

Correlates of connected consciousness assessed by the isolated forearm technique during anaesthesia



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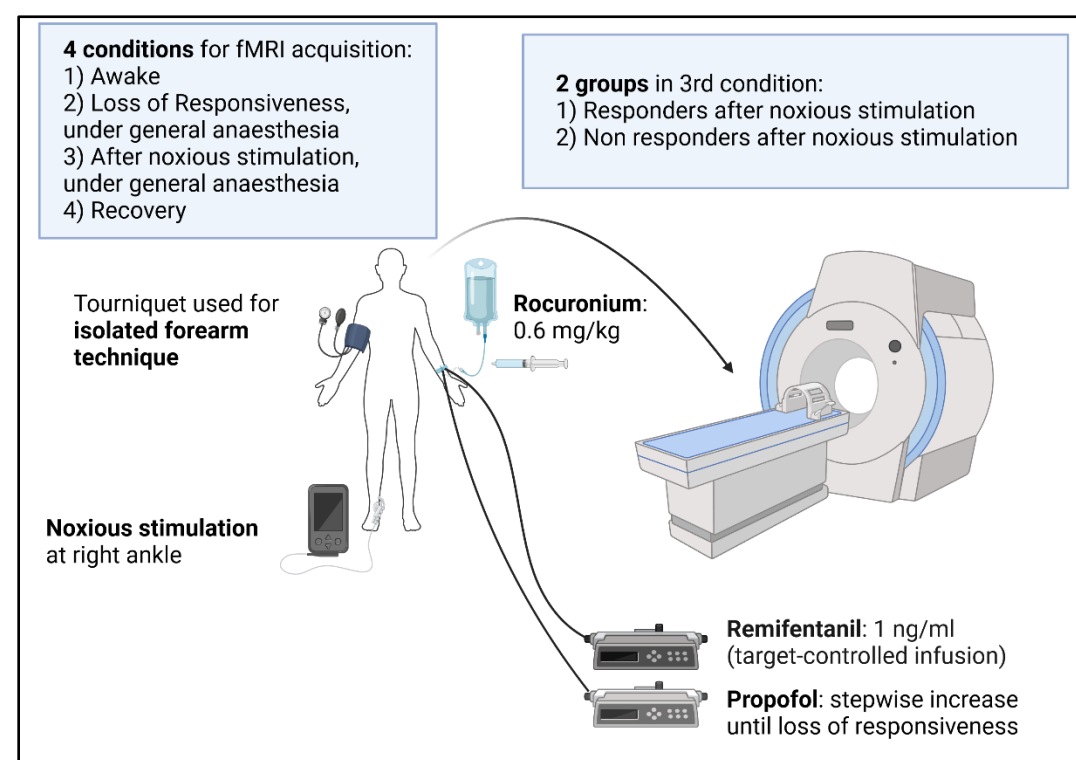
Background/Goal

Connected consciousness (CC) is defined as the awareness of one's environment. During general anaesthesia, around 5% of patients experience CC after a noxious stimulus (1). The isolated forearm technique (IFT) consists of inflating a tourniquet on the arm before the injection of a neuromuscular blocker to allow voluntary hand movements. Using fMRI, we aimed to identify the correlates of CC in those who are responsive during anaesthesia.

Materials/Methods

Using the IFT, 25 healthy volunteers were placed under general anaesthesia using remifentanil [constant 1 ng/mL concentration] and propofol [stepwise increase until loss of responsiveness; 5.36(0.78) µg/mL] target-controlled infusions, and rocuronium [0.6 mg/Kg single bolus after tourniquet inflation].

After laryngeal mask insertion, propofol was decreased following an up-and-down sequential allocation [1.85(1.17) µg/mL]. A noxious stimulation prior to posing closed questions probed responsiveness, yielding 10 responders and 15 non responders. Resting-state fMRI sequences were acquired in four conditions: awake, unresponsiveness in all subjects, after stimulation, and recovery. We used a "dual regression" approach to investigate connectivity between number of resting-state networks (RSNs): default mode network (DMN), executive control network (ECN), thalamus (THAL), hippocampus (HPC), visual (VIS), sensorimotor (SM), and auditory (AUD) networks.



