Social interaction in cocaine users: altered response to joint attention and underlying functional changes of the reward system

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Introduction

- **Social interaction deficits** in drug users likely have consequences for treatment and contribute to the high costs for the society associated with addiction [1]
- The **neural basis** of altered social interaction in drug users is unknown
- Joint attention is a central element of social interaction (see Figure 1)
- Engagement in joint attention is considered to reflect our understanding of another person’s point of view and has been shown to activate the **reward system** [2]

![Picture of joint attention established](image)

Objective

To investigate the nature of basic **social interaction deficits in cocaine users** by applying behavioral, psychophysiological and functional brain imaging methods

Methods

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<td>Gaze was recorded by an eye-tracking device and used to control the gaze of an avatar</td>
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<td>Participants either looked in the same direction as the avatar (joint attention) or in another direction (nonjoint attention)</td>
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<td><strong>Participants</strong></td>
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<td>80 regular cocaine users</td>
<td>16 regular cocaine users</td>
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<td>63 healthy controls</td>
<td>16 healthy controls</td>
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<td>Mixed-effects analyses of variance: between-subjects factor: group; within-subjects factor: joint (joint vs. nonjoint attention)</td>
<td>GLM as implemented in SPM8</td>
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Results Study I

- **Valence ratings** revealed that cocaine users differentiated less between joint attention and nonjoint attention than controls: (interaction group*joint for valence ratings: (F(1,141)=4.35, p<0.04))
- **Arousal ratings** additionally reflect altered emotional engagement than controls (interaction group*joint for arousal ratings: (F(1,141)=3.94, p<0.05))
- Subjective ratings were in line with reduced **pupil responses** in cocaine users (interaction group*joint for pupil size: (F(1,130)=4.91, p<0.03)) (Figure 2a-c)

Results Study II

- In response to social interaction cocaine users displayed decreased activation of the **medial orbitofrontal cortex (mOFC)** (peak: x=-6, y=56, z=-5, p<0.05, FWE) — a key region of reward processing
- Blunted activation of the mOFC was significantly correlated with a decreased **social network size** (r=0.35, p<0.05) (Figure 3a-c)

![Graph showing decreased mOFC activation with reduced social network size](image)

Conclusion and implication

- Basic social interaction deficits in cocaine users may arise from blunted social reward processing
- Alterations in social gaze processing seem to be related to impaired real-life social behavior in cocaine users
- Altered reward sensitivity might reduce the motivation to engage in social interaction and impair general social competence
- This might explain why negative social consequences (e.g. family problems) do not lead the addicted person to give up drug use
- Since social reward processing is an important factor in the treatment of substance use disorders, **training of social reward processing** might be beneficial for therapy

References:


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