

Autonomic nerve recordings applied as a novel psychophysiological tool for Consciousness Science

ABSTRACT:

Background

Influential theories in consciousness science propose a basic conscious sense of ‘self’ depends upon the control and representation of the physiological state of the body, through interoceptive predictive coding mechanisms. An ‘active inference’ model suggests that selfhood is coupled to efferent autonomic neural activity and its predicted effects on interoceptive feedback from the body. Correspondingly, some studies report that changes in conscious self-perception are accompanied by changes in autonomic response.

Aims

We tested the hypothesis that fine-grained measures of peripheral autonomic (sympathetic) nerve traffic encode states of consciousness (including illusions of body ownership).

Method

Experiments were conducted using multi-axis autonomic recordings, encompassing: 1) Direct sympathetic microneurography recordings (made in 3 healthy participants); 2) A newly-described non-invasive measurement of skin sympathetic nerve traffic (SKNA) (in 37 participants); 3) Conscious perception of body ownership was manipulated using an established Rubber Hand Illusion protocol.

Results

We established the feasibility of combining consciousness science experiments with both microneurography and SKNA. We found evidence (confirmed using Bayes factors) that successful induction of the Rubber Hand Illusion was not associated with reliable tonic differences in peripheral nerve activity, nor heart rate responses.

Conclusions

Our findings highlight the utility of fine-grained autonomic measurement (notably SKNA) to theories of conscious self-representation. Our observations regarding the Rubber Hand Illusion suggest that autonomic changes are artifactual or transient.

Keywords

Active inference, Autonomic, Illusion, Interoception, Selfhood

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Published Work:

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