



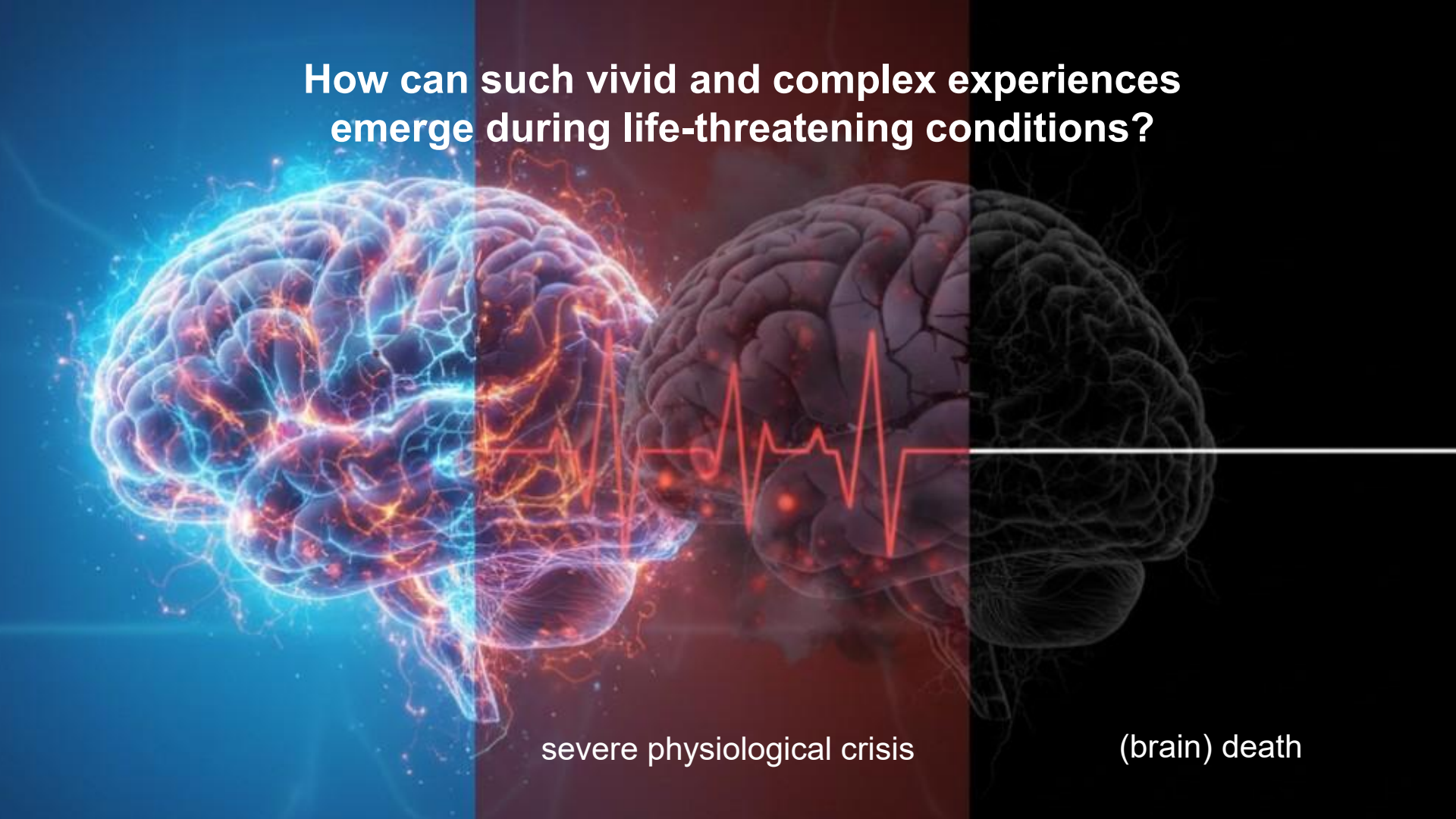
Neurosciences confronting near-death experiences



severe physiological crisis

(brain) death

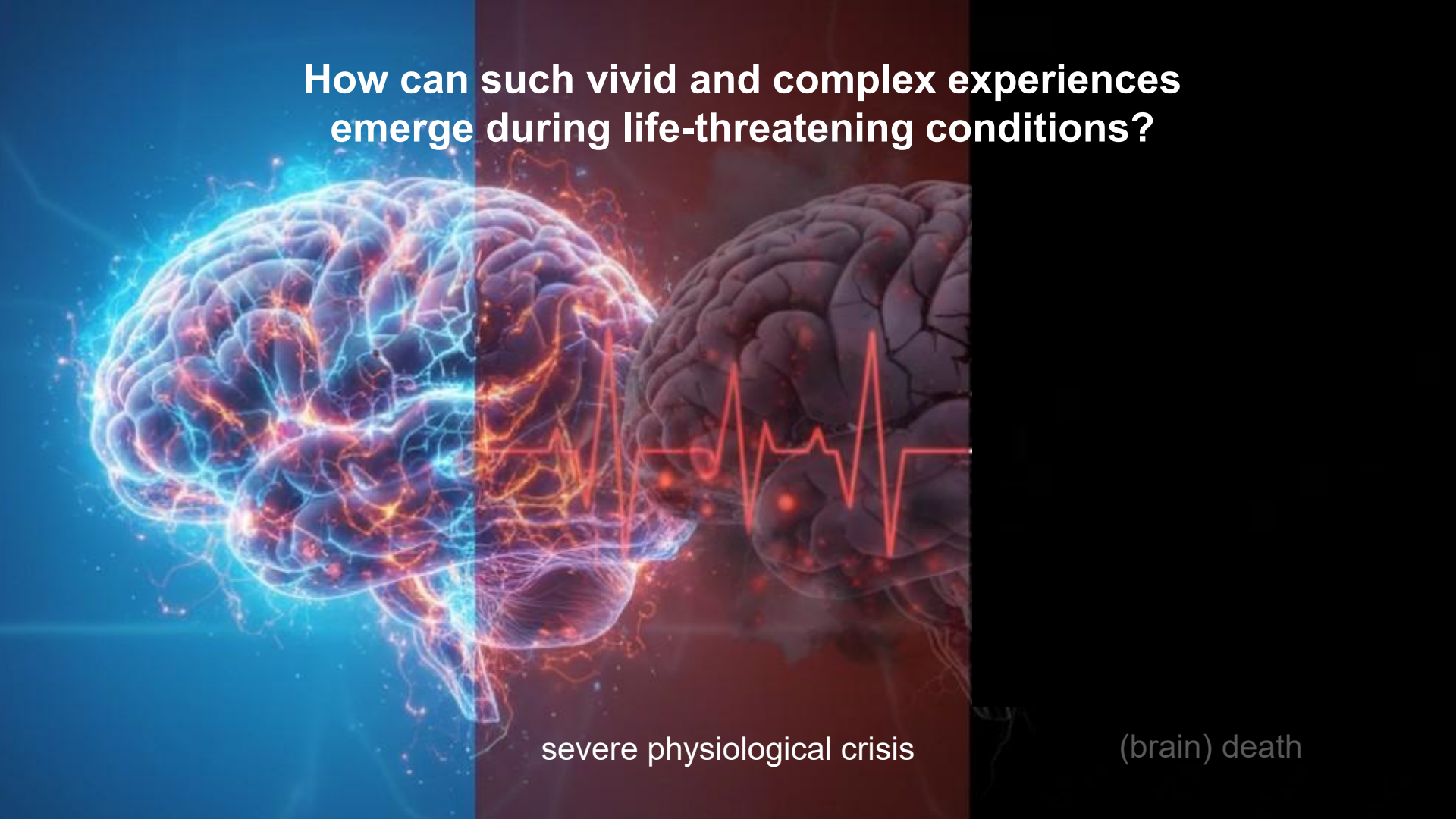
How can such vivid and complex experiences emerge during life-threatening conditions?



