# Facial emotion recognition after smoked cocaine and levodopa-carbidopa-entacapone administration in regular cocaine smokers

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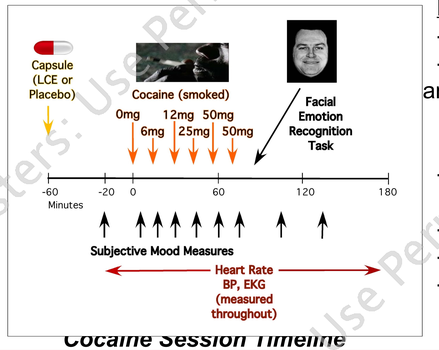
## Introduction

Drugs that affect serotonergic (5-HT) neurotransmission modulate facial emotion recognition. For instance, 3,4-methylenedioxymeth-amphetamine (MDMA, the active constituent of 'ecstasy') acutely reduces fear identification in healthy humans; whereas selective 5-HT reuptake inhibitor (SSRI) antidepressants either increase or decrease fear identification, depending on whether dosing is acute or chronic. In contrast, relatively little is known about the role of dopaminergic (DA) signaling in perception of facial emotion in humans. However, patients with both schizophrenia and Parkinson's Disease (PD), disorders characterized by increased and decreased DA function respectively, have impairments in social functioning and specifically in facial emotion processing, suggesting a role for DA neurotransmission in facial emotion recognition. These prior findings, as well as evidence about effects of DA medications on processing of emotional faces, indicate that emotion recognition may follow an inverted U-shape curve as a function of DA signaling.

## Goals

- To investigate individual and combined effects of two dopaminergic treatments, Levodopa-Carbidopa-Entacapone (LCE) and smoked cocaine, on recognition of facial emotion in cocaine users, under controlled laboratory conditions
- Part of a larger study assessing therapeutic potential of DA enhancement for cocaine abuse

## Methods




*Cocaine Session Timeline*

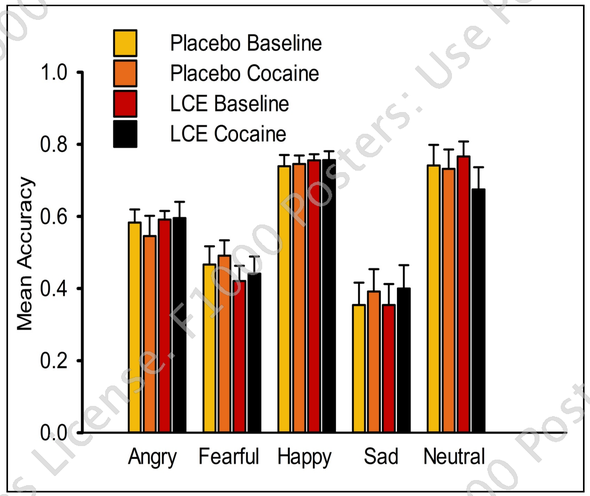
**Facial Emotion Task:**

- Ekman faces morphed
- 4 basic emotions (angry, arful, happy, sad) plus

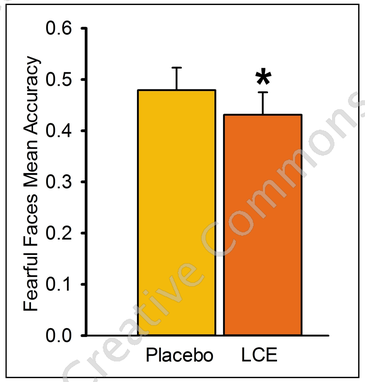
steps

- 40 pictures per emotion plus 10 neutral (170 total)
- 500 msecs, randomized
- Forced choice response
- 1-9 threat ratings

## Figures & Results




***Emotion Recognition Accuracy***




***Fear Recognition Accuracy***

***Emotion Recognition Stimuli***

## Methods

**Participants:**

12 (10 male) healthy adult cocaine smokers (mean frequency = 3.2 ± 2.3 days/week; $166 ± $148/week)
No major current Axis 1 diagnosis except cocaine dependence
Not treatment-seeking

**Design:**

Within-subjects, single-blind
10-day inpatient stay on locked GCRU

**Medication Phases:**

Two 5-day phases (counterbalanced)
Phase 1: maintained on LCE (400mg/100mg/200mg)
Phase 2: maintained on placebo

**Facial Emotion Recognition Testing:**

Day 4 of each phase: Baseline (no cocaine)
Day 5 of each phase: After 6 doses of smoked cocaine (total 143 mg)

## Results

- Main effect of LCE on recognition of fear: accuracy was decreased on LCE relative to placebo (partial eta squared = 0.378)
- No main effect of LCE on recognition of angry, happy, sad, or neutral faces, misclassifications, ratings of threat, or reaction times
- No main effect of cocaine on recognition of emotional faces, misclassifications, ratings of threat, or reaction times
- No interactions between cocaine and LCE

## Conclusions

Increasing DA neurotransmission by maintenance on LCE, the direct precursor of DA, decreased accuracy of fear recognition in regular cocaine users. This is broadly consistent with a decrease in bilateral amygdala response to emotional faces shown to occur in both healthy participants and non-depressed PD patients after levodopa administration in previous studies. Conversely, transient increase in synaptic dopamine after cocaine administration did not affect emotion recognition. Converging evidence indicates that DA neurotransmission modulates facial emotion recognition. However, these effects are complex, with both reductions and increases in DA signaling disrupting optimal function.

## Acknowledgements & Disclosure

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