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# The drug methylenedioxyamphetamine (MDMA) enhances plasma oxytocin and modulates cortical responses during affective touch

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## Abstract

Oxytocin (OT) is a key mediator of social attachment across many mammalian species, yet little is known about endogenous OT neuromodulation of key neural pathways of affective touch in humans. We investigated this question by manipulating perception of touch after administration of 1.5 mg/kg of the drug methylenedioxyamphetamine (MDMA) or placebo during functional magnetic resonance imaging (fMRI) in  $n = 22$  healthy adult volunteers. MDMA is an amphetamine derivative associated with prosocial effects, enhancement of pleasantness of affective touch and facilitation of peripheral OT release. In this study, each participant completed two counterbalanced fMRI sessions (drug and placebo), in which they were gently stroked at two velocities (3 cm/s and 30 cm/s). OT samples were collected pre- and post-session to measure any change in endogenous OT. MDMA increased subjective effects of drug, measures of friendliness, blood pressure, heart rate, and a range of affective and social self-report ratings, as well as pleasantness of touch at both stroking speeds. Plasma OT showed main effects of drug and OT change, with greater OT change during the MDMA session. Hemodynamic responses in the brain showed a main effect of MDMA vs placebo in bilateral precentral gyri, alongside an interaction between OT, drug, pleasantness, and stroking velocity in medial prefrontal (mPFC) and inferior temporal gyrus (ITG) clusters. These findings indicate that MDMA influences endogenous OT and cortical responses to touch. Neuromodulation of mPFC and ITG responses depending on MDMA, OT and pleasantness points to their critical role in augmenting the perception of social touch.

**Keywords:** MDMA, Oxytocin, Touch, fMRI

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