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# Serum Endocannabinoid and Mood Changes after Exercise in Major Depressive Disorder

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## Abstract

The endocannabinoid (eCB) system is implicated in the pathophysiology of depression and is responsive to acute exercise in healthy adults.

### Purpose

We aimed to describe acute changes in serum eCBs across a prescribed moderate (MOD) and a self-selected/preferred (PREF) intensity exercise session in women with major depressive disorder (MDD) and determine relationships between changes in eCBs and mood states.

### Methods

Women with MDD (n=17) exercised in separate sessions for 20 min on a cycle ergometer at both MOD or PREF in a within-subjects design. Blood was drawn before and within 10 min after exercise. Serum concentrations of eCBs (anandamide [AEA]; 2-arachidonoylglycerol [2-AG]) and related lipids (palmitoylethanolamine [PEA]; oleoylethanolamine [OEA]; 2-oleoylglycerol [2-OG]) were quantified using stable isotope-dilution, liquid chromatography/mass spectrometry/mass spectrometry. The profile of mood states and state-trait anxiety inventory (state only) were completed prior to, 10 min and 30 min post-exercise.

### Results

Significant elevations in AEA ( $p=0.013$ ) and OEA ( $p=0.024$ ) occurred for MOD (moderate effect sizes: Cohen's  $d=0.58$  and  $0.41$ , respectively). Significant ( $p<0.05$ ) moderate negative associations existed between changes in AEA and mood states for MOD at 10 min (depression, confusion, fatigue, total mood disturbance [TMD] & state anxiety) and 30 min post-exercise (confusion, TMD & state anxiety). Significant ( $p<0.05$ ) moderate negative associations existed between 2-AG and mood states at 10 min (depression & confusion) and 30 min post-exercise (confusion & TMD). Changes in eCBs or related lipids or eCB-mood relationships were not found for PREF.

## Conclusion

Given the broad, moderate-strength relationships between improvements in mood states and eCB increases following MOD, it is plausible that the eCB system contributes to the mood-enhancing effects of prescribed acute exercise in MDD. Alternative mechanisms are likely involved in the positive mood state effects of preferred exercise.

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