severe physiological crisis

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severe physiological crisis

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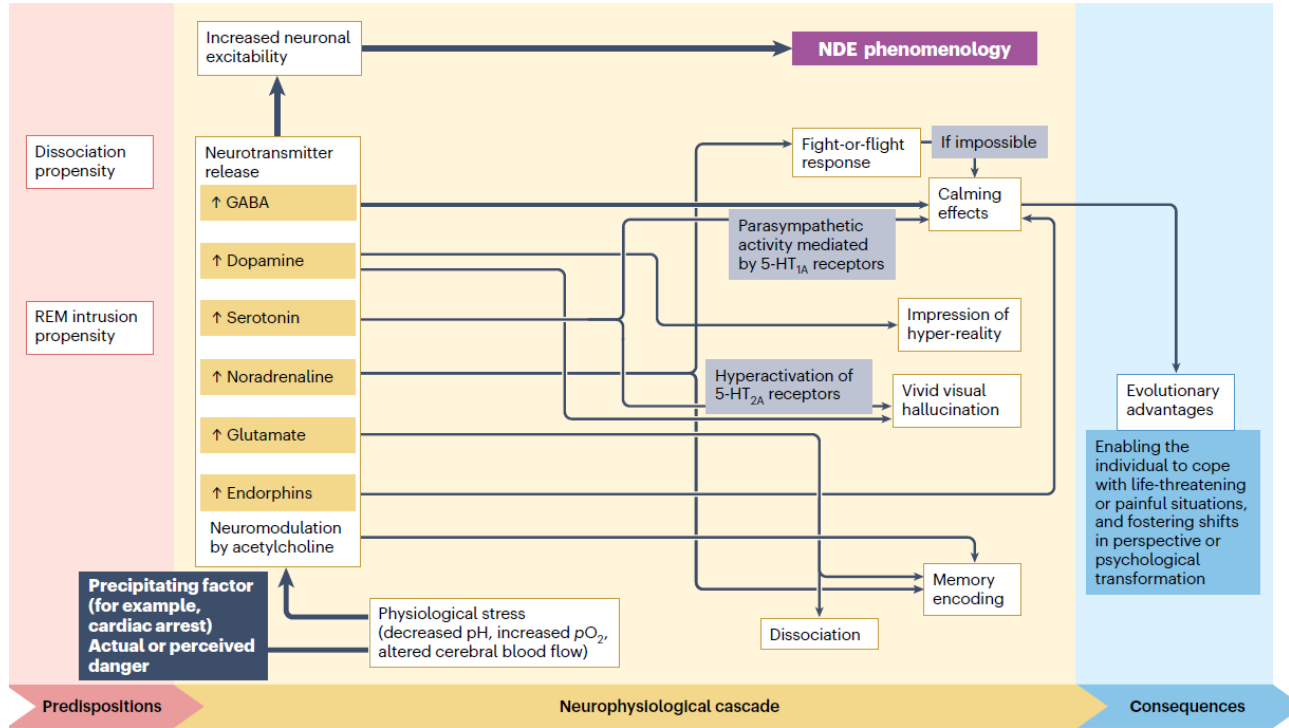
**How can such vivid and complex experiences
emerge during life-threatening conditions?**

