Hearbeat dynamics drives emotional processing: a study on directional brain-heart axis

While the involvement of bodily activity in emotion physiology is widely recognized, a century-long debate on bodily states and emotions persists. Focusing on its specificity and causal role, this talk shows how the peripheral neural control on cardiovascular activity prompts and functionally sustains brain dynamics during an emotional experience. The afferent inputs are processed by the brain by triggering a concurrent efferent information transfer to the body.

To this end, an ad hoc time-resolved computational technique was implemented to quantify the functional directional brain–heart interplay under emotion elicitation mediated through video presentation.

More in detail, through analysis on public benchmark datasets (DEAP and HCI-MAHNOB), we show that sympathovagal activity plays a leading role in initiating the emotional response, in which ascending modulations from vagal activity precede neural dynamics and correlate to the reported level of arousal. The subsequent dynamic interplay observed between the central and autonomic nervous systems sustains the processing of emotional arousal. The talk will show experimental results indicating how the dynamic interplay between the central and autonomic peripheral nervous systems sustains emotional experiences through specific timings and cortical areas. The observed ascending pathway of vagal activity toward cortical brain signals uniquely suggests that emotion arousal processing is an integration of physiological inputs in the brain rather than an interpretation of physiological changes.

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