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The ascending arousal system and its impact on cognition

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Propositions

Subject of the dissertation

1. Given that the neuromodulatory systems are all interconnected, researchers should be cautious when inferring that pupil size reflects noradrenergic activity specifically.
2. Studying the locus coeruleus requires specific MRI scan sequences to visualise the structure at an individual level. Relying on probabilistic atlases of the LC from other sample populations or diverse groups may introduce biases.
3. More work is required to determine the optimal tVNS parameters and titration levels necessary to engage the vagus nerve at the level of the individual.
4. Previous studies investigating the effects of reward have predominantly focused on the dopaminergic midbrain. However, this provides only a part of the picture, as the ascending arousal system as a whole plays a broader role in modulating reward-related processes.

Relevant field

5. It is important when studying cognition and behaviour, to consider the impact that arousal might have on performance and physiology.
6. The neuromodulatory systems of the ascending arousal system are highly interconnected. Therefore, understanding their specific roles in behaviour and cognition requires considering their reciprocal interactions.
7. tVNS is a relatively new method of indirect brain stimulation. More research is needed to evaluate its efficacy and reliability, especially before it is used in a therapeutic context.
8. Typically, fMRI studies model BOLD activity using the canonical hemodynamic response function. However, the timing and shape of the HRF can vary across different brain regions, particularly in the subcortex. Understanding this variation is crucial for advancing the field.

Subjects of your choice

9. The effects of reward anticipation in dog training can be observed through behaviours like tail wagging, which, much like the unseen brain activity captured in fMRI, reflect underlying cognitive processes linked to the expectation of receiving a reward.