

Cognition Colloquium

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Heart-brain interactions: Of love and death

While for a long time in human history it was assumed that the heart was important for emotional and cognitive functions, in today's "rational" world the role of the heart is often reduced to its function as a pump that supplies the body with blood.

However, more and more studies are showing that the heart actually contributes to daily cognitive and emotional functions. Evidence is accumulating that much of cognition and emotion - perhaps all - represent integrated (body) cardio-neural states and as such are constantly dependent on an intact heart-brain interaction (HBI). I will show how even simple perceptual tasks are dependent on HBI and also on breathing.

It follows that any disturbance of the HBI will alter our emotions and cognition. Such disturbances can be caused, for example, by medication and recreational drugs. Long-term and/or repeated psychosocial stress can also have a negative impact on HBI. In particular, I will outline how long-term changes in HBI could be of great importance for the development of cardiovascular diseases such as hypertension and cardiac arrhythmias, as well as mental disorders such as anxiety and depression.

References:

- Schaare HL, Blöchl M, Kumral D, Uhlig M, Lemcke L, Valk SL, Villringer A (2023). Associations between mental health, blood pressure and the development of hypertension. *Nat Commun* 14:1953.
- Al E, Stephani T, Engelhardt M, Haegens S, Villringer A, Nikulin VV (2023). Cardiac Activity Impacts Cortical Motor Excitability, *PloS Biology*, in press
- Kluger DS, Forster C, Abbasi O, Chalas N, Villringer A, Gross J (2023). Modulatory dynamics of periodic and aperiodic activity in respiration-brain coupling. *Nat Commun* 14:4699
- Grund M, Al E, Pabst M, Dabbagh A, Stephani T, Nierhaus T, Gaebler M, Villringer A (2022). Respiration, Heartbeat, and Conscious Tactile Perception. *J Neurosci* 42:643-656.
- Kumral D, Al E, Cesnaite E, Kornej J, Sander C, Hensch T, Zeynalova S, Tautenhahn S, Hagendorf A, Laufs U, Wachter R, Nikulin V, Villringer A (2022). Attenuation of the Heartbeat-Evoked Potential in Patients With Atrial Fibrillation. *JACC Clin Electrophysiol* 8:1219-1230
- Al E, Iliopoulos F, Forschack N, Nierhaus T, Grund M, Motyka P, Gaebler M, Nikulin VV, Villringer A (2020). Heart-brain interactions shape somatosensory perception and evoked potentials. *Proc Natl Acad Sci* 117:10575-10584.



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