Phenomenology and brain measures during cognitive trance: a case study

Gosseries O[1], Sombrun C[2], Thibaut A[1], Sanz LR[1], Wolff A[1], Raimondo F[1], Fecchio M[3], Panda R[1], F. Taulelle[2], Vanhaudenhuyse A[4*], Laureys S[1*]

[1] GIGA Consciousness, Coma Science Group, University and University Hospital of Liege, Belgium; [2] TranceScience Research Institute, Paris, France; [3] Department of Biomedical and Clinical Sciences "Luigi Sacco", University of Milan, Milan, Italy; [4] Algology Department & Sensation & Perception Research Group, GIGA consciousness, University and University Hospital of Liège, Belgium; * Contributed equally

Background

COGNITIVE TRANCE

DEFINITION

- Volitional & self-induced modified state of consciousness
- Inherited from shamanic traditional practices
- Characteristics:
  - Lucid but narrowed awareness of environment
  - Hyper-focused immersive experience of flow
  - Expanded inner imagery
  - Modified somatosensory processing
  - Altered sense of self and time

[1,2]

AIMS

Investigate the phenomenology and neural correlates of cognitive trance using multimodal neuroimaging assessments in an expert practitioner

Methods

PROTOCOL: 1 expert participant undergoing electroecenphalogram (EEG), transcranial magnetic stimulation (TMS) & fluorodeoxyglucose positron emission tomography (FDG-PET) during normal resting wakefulness & trance state

PARTICIPANT: 56 yo right-handed female, originally trained in Mongolia, practicing trance for 17 years, able to induce trance spontaneously without moving after induction

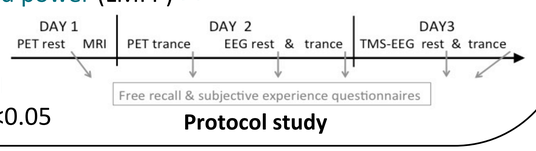
SUBJECTIVE QUESTIONNAIRES: free recall, time perception (subjective duration of the experience, in min), level of arousal (wakefulness), absorption (be fully involved in experience) & dissociation (mental separation from environment) using 0-10 VAS [3]

EEG: 256 channels (EGI), spectral power (δ, θ, α, β), complexity (Komolgorov-Chaitin complexity – K, spectral & permutation entropy – SE & PE) [4,5] & connectivity (dwPLI) [6]

TMS-EEG: 64 channels (Nexstim), TMS-responses during frontal & parietal stimulation, diversity index (DI) [7] & local mean field power (LMFP) [8]

FDG-PET: global brain metabolism [9]

ANALYSES: as previously published [4-9]
results considered significant at p<0.05



Protocol study

Results

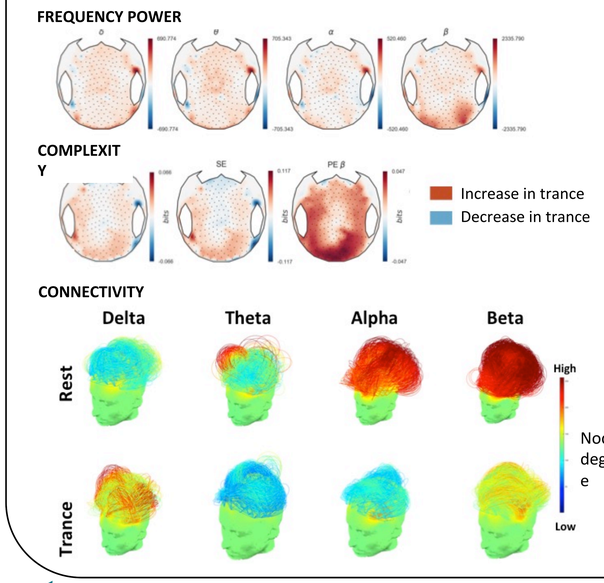
SUBJECTIVE QUESTIONNAIRES

	Rest	Trance	P-value
Arousal (0-10)	7±0.6	10±0.5	**0.001**
Absorption (0-10)	6±1	9±0.8	**0.007**
Dissociation (0-10)	0.3±0.6	8.5±1.7	**0.0006**
Perceived time (min)	35±23	6±4	**0.0498**
Real time (min)	25±9	23±11	0.829

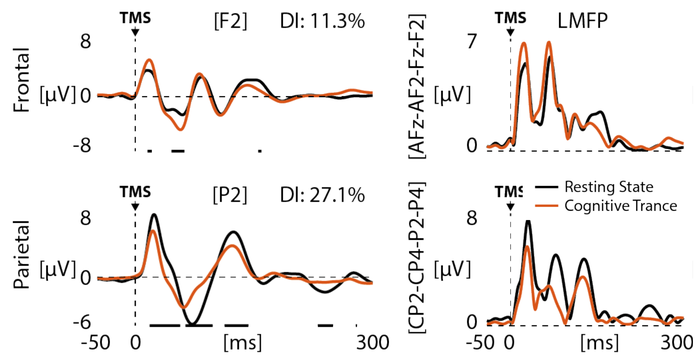
FREE RECALL (after EEG in trance):

"At first, there was a song during the induction, with movements. After, I had the vision of an eagle and it began to fly and I felt the sensation to also fly with him in a very beautiful orange light. It was a sunset and it was very pleasant. I was doing tai-chi movements. It was beautiful. This eagle took me in a kind of eye, a very bright eye, and after I had a feeling of an opening, a total well-being. I felt like ecstasy, a state where you are just in your place and it is perfect."

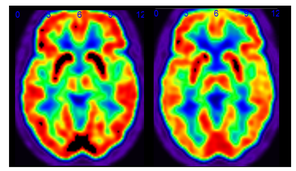
EEG



TMS-EEG



FDG-PET



No significant difference between rest (left) and trance (right)

Discussion

Our findings showed:

- Higher absorption, dissociation, wakefulness and time-scale distortion in trance compared to rest
- EEG increase spectral power in all frequency bands, increase complexity (especially posterior regions), increase in δ and decrease in α & β connectivity
- Target-specific modification in cortical reactivity: increase during frontal stimulation (possibly related to focused attention), and decrease in parietal stimulation (possibly related to decreased external awareness)
- No difference in global brain metabolism

In conclusion, cognitive trance is a modified state of consciousness characterized by changes in behavior and neurophysiological processes. Further studies on a larger sample of subjects are needed to better understand the neural basis of cognitive trance, which can be practiced by any individual undergoing specific (self)-training.

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ogosseries@uliege.be