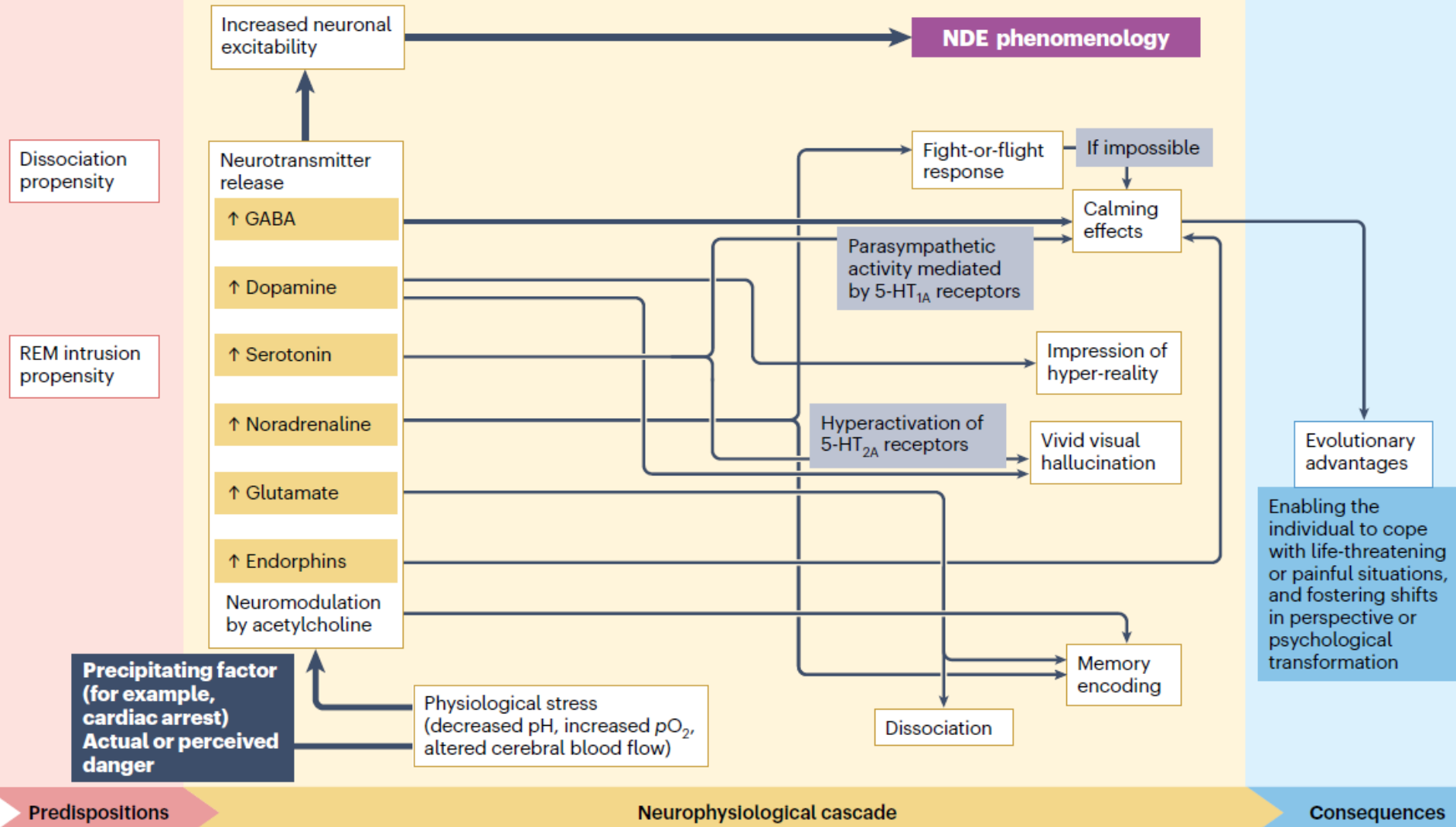


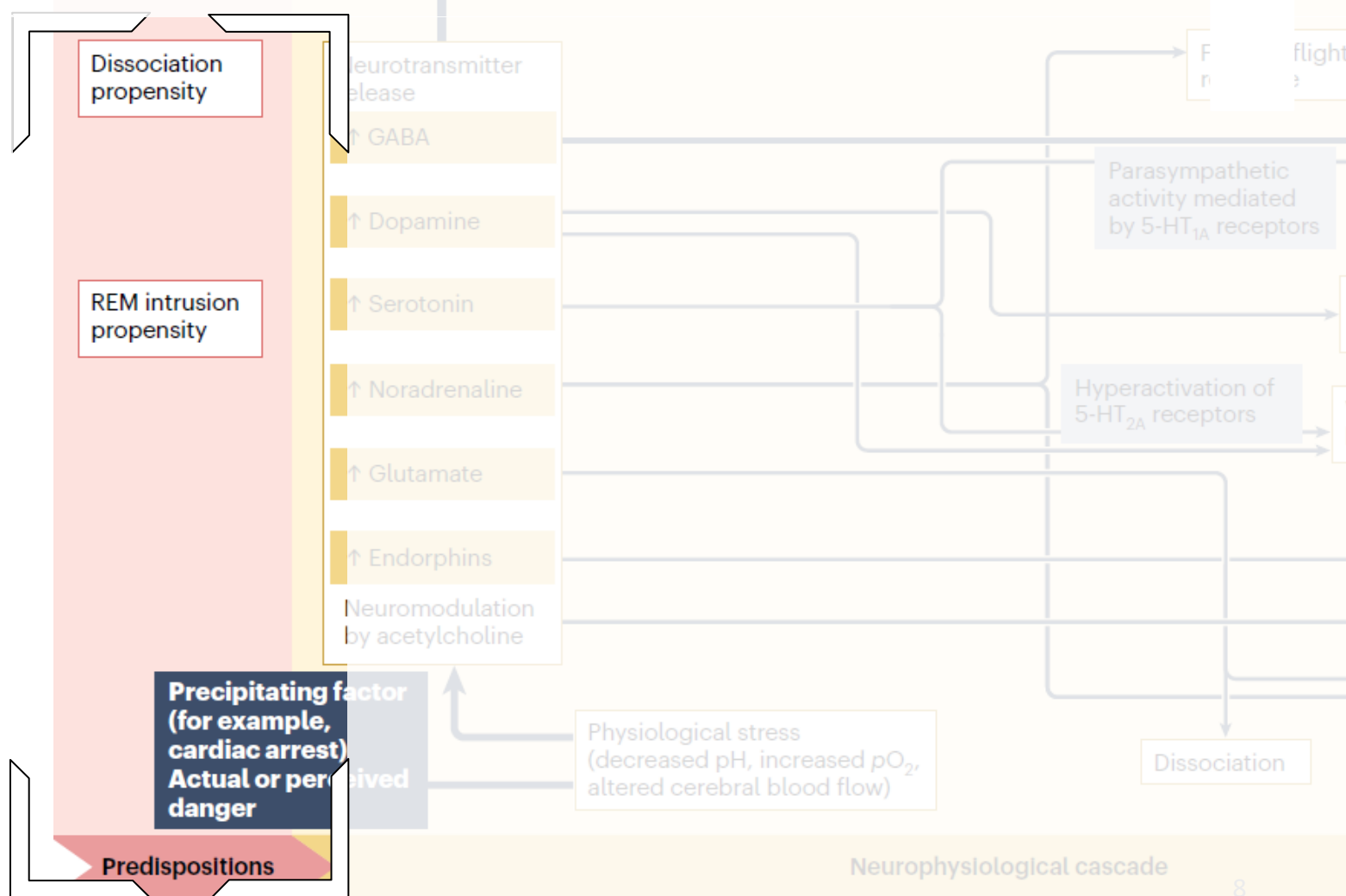
severe physiological crisis

(brain) death

a comprehensive model







Dissociation propensity as a trait



Dissociation propensity as a trait

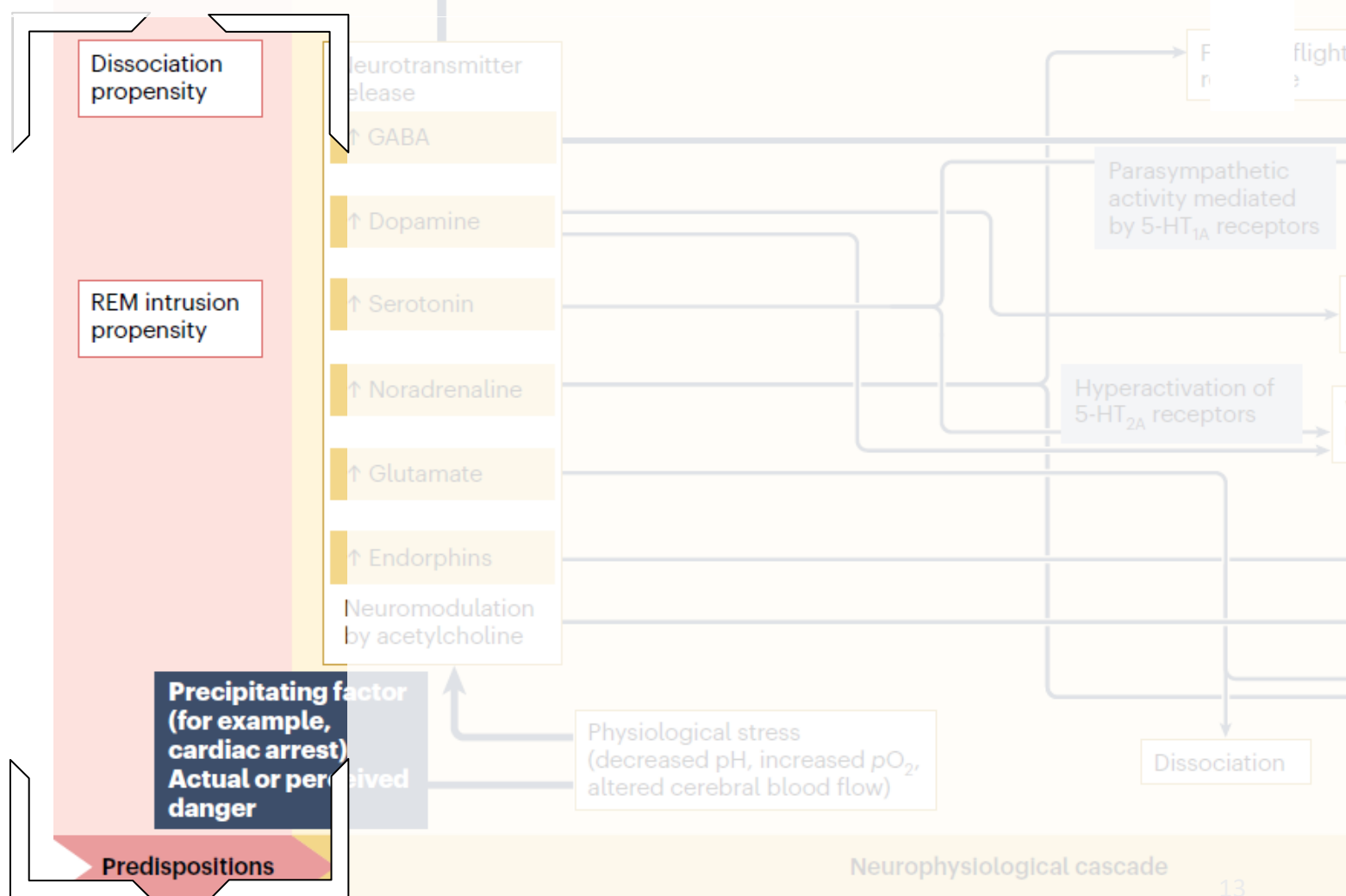


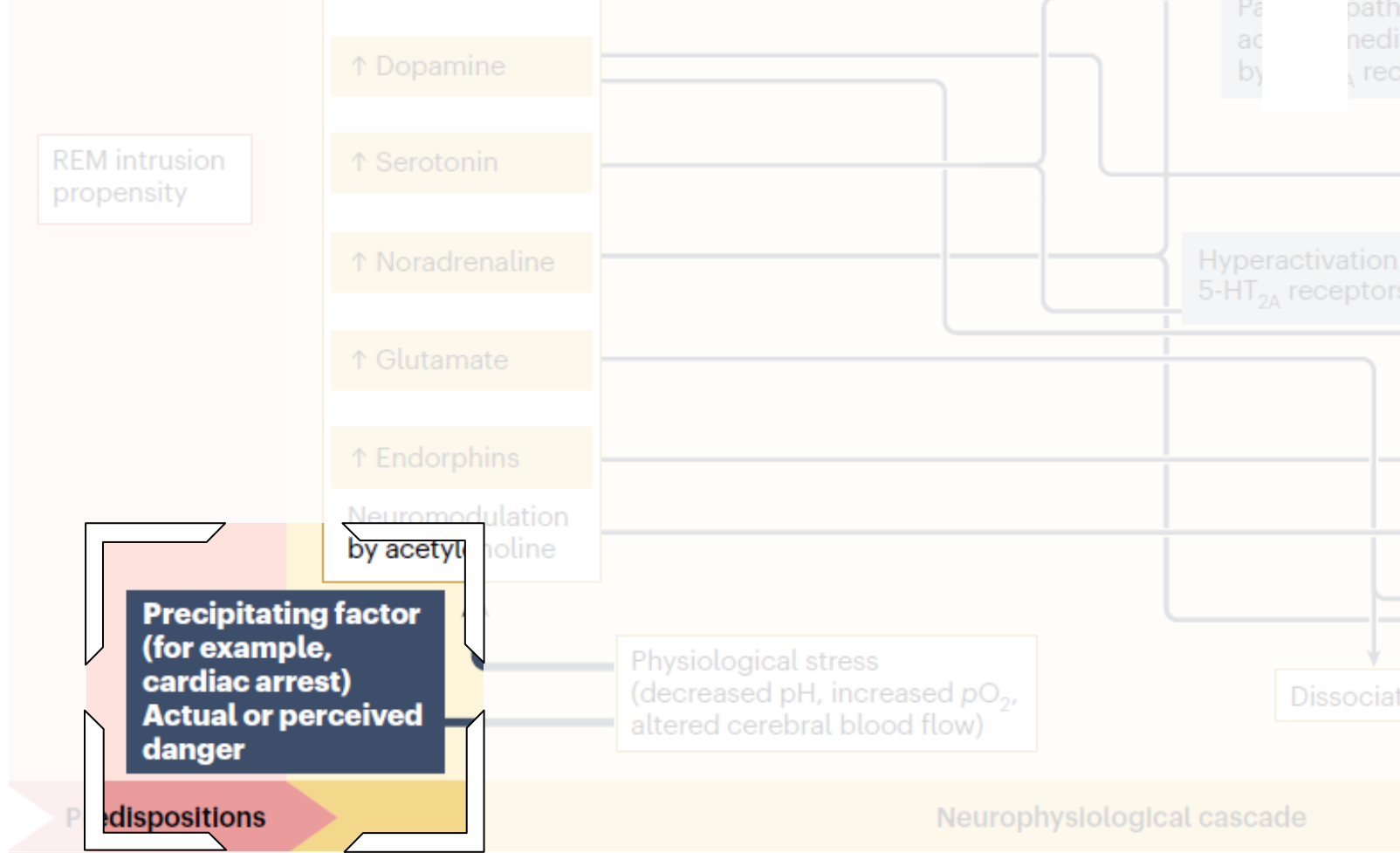
Dissociation process during the event

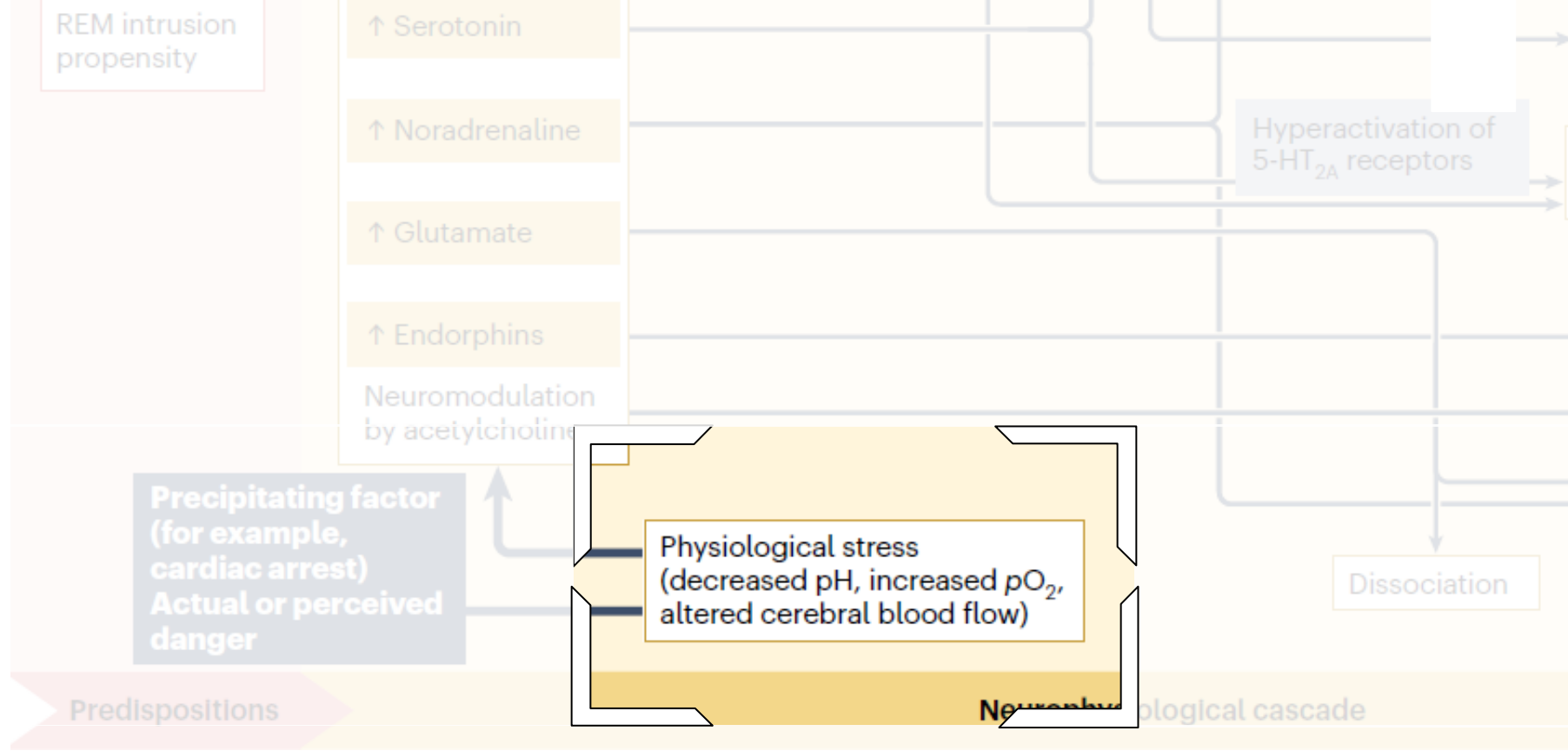


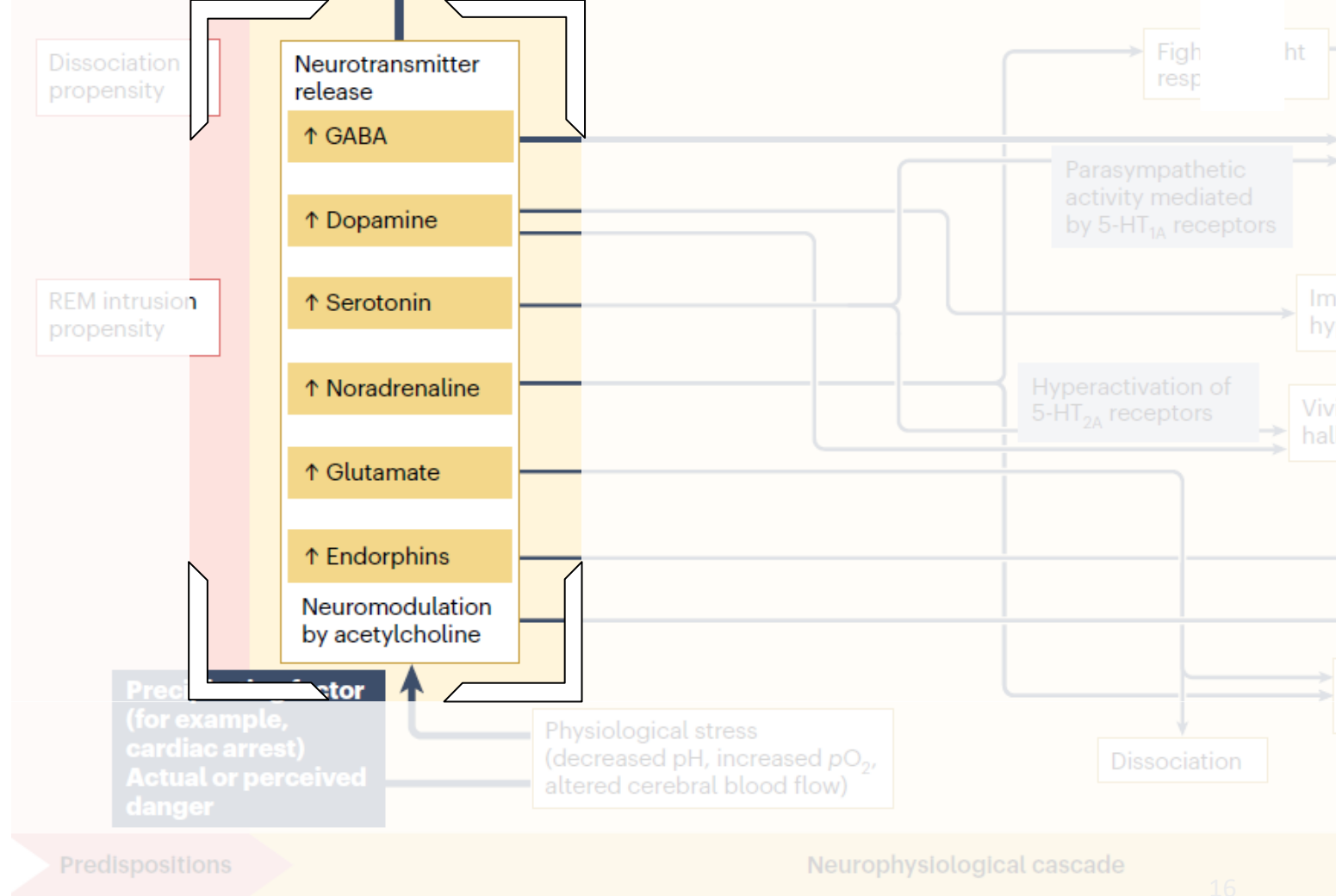
Dissociation process during the event











excitability

Dissociation propensity

REM intrusion propensity

- Neurotransmitter release
- ↑ GABA
- ↑ Dopamine
- ↑ Serotonin
- ↑ Noradrenaline
- ↑ Glutamate
- ↑ Endorphins
- Neuromodulation by acetylcholine

Precipitating factor (for example cardiac arrest, actual or perceived danger)

Physiological stress (decreased pH, increased pO₂, altered cerebral blood flow)

