How much of Me do I see in You
Neural correlates of self-other distinction in the affective domain

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Background

When inferring mental states of others, individuals' judgments are influenced by their own state of mind, which has been referred to as egocentric bias. The right supramarginal gyrus (rSMG) has been associated with self-other differentiation and the control for egocentric bias in the affective domain. Transcranial direct current stimulation (tDCS), a non-invasive brain stimulation technique known to modulate brain activity, was used in this study to investigate the link between rSMG and emotional egocentric bias.

Methods

The Self-Other Facial Emotion Judgement (SOFE) Task
We developed a new task to investigate egocentric bias with regard to emotional valences on an intensity continuum.

The task consists of 3 conditions (Figure 1):
- Self condition: rating of own emotional state right after imagining oneself in an emotionally arousing, yet ambiguous situation
- Face condition: rating of the emotional state of another's facial expression
- Other condition: rating of the emotional state of another's facial expression right after situational imagination
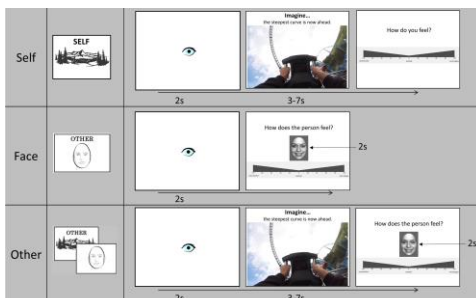

Figure 1. SOFE task conditions.

Each run consisted of four counterbalanced blocks (6: self, 12: face; 12 other).

Stimuli
24 situations, 48 facial expressions (24 happy; 24 fearful; 24 male; 24 female) morphed by intensity

Emotional egocentricity was analyzed by distracting emotion ratings in the *face condition* from the ones given in the *other condition*. *Congruency* (Figure 3) was calculated based on individual's emotion ratings of situations (*self condition*) and facial expressions (*face condition*).

Figure 2. Congruency conditions.

tDCS protocol
Offline anodal stimulation, 1mA for 20min to the rSMG, delivered over the electrode position CP4

Results

Sample
Active tDCS: 24 adults (14 men; age: M = 25.9; SD = 2.8)
Sham tDCS: 23 adults (14 men; age: M = 25.9, SD = 2.8)

Analysis of emotion ratings and egocentric bias
- No between-group differences in own emotion ratings (*self condition),* neither for *fearful (*active: $M = -49.13$; $SE = 3.58$; sham: $M = -49.44$; $SE = 2.89$) nor for *happy* (active: $M = 50.35$; $SE = 2.44$; sham: $M = 47.26$; $SE = 3.10$).
- In all *incongruent* trials, emotion ratings in the *Other condition* were lower in intensity than the ones given in the *Face condition* (Table 1).
- Emotional egocentric bias could be found for *incongruent* trials.

tDCS effects
- Active tDCS applied to the rSMG increased subjects' ability to overcome egocentric judgments.
- This effect was valence dependent with significant effects for emotion ratings of *happy* faces right after imagining to be in a *fear*-evoking situation ($U = 162$, $r = -.35$; Figure 3).
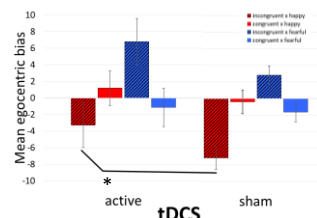
Table 1. *Descriptive statistics for emotion ratings of face stimuli.*

tDCS	Congruency	Emotion	Other Condition M (SE)	Face Condition M (SE)
Active	congruent	happy	41.20 (2.77)	40.01 (2.69)
		fearful	-42.84 (2.43)	-41.72 (2.21)
	incongruent	happy	29.85 (3.98)	33.11 (2.23)
		fearful	-32.62 (3.75)	-39.41 (2.47)
Sham	congruent	happy	39.79 (3.50)	40.19 (3.35)
		fearful	-41.28 (2.16)	-39.64 (2.27)
	incongruent	happy	24.76 (2.81)	31.92 (2.47)
		fearful	-33.13 (2.11)	-35.95 (1.82)

Figure 3. Emotional egocentricity bias (*mean + SE*). *Bonferroni-corrected $p < 0.05$.

Discussion

Our findings extend previous research showing a causal role of the rSMG for emotional self-other distinction to the inference of emotional states from pictorial stimuli. They additionally point towards valence-specific patterns of rSMG functionality.

Self-other distinction forms a critical condition for empathy and might be indicative for social cognition deficits in autism spectrum disorders (ASD). In a next step, the SOFE task will thus be applied in ASD to characterize egocentric bias suppression and SMG network integrity in affected individuals.