Study of The Interaction of Stress and Cocaine Cues on Cocaine Craving in Cocaine-Dependent Men

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Name some commonly abused drugs:
- Hallucinogen
- CNS stimulant

Brain Areas Involved in the Reward Pathway
- Nucleus Accumbens
- Prefrontal cortex
- Orbitofrontal cortex
- Insula
- Anterior and posterior cingulate

Introduction:

The treatment of cocaine dependence is difficult. As most users cycle between periods of heavy use, detoxification, abstinence, relapse, and reinitiating of heavy use again.

Most often stressful situations and experience of negative emotions are factors leading to relapse.

Recent attempts have emphasized on the role of the reward pathways and drug addiction, in response to acute Stress and ones feeling of negative emotions.

Methods

- 10 males with Cocaine dependence in an early stage of drug abstinence.
- Mean age: 43.6 years
- Mean years of use: 15.9 years
- Mean days clean: 8 days
- Mean cost per month: $1,139.00

Experimental Procedures

- fMRI BOLD signals
- Self Rated Cocaine Craving
  - 0 “not at all”
  - 100 “the most I have ever felt”
Each participant received 2 trials in the fMRI study:

- Stressful trial: Mild electrical wrist shock
- Non-stressful trial

Cocaine story: A narrative of a very emotional memory of drug administration of a drug addict.

Result:
Participants in both trials (stressful and non-stressful), reported significantly more cocaine craving during the cocaine narrative than the baseline and the neutral story.

fMRI results:
Significant increase in activation of posterior cingulate, left insula, and right thalamus during cocaine story compared to neutral story in each trial. An interaction effect was observed in both the fMRI BOLD signals as well as the self-reported questionnaires, in which the cocaine story and the stressful situation (fear of shock) increased cocaine cravings and activations in the posterior cingulate and the parietal lobe.

Discussion:

Brain Areas Involved in the Reward Pathway
- Nucleus Accumbens
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In summary, cocaine craving provoked by cocaine cues activated areas related to the reward pathway and presence of a stressor (mild wrist shock) in the stressor trial, enhanced the associated brain area activations and the self-reported level of craving in participants.

Discussion

Only elements of the reward pathway were activated.
This could be due to the modest level of craving the subjects felt in baseline as well as throughout the study.

It can also be that psychological motivation for drug abuse involves other pathways than just the incentive and reward pathways.

In summary, cocaine craving provoked by cocaine cues activated areas related to the reward pathway and presence of a stressor (mild wrist shock) in the stressor trial, enhanced the associated brain area activations and the self-reported level of craving in participants.

Strengths:
- Number of subjects
- Use of both self-reported questionnaires and fMRI

Improvements:
- Use Positron Emission Tomography (PET) scan, to study the pathways as well as activation at different time points which may provide better insight to the drug reward pathway.
- Collect self-reported questionnaires (i.e., level of cocaine craving) from both before and after the electrical shock inducement (instead of just before).