Fight-or-flight response

If impossible

Calming effects

Parasympathetic activity mediated by 5-HT_{1A} receptors

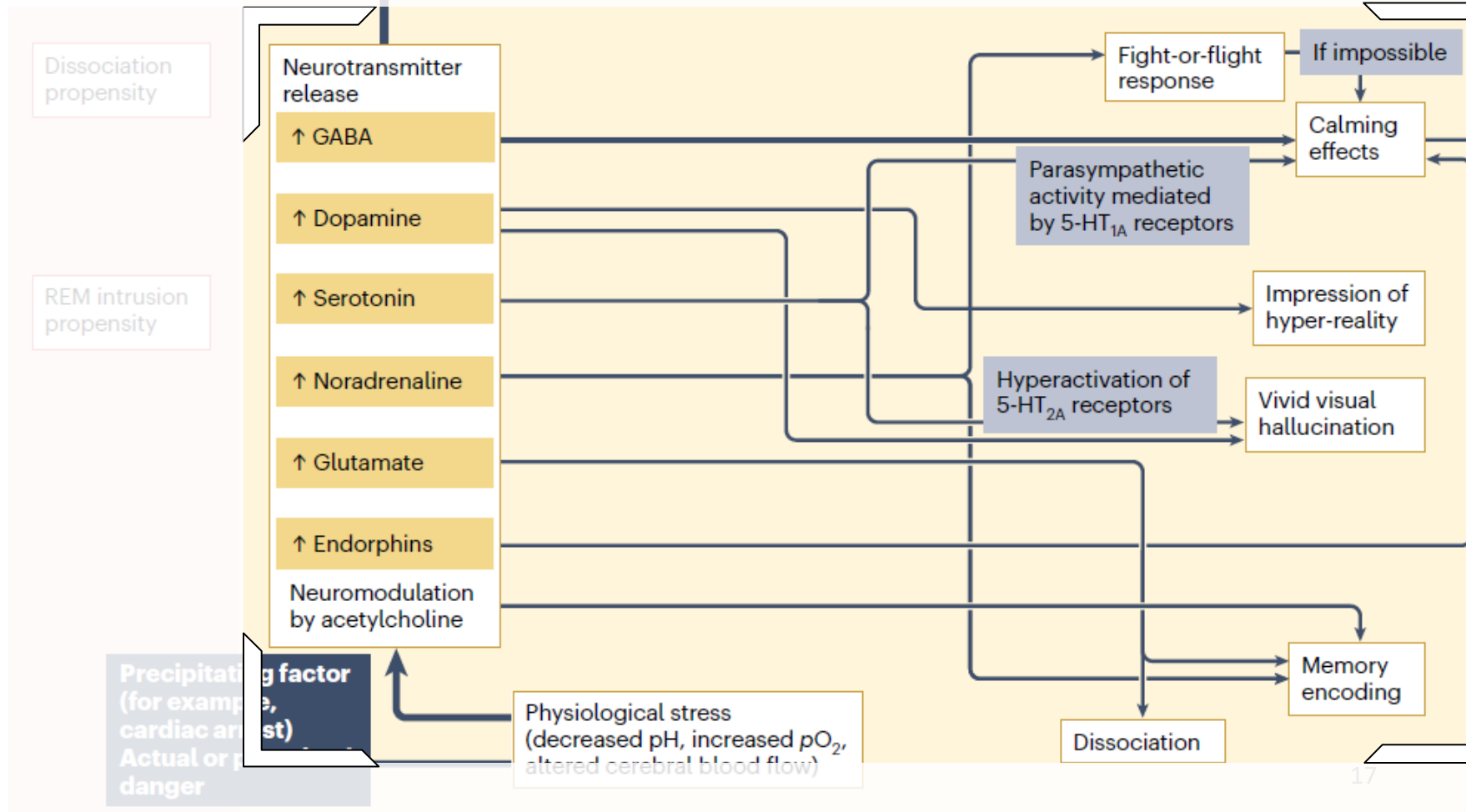
Impression of hyper-reality

Hyperactivation of 5-HT_{2A} receptors

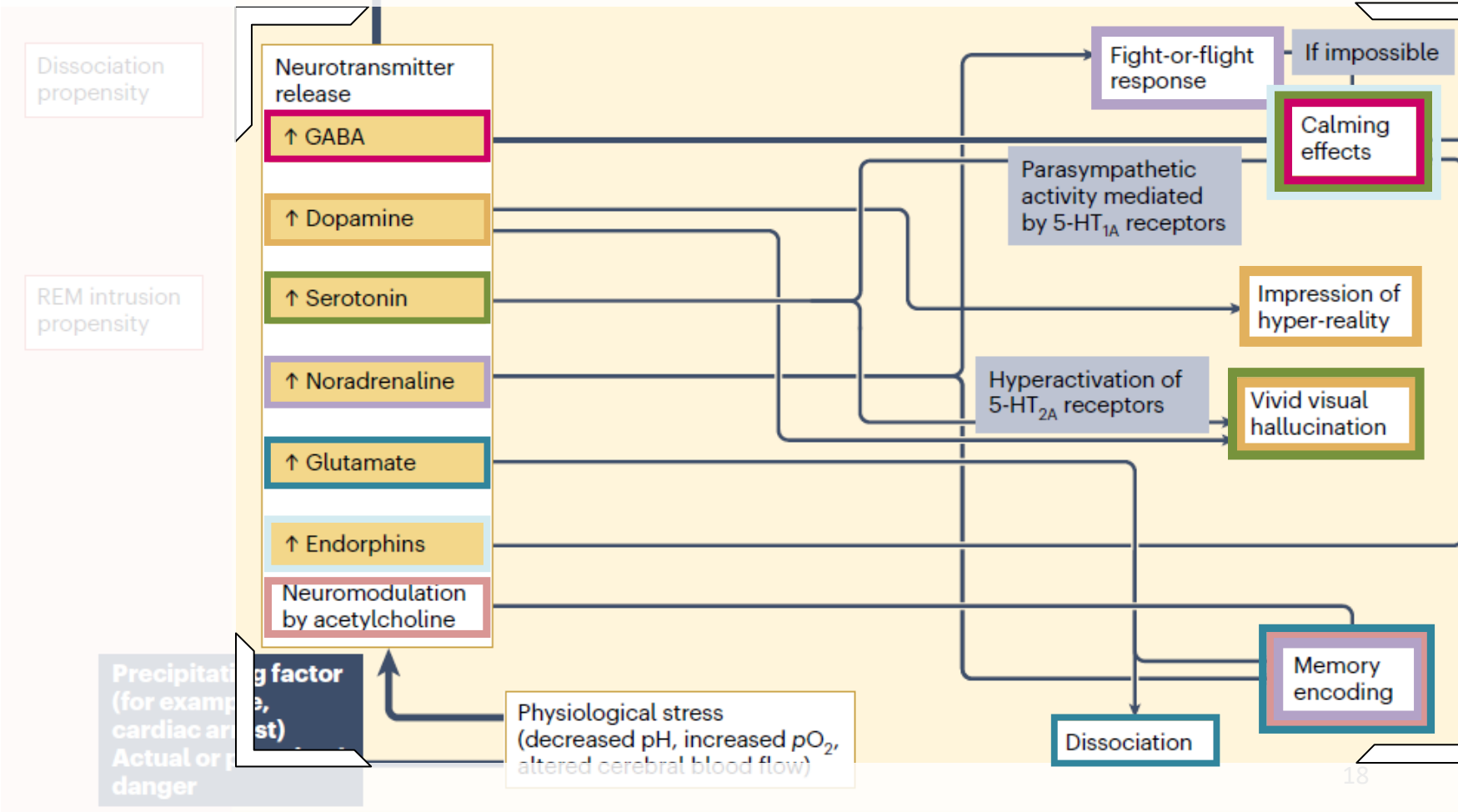
Vivid visual hallucination

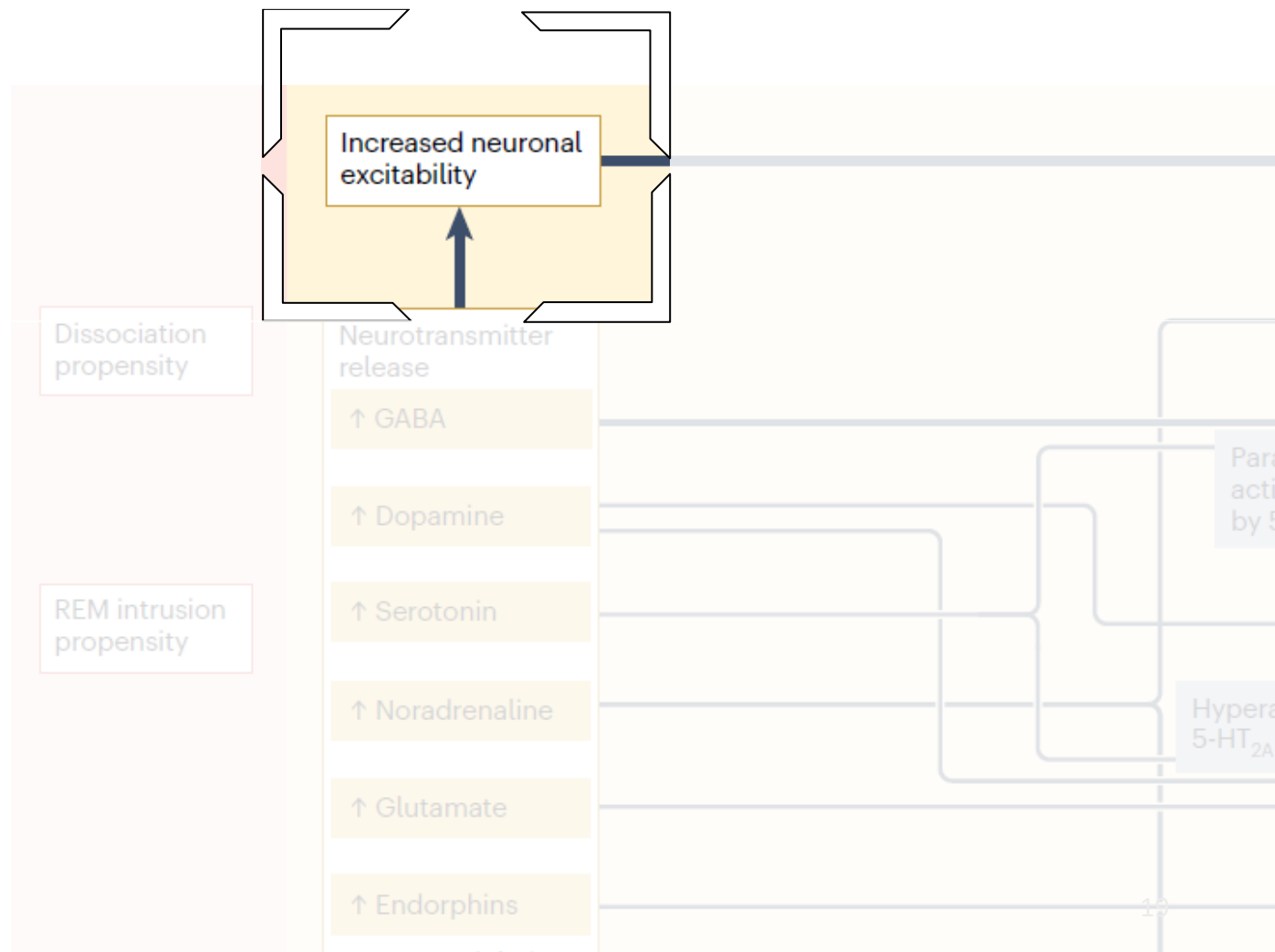
Memory encoding

Dissociation



excitability





EEG signature of NDE-like

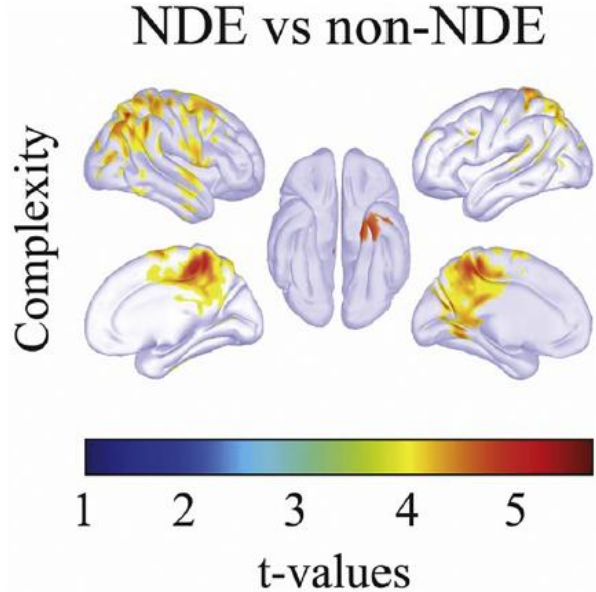
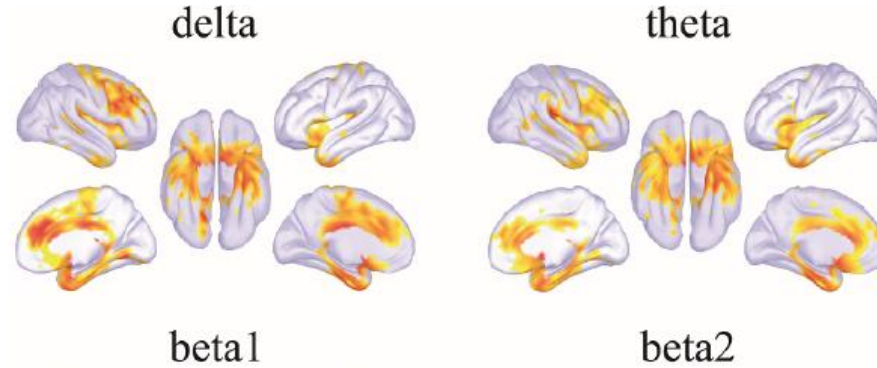


Fig. 4. Full-band Complexity: Between group (NDE-like vs non-NDE-like) cortical differences. T-values cortical maps of the NDE-like versus non-NDE-like comparisons related to complexity measures are presented. The threshold for significance at $p = 0.05$ is $|t| = 4.01$. Voxels with $p > 0.05$ are left uncolored. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)



