

# Magnetoencephalographic Evidence of Ketamine's Efficacy in Alleviating Symptoms of Major Depressive Disorder: A Systematic Review

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## INTRODUCTION & AIM

To analyze the effect of ketamine (KT) on Major Depressive Disorder (MDD) symptoms and explore the underlying neural mechanisms from an magnetoencephalographic (MEG) perspective.

## METHOD

Databases including EBSCO, PubMed, Embase, and Web of Science were searched for literature on MEG observations of KT intervention in MDD patients, covering publications up to June 2024.

## RESULTS & DISCUSSION

Fourteen RCTs from the United States, involving 351 MDD subjects aged 18-65, were included. The studies, mainly published after 2016 in molecular and biological psychiatry journals, used the DSM-IV criteria for MDD diagnosis. KT was administered at 0.5 mg/kg, with a placebo of 0.9% saline, over less than 40 minutes. KT significantly improved depression, anxiety, psychotic symptoms, and suicidal ideation, as evidenced by reductions in Montgomery Depression Rating Scale scores. MEG findings indicated: 1) AMPA-mediated glutamatergic transmission increase; 2) increased anterior cingulate gyrus (ACC) activation correlating with rapid antidepressant response; 3) prefrontal ACC involvement negatively correlated with symptom improvement during increased working memory load; 4) increased functional connectivity of the anterior striatum; 5) hydroxyketamine levels correlated with gamma power and antidepressant efficacy; 6) baseline gamma power predicted post-dosing gamma power and antidepressant efficacy; 7) decreased connectivity between the amygdala and temporal insula; 8) prefrontal ACC-left amygdala connectivity negatively correlated with symptom changes; 9) increased  $\delta$ - $\alpha$  and  $\delta$ - $\gamma$  connectivity in responders, and decreased connectivity in non-responders; 10) fusiform M170 component association with antidepressant effects.

## CONCLUSION

KT improves depression and enhances resting functional connectivity in MDD patients, though the involved frequency bands are inconsistent and findings lack reproducibility.

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