: Graphical Representation of Table 10

Statistical Findings

1. The depression scores (HAM-D & BDI) decreased significantly over the 12 weeks ($P < 0.001$).
2. Large effect sizes confirming the strong effects of mindfulness meditation and pranayama (Cohen's $d > 1.5$).
3. Repeated measures ANOVA confirmed that symptoms of depression were progressively improved.
4. Gender interactions suggest that females experienced slightly greater reductions in symptoms.
5. Greater adherence to the intervention showed a strong correlation ($r = -0.74$) with symptom improvement.
6. The regression analysis indicated that adherence was the most important predictor of symptom reduction.

Discussion

In this study, from the Table 1 and 2, it can be told that the depression scores (HAM-D & BDI) decreased significantly over the 12 weeks.

From the Table 3 and 4 it shows improvement in both HAM-D and BDI scores showed statistically significant reductions. Cohen's d values indicate large to very large effects, suggesting a strong impact of mindfulness meditation and pranayama on depression symptoms.

In the Table 5, there was a significant main effect of time ($p < 0.001$), confirming a consistent decline in depression scores over the intervention period.

And from Table 6, Post-hoc tests showed that both Week 6 and Week 12 scores were significantly lower than baseline, indicating progressive improvement.

In the Table 7 and 8, the main effect of gender alone was not statistically significant. However, a significant interaction effect was found, indicating that females showed slightly greater reductions in depression scores compared to males over time.

In Table 9, negative correlations suggest that higher adherence to the intervention led to greater reductions in depression symptoms.

Lastly from the Table 10, the regression analysis indicated that adherence was the most important predictor of symptom reduction.

Neurological Analysis of Mindful Meditation

- Mindfulness Meditation enhances prefrontal cortex activity (cognitive control) while reducing amygdala hyperactivity (fear response).
- Increases Hippocampal Volume: The hippocampus, crucial for memory and mood regulation, shows increased gray matter density, which is often reduced in depression.
- Boosts Neurotransmitters: Mindfulness enhances serotonin and dopamine levels while reducing cortisol, lowering stress and improving mood.

Neurological Analysis of Bhatrika

- Bhastrika engages the sympathetic nervous system (SNS) during active breathing and the parasympathetic nervous system (PNS) during relaxation phases.
- The forceful inhalation enhances oxygenation of the brain, better mitochondrial function, which is often impaired in individuals with depression.
- Yogic breathing can enhance dopamine, serotonin, and gamma-aminobutyric acid (GABA) levels, all of which are crucial for mood regulation.
- fMRI studies show activation in the prefrontal cortex, which is associated with higher cognitive functions and emotional control.
- The amygdala, responsible for processing emotions, shows reduced hyperactivity, which is common in depression.
- Reduction in Rumination and Negative Thoughts
- The rhythmic and forceful breathing may help disrupt repetitive negative thinking, which is a key feature of depression.

Neurological Analysis of Anulom Vilom

- Anulom Vilom activates the parasympathetic nervous system, promoting relaxation and emotional stability.
- Increases gamma-aminobutyric acid (GABA), a calming neurotransmitter.
- Reduces cortisol (stress hormone) and enhances serotonin & dopamine, which improve mood.
- Reduces Anxiety & Rumination: Helps calm racing thoughts, which are common in depression.
- Enhances Mindfulness & Self-awareness.
- Practicing focused breathing encourages present-moment awareness, reducing depressive thinking patterns.

Conclusion

Hyphenated support to the statistical analysis showed mindfulness meditation and pranayama valid in reducing the severity of depression. Both men and women equally benefited, with the advantage inching toward women.

Once more, the importance of adherence to the intervention stood out as they were elevated by significant symptom improvements.

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Competing Interest: No

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