EEG signature of NDE-like



The slow oscillatory activity may provide a temporal frame favorable for the emergence of conscious experiences and of their subsequent memory encoding

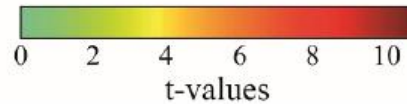


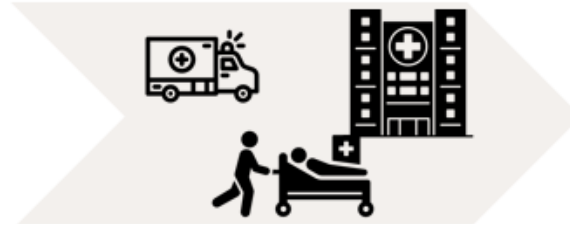
Fig. 2. Cortical level differences between NDE-like and non-NDE-like groups for significant frequency bands. T-values cortical maps of the NDE-like versus non-NDE-like comparisons are presented for those bands showing significant between-group differences after SnPM correction.



EEG signature of classical NDE?



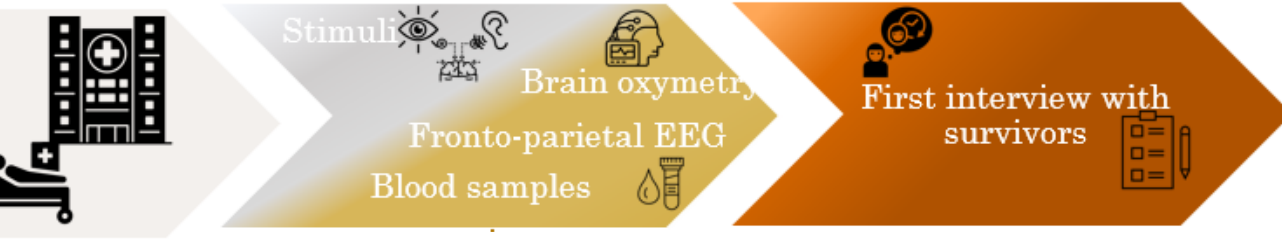
EEG signature of classical NDE?



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EEG signature of classical NDE?

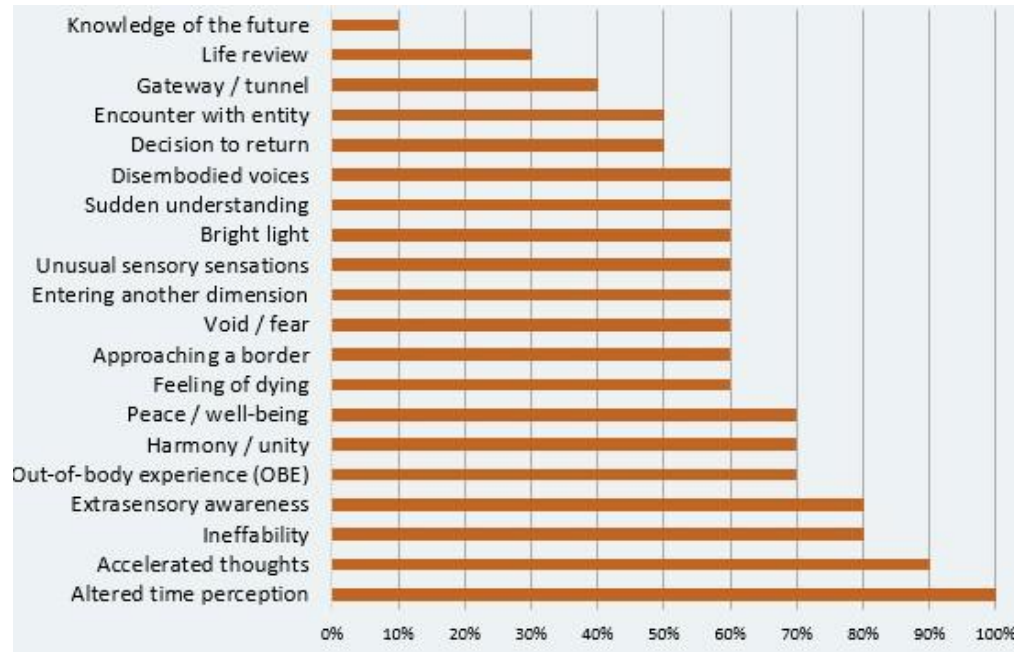


EEG signature of classical NDE?