Protocol of the study

Demographic data of both groups (* p<0,05)

	Non-responders N=15		Responders N=10	
	Mean	SD	Mean	SD
Age (Years)	24,3	2,68	23,5	3,2
Weight (Kg)	67,5	11,06	69,4	6,85
Height (cm)	175,3	8,54	170,7	8,57
BMI (Kg/m ²)	22,1	2,49	23,9	2,32
Effect Site concentration Propofol (µg/ml)	2,4 *	1,42	1,3 *	0,26
Neurostimulation test (mA)	30	12,95	30,5	6,85
ASA status	1	/	1	/

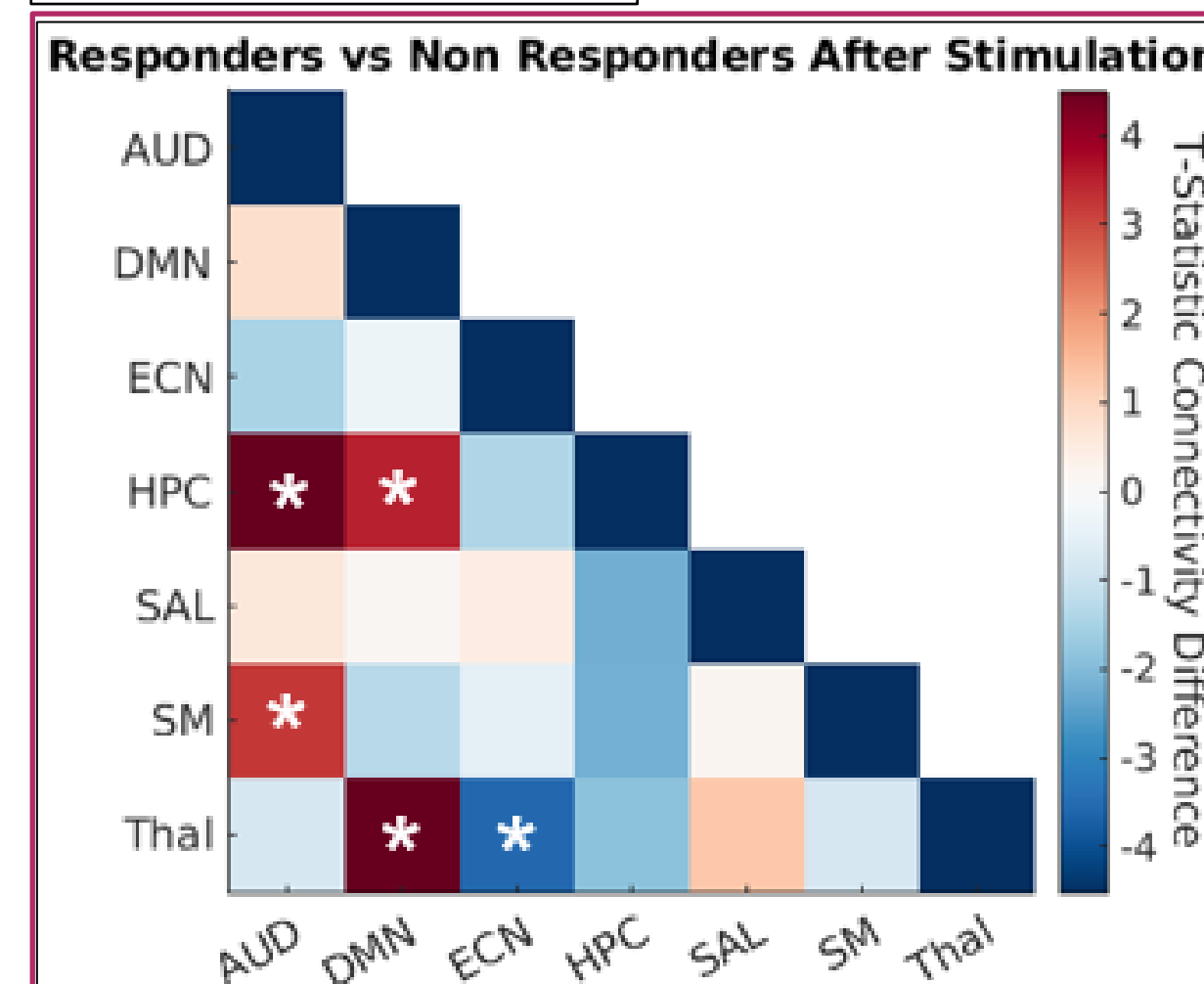
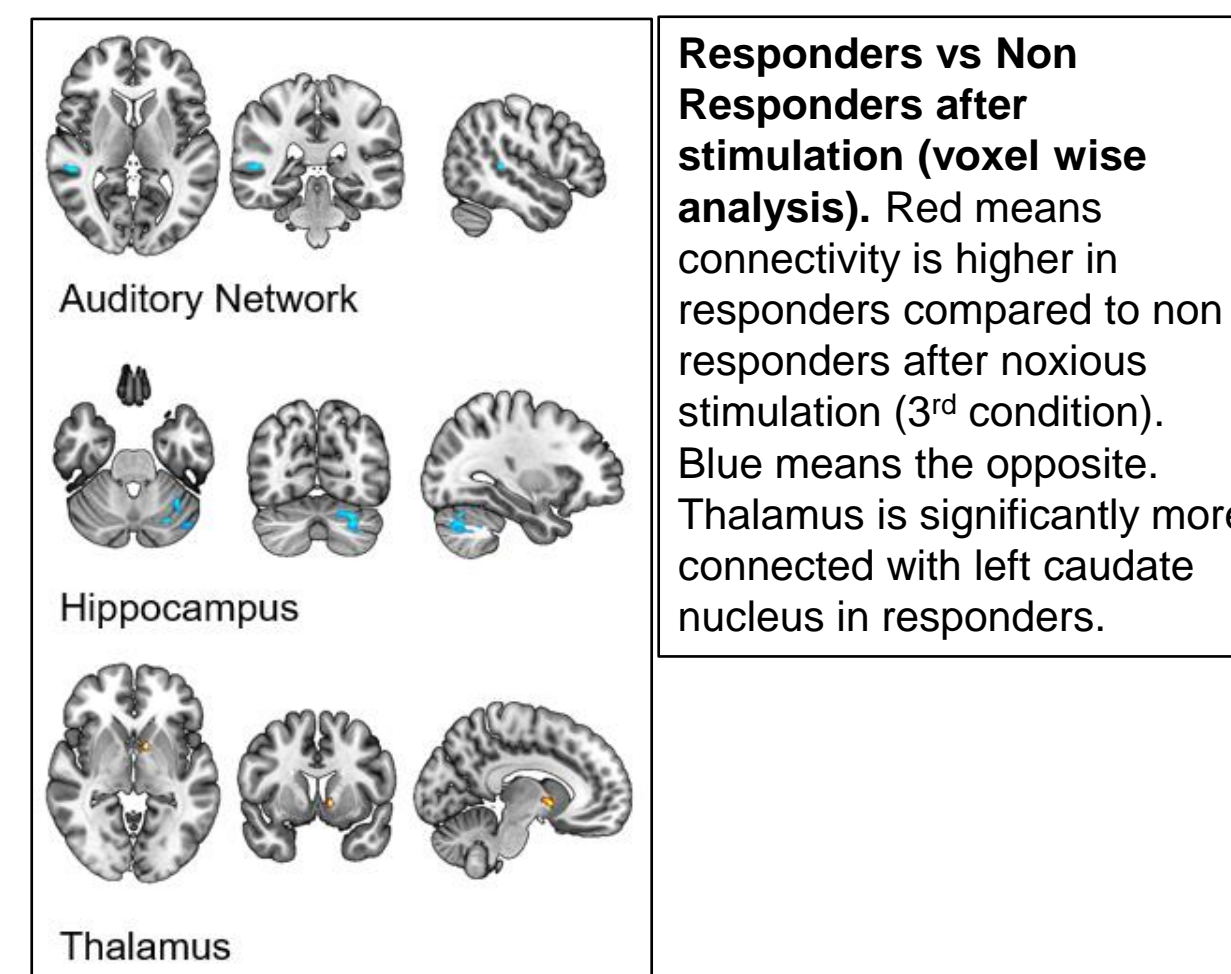


Figure. Pairwise comparisons of between-network connectivity between responders and non-responders after noxious stimulation. Blue indicates anticorrelation whilst red indicates correlation between networks. Star indicates significant interaction or significant pairwise t-tests between responders and non-responders. P<0.05, FDR corrected.

Results/Discussion

After stimulation, pairwise comparisons showed increases in connectivity between the thalamus and DMN in responders compared to non-responders, whilst a decrease in connectivity between the thalamus and ECN. Therefore, conserved cognition in responders is likely underwritten by the thalamic anchoring of the anticorrelation between the DMN and ECN. There was also increased connectivity between SM and AUD, which could indicate the preservation of auditory function both in hearing the questions and providing a motor response, whilst the observed increased connectivity between DMN and HPC might drive responders' conserved capacities for memory.

Conclusion

Connected consciousness during propofol anaesthesia is associated with thalamic anchoring of cortical RSNs.

Acknowledgment:

- To my co-authors and colleagues
- To Carine Vauchel
- To my wife Coralie De Decker



Reference: 1) Sanders RD et al. Anesthesiology 2017; 126: 214-222.

Erratum: We incorrectly wrote in the abstract that 26 subjects were included. Correction has been made in the poster.