

## Interoception in Musicians' Flow

Jasmine Tan<sup>1</sup>, Joydeep Bhattacharya<sup>2</sup>

*Goldsmiths, University of London*

[ps301jt@gold.ac.uk](mailto:ps301jt@gold.ac.uk), [j.bhattacharya@gold.ac.uk](mailto:j.bhattacharya@gold.ac.uk)

### ABSTRACT

#### Background

Flow is a state in which an individual is intensely engaged with a skill-matched challenging activity and the experience is intrinsically rewarding. People often report a different bodily sensation during flow, most commonly a sense of effortless movement and a merging of action and awareness. However, the nature of interoception, i.e. the brain perceiving the bodily sensations, during flow is not yet characterized.

#### Aims

We investigated the degree of interoception in musicians' flow experience by the heartbeat-evoked potential (HEP), an event-related potential (ERP) reflecting cortical processing of the heartbeat.

#### Methods

40 musicians were instructed to play a self-selected musical piece that did induce flow. Further, they also played two other self-selected musical pieces that did not induce flow but were matched with the flow-inducing piece either in challenge (non-flow equal challenge) or in liking (non-flow equal liking). These non-flow inducing pieces were selected to differentiate the contributions of two different aspects of flow, namely that it involves a challenging task matched to the player's ability and it is also an experience that is intrinsically rewarding. EEG and ECG signals were continuously measured. The HEP was extracted in the period immediately after musicians stopped playing, and subsequently compared across the three conditions.

#### Results

The HEP differed notably between the three conditions. Compared to the two non-flow states, flow state was associated with a stronger lateralisation effect: the HEP was more negative specifically over the left frontal electrodes for the flow condition. Comparing the two non-flow states, the HEP was more negative for non-flow equal challenge at the earlier latency but equal liking became more negative at the later latency (i.e. after 280 ms). As more negative HEPs are usually associated with better interoception, these results suggest that flow is linked with stronger interoception.

#### Conclusions

We demonstrate that the cortical processing of heartbeat is significantly modulated by the flow experience in musicians, providing a novel insight into the brain-body interaction during flow.

### Keywords

Musicians, music performance, flow experience, interoception, HEP