EEG signature of classical NDE?

- Prevalence: 28.6% of the emergency patients reporting disconnected consciousness episodes !!



EEG signature of classical NDE?



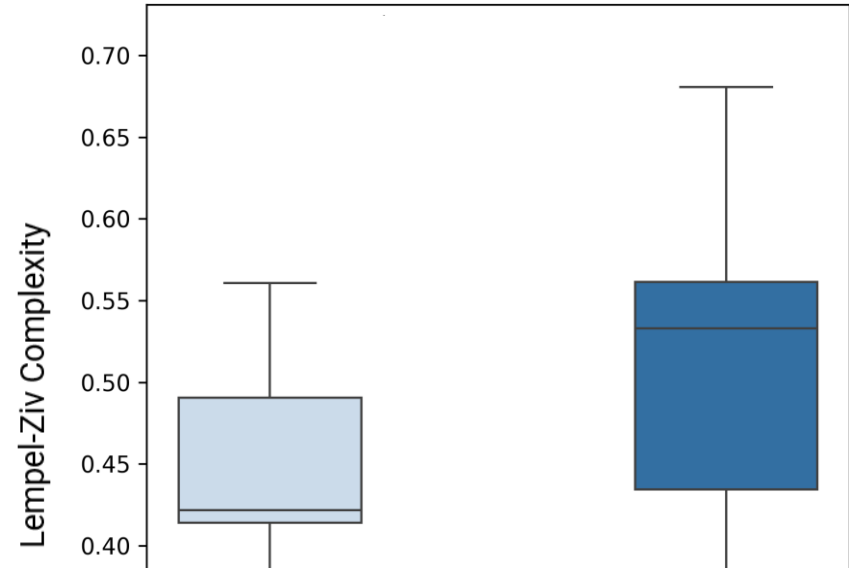
EEG signature of classical NDE?

- Prevalence: 28.6% of the emergency patients reporting disconnected consciousness episodes !!



EEG signature of classical NDE?

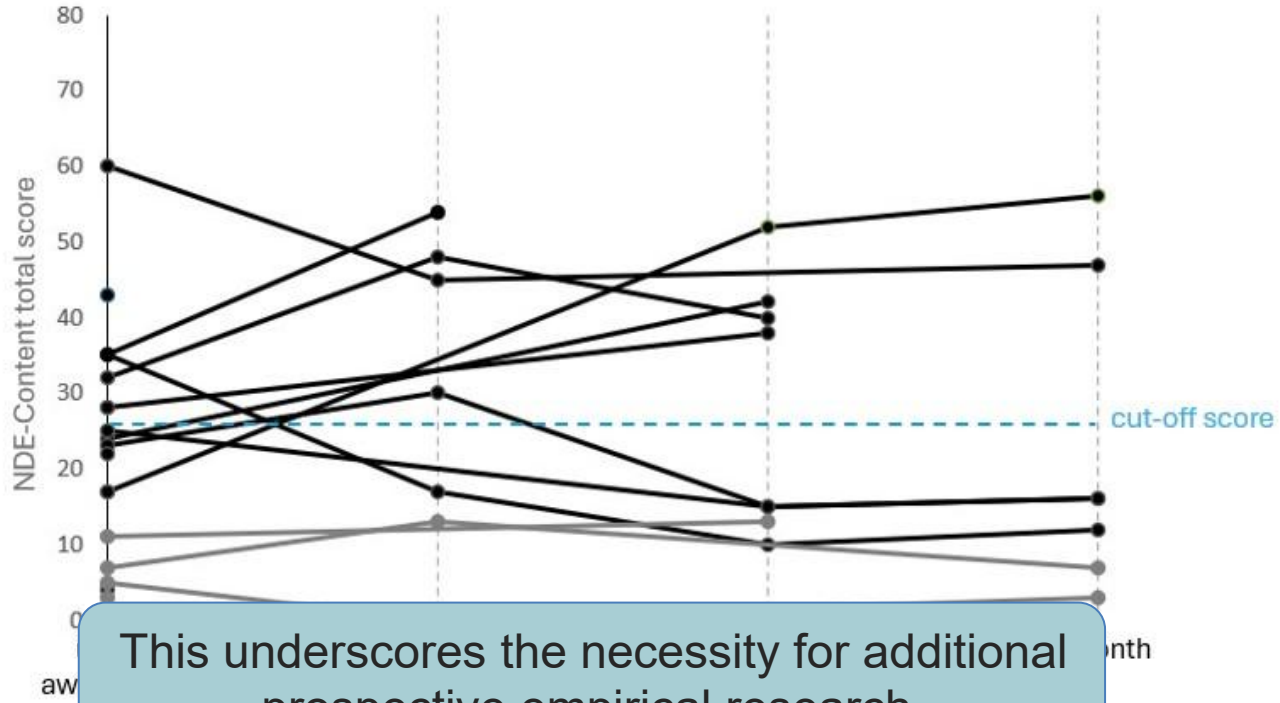
- Prevalence: 28.6% of the emergency patients reporting disconnected consciousness episodes !!
- EEG (*Cerebair Nihon Kohden*):
 - 7 “clinically unconscious/unresponsive” patients without NDEs (‘Not DC’)
 - 4 “clinically unconscious/unresponsive” patients with NDEs (‘NDE’)
 - 10 awake patients



Although we may never be able to determine with absolute precision the exact moment at which an NDE occurs, our data reveal that the brain of the NDE patients remain more organized and dynamically active

