Granger causality

The Granger causality test is a statistical hypothesis test for determining whether one time series is useful in forecasting another, first proposed in 1969.

Ordinarily, regressions reflect “mere” correlations, but Clive Granger argued that causality in economics could be tested for by measuring the ability to predict the future values of a time series using prior values of another time series. Since the question of “true causality” is deeply philosophical, and because of the post hoc ergo propter hoc fallacy of assuming that one thing preceding another can be used as a proof of causation, econometricians assert that the Granger test finds only “predictive causality”.

Previous imaging studies independently highlighted the role of the anterior thalamus (ANT) and nucleus accumbens (NAcc) in successful memory retrieval. While these findings accord with theoretical models, the precise temporal, oscillatory and network dynamics as well as the interplay between the NAcc and ANT in successfully retrieving information from long-term memory are largely unknown.

The University of Hamburg, Lübeck and Magdeburg in Germany addressed this issue by recording intracranial electroencephalography in human epilepsy patients from the NAcc (n = 5) and ANT (n = 4) during an old/new recognition test.

The findings demonstrate that differences in event-related potentials between correctly classified old (i.e., studied) and new (i.e., unstudied) images emerged in the NAcc and ANT already between 200 and 600 ms after stimulus onset. Moreover, time-frequency analyses revealed theta (4-8 Hz) power decreases for old compared to new items in the NAcc and the opposite effect in the ANT. Importantly, Granger causality analyses revealed a directional communication from ANT to NAcc suggesting that entrainment from ANT drives successful memory retrieval.

Together, this findings show evidence for the notion that the NAcc and ANT receive memory signals, and that theta oscillations may serve as a mechanism to bind these distributed neural assemblies [1)].

1)
Bauch EM, Bunzeck N, Hinrichs H, Schmitt FC, Voges J, Heinze HJ, Zaehle T. Theta Oscillations underlie Retrieval Success Effects in the Nucleus Accumbens and anterior Thalamus: evidence from human intracranial recordings. Neurobiol Learn Mem. 2018 Jul 4. pii: S1074-7427(18)30154-0. doi: 10.1016/j.nlm.2018.07.001. [Epub ahead of print] PubMed PMID: 29981424.

From:
https://neurosurgerywiki.com/wiki/ - **Neurosurgery Wiki**

Permanent link:
https://neurosurgerywiki.com/wiki/doku.php?id=granger_causality

Last update: **2024/06/07 02:49**