Effects of Facial Emotions on Social-motor Coordination in Schizophrenia

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Impairments in schizophrenia

In processing non-verbal social cues

- Body posture [Thoma 2013]
- Hand gesture [Mathews 2013]
- Gaze direction [Rosse 1994]
- Facial emotion [Kohler 2003]

In social-motor coordination

- Motor signature [Varlet 2012]
- Social priming [Raffard 2015]

How do these impairments interact?

More precisely, how does facial emotion affect social-motor coordination in schizophrenia?

Social-motor coordination

The social aspect of interpersonal interactions (e.g., automatic processing of the social information) and the dynamics of the motor coordination are highly interlinked and are referred to as social motor coordination.

Synchrony:

Synchrony is the reciprocal adaptation of the temporal structure of movement in two or more interactive partners and is used often as a means to quantify social interaction in simple motor tasks.

Synchrony → Affiliation

Can positive facial emotions increase synchrony in schizophrenia patients?

Task: Mirror game

A paradigm based on a theater joint-improvisation activity. This game provides a quantifiable framework, while maintaining the natural aspect of the interaction; e.g., the bi-directionality. In this game, two participants mirror each other’s hand movements. In the mirror game, synchrony is simply investigated by measuring temporal coordination across participants’ hand trajectories.

Humanoid robotics

Use of humanoid robots provides us advantages such as

- Repetitive behavior across trials
- Solving the attribution problem
- Controlled facial expressions

Can artificial facial emotions increase synchrony?

Human-robot social-motor coordination

Analysis

Two covariates:

- Synchrony
- Number of given feedback

Causal direction:

- One-way in the neutral condition
- Bi-directional in the feedback conditions

Can positive facial emotions increase synchrony in schizophrenia patients?

Results

We contribute three main findings

- 22 schizophrenia patients and 22 matched healthy controls performed 15 trials of mirror game
- Non-social feedback has an impeding effect on synchrony in both groups
- Social feedback has a facilitatory effect for the control participants
- Social feedback has an impeding effect for the schizophrenia patients
- The patients’ performance is more associated with their performance in Trail-Making-Test.

Conclusion

Our results suggest that the social-motor coordination impairment observed in schizophrenia (i.e., lack of facilitatory effect of facial emotion on synchrony) is due to a deficit in their automatic processing of social information that is compensated by higher-order cognitive mechanism (such as cognitive flexibility measured by TMT).