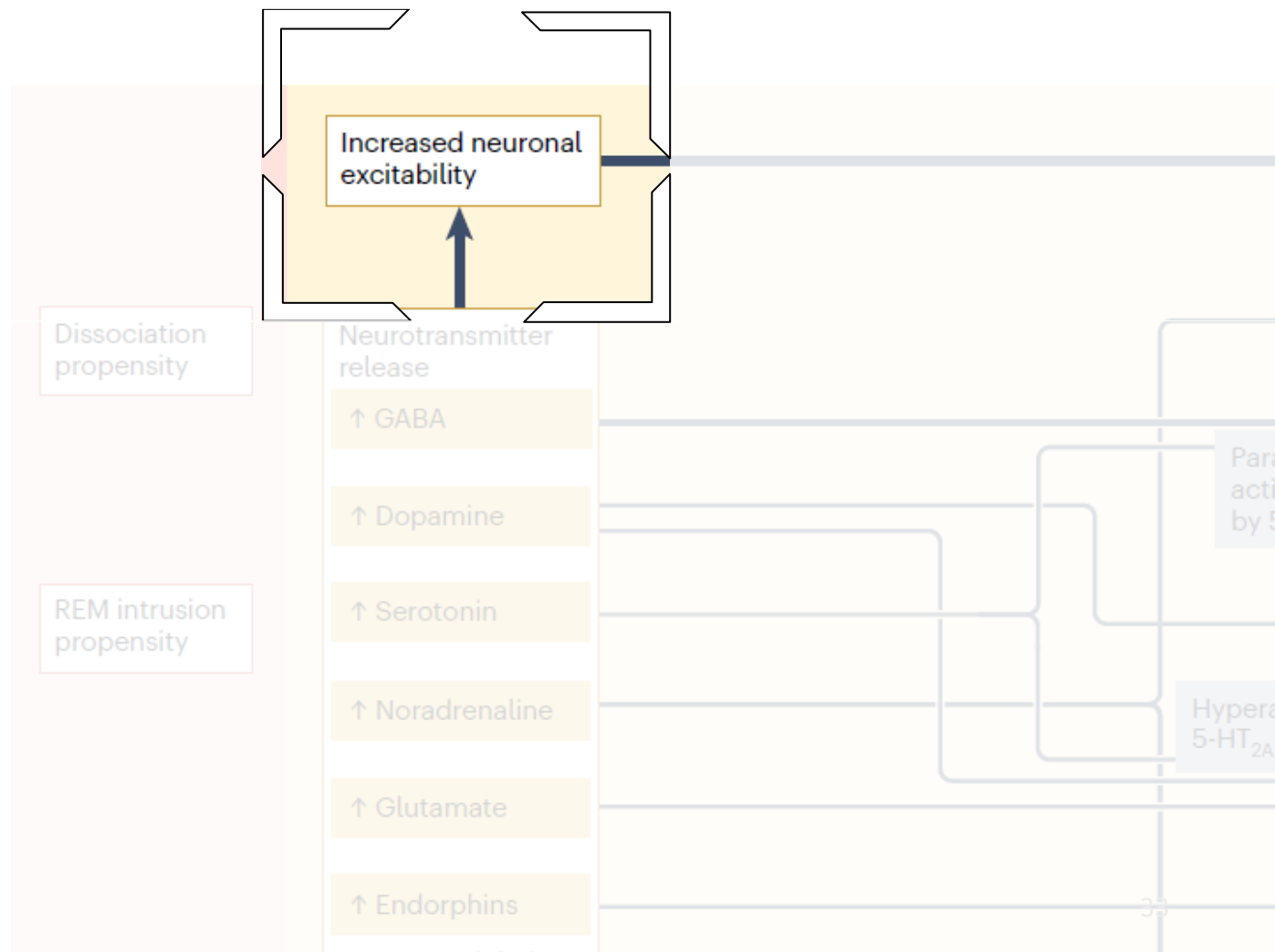


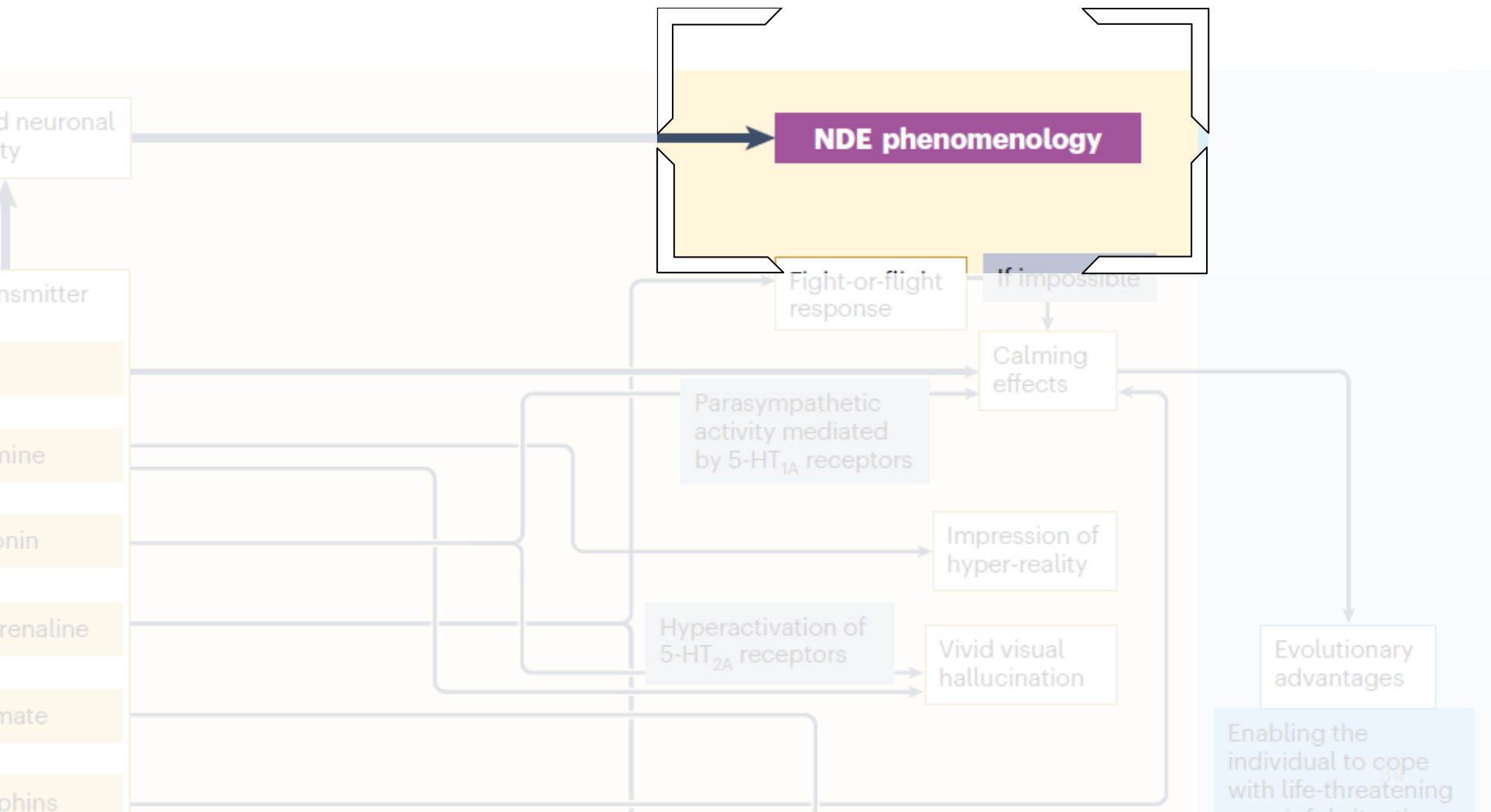
Disconnected consciousness memory evolution

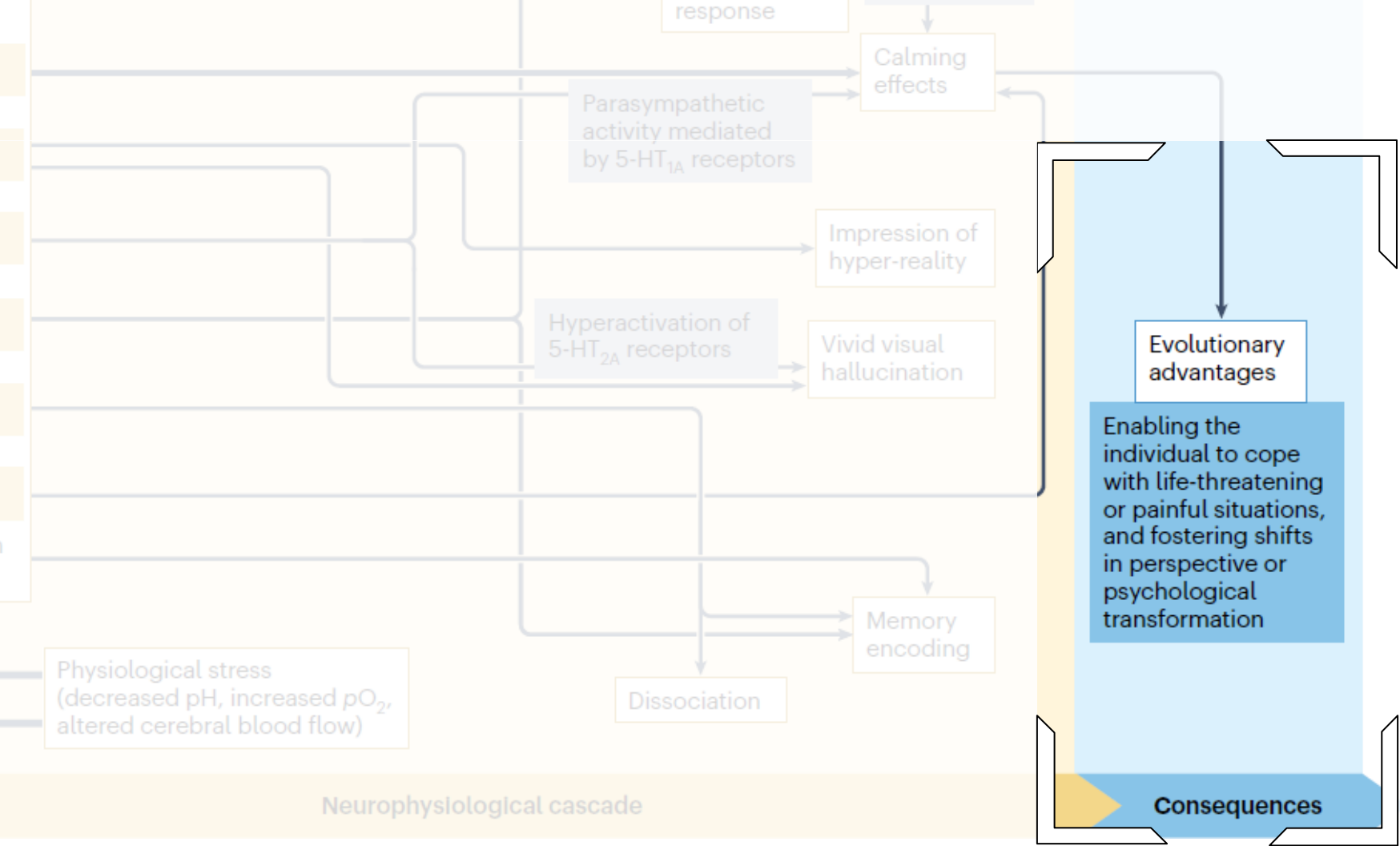


This underscores the necessity for additional prospective empirical research.









Take home message

- At first glance, NDEs may appear to challenge our conventional models of consciousness, but neuroscience is beginning to provide convincing explanations → a cascade of **concomitant psychological and neurophysiological events**
- NDEs
 - ≠ “mere” dreams
 - ≈ naturally-occurring adaptive responses to threat

Thanks!



Pauline Fritz

FUNDAÇÃO
Bial

Institution of public utility

nature reviews
neurology

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