When I heard myself: Pianists brain responses to own musical performance and other pianists' performances

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INTRODUCTION

The goal of this study is to investigate the brain responses of professional pianists listening to their own performances in comparison to performances of the same piece played by another pianist. With this paradigm it can be studied how highly trained musicians react differently to their own musical performance, which supposedly involves self-referential processes such as the feeling of owner- or authorship. For these processes we expected find brain regions associated to the mirror neuron system (premotor cortex, IFG, SPL) and interoception (insula, medial prefrontal cortices) when comparing the two experimental conditions.

METHOD

Subjects: 8 professional pianists (6 women, all right handed, mean 24.9 years) taking part in the international piano competition *Concours de Genève*

Musical stimuli:

- Commissioned oeuvre for the competition: *Faims II* by the Swiss composer Stefan Wirth
- Recordings were made during the competition
- 20 excerpts of own and 20 of others pianists' performances
- Duration of each excerpt: 10 seconds

Task: Listen attentively to the music, evaluate immediately after each excerpt:

- Attribution of performance (4-point scale: me, maybe me, maybe other, other)
- Pleasantness of excerpt (5-point scale)
- Technical difficulty of excerpt (5-point scale)

Experimental conditions:

Own musical performances of the same piece

Other pianists musical performances of the same piece

Measurements:

- fMRI, 3Tesla (Siemens Trio), 36 slices, 2.1 TR
- Electromyogram (EMG)

Data analysis:

Behavioral data: D prime measures for attribution of performance

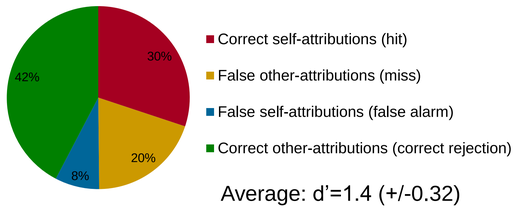
fMRI data: SPM8 was used for all analyses

- First level: Models for **actual**, **perceived** and **correct** performance discrimination
- Second level: One-sample t-tests for each contrast

RESULTS

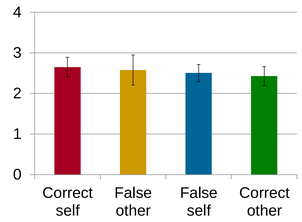
BEHAVIORAL RESULTS:

Attribution of performance

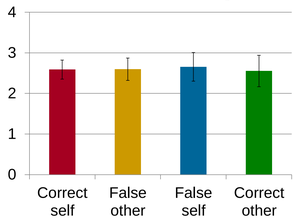


Average: d'=1.4 (+/-0.32)

Pleasantness



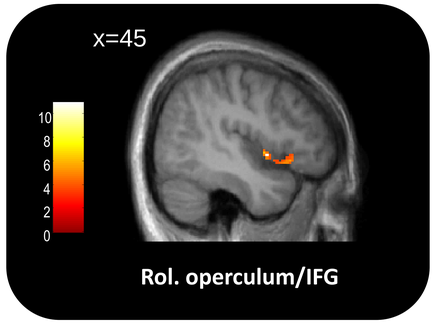
Technical difficulty



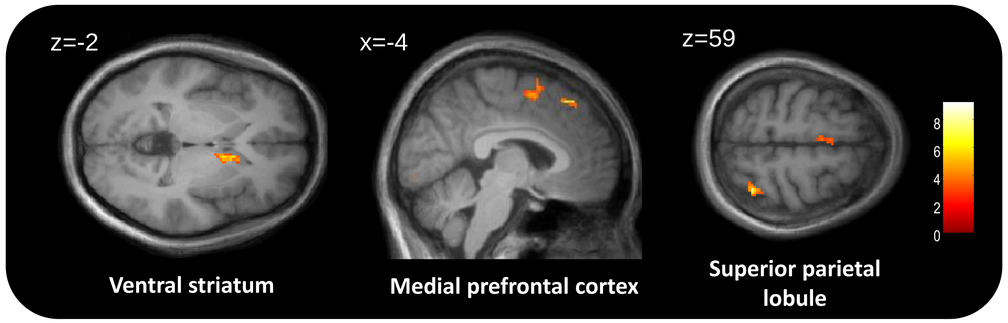
No significant differences between conditions for pleasantness and technical difficulty

fMRI RESULTS:

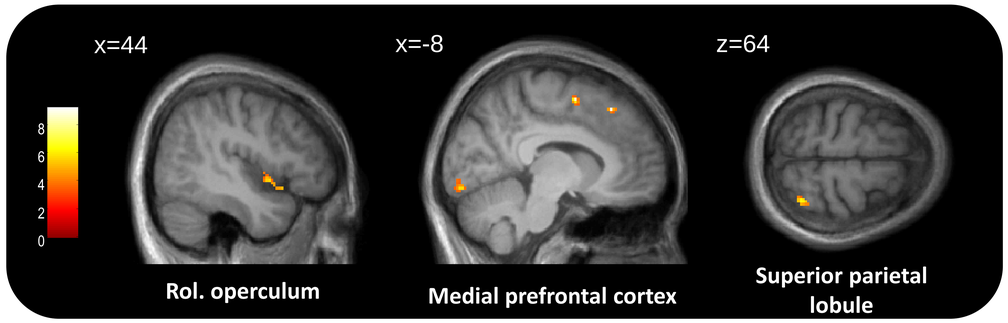
Actual: OWN versus OTHER



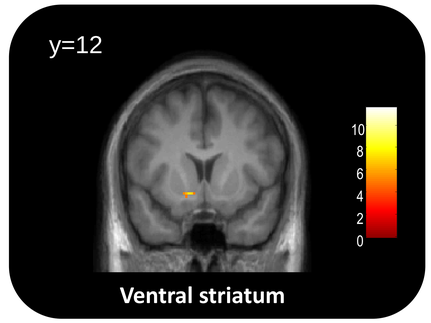
Perceived: OWN versus OTHER



Correct attributions: OWN versus OTHER



Correct attributions versus misattributions



All shown clusters are shown at the significance threshold p=0.005 uncorrected, but all clusters survive also signicance threshold of p=0.001

CONCLUSION

The **behavioral** results show that the pianists were able to discriminate their own performances from other pianists performances. **FMRI** results confirm the hypothesis that brain regions associated with interoception and self-referential processes like the medial prefrontal cortex are involved when perceiving own performances . Moreover, comparing the brain activity when listening to own performances compared to listening to other pianists reveals that also motor circuits are more strongly implicated. This finding could be considered as indicator that in this process the mirror-neuron system is involved.

Acknowledgments:

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