

Understanding Stress- A Different Approach

-Shashank Katiyar

What is Stress

Stress is a feeling- response against dangerous situations.

Small bursts helpful, chronic not.

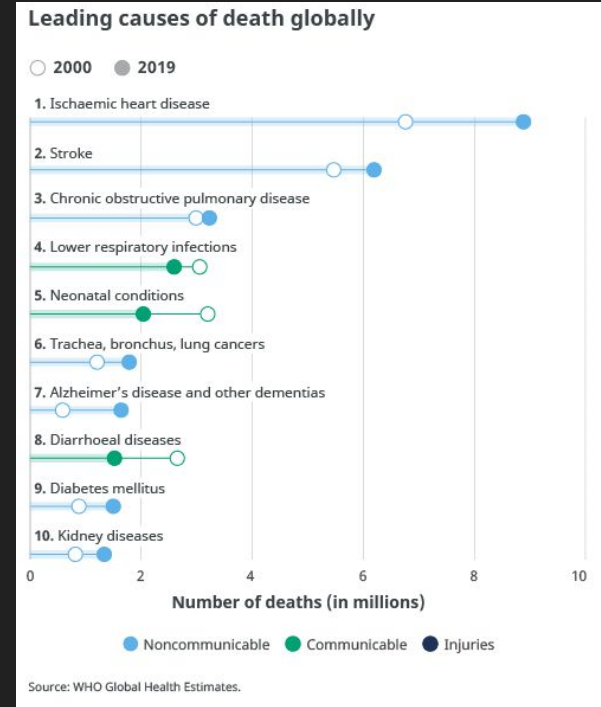
Wasn't meant for modern lifestyle.



Impact of chronic stress in our lives

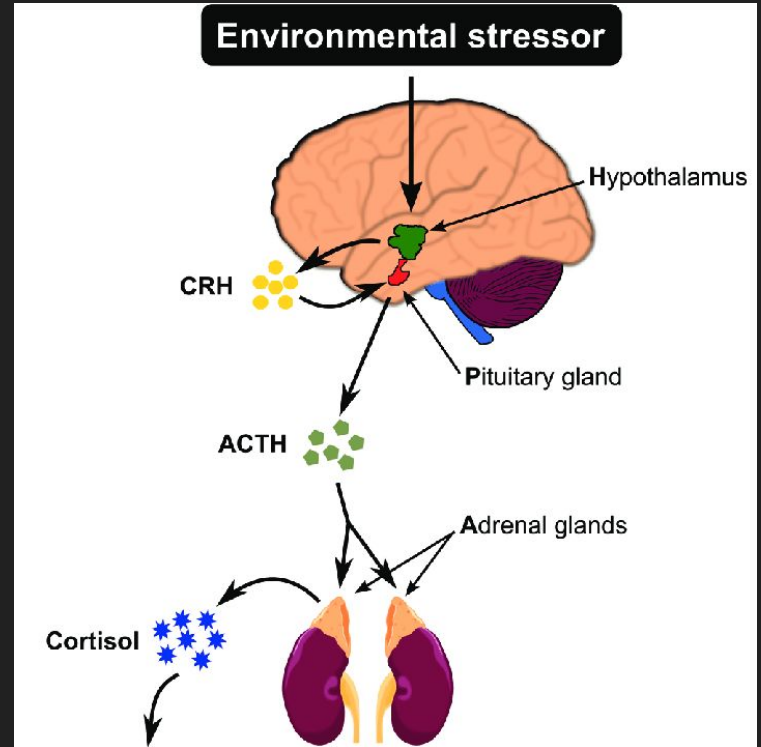
It affects our body, mood, and behavior negatively

Overall, it leads to an unhappy mind and body



Neuromodulators- Cortisol

Cortisol is associated with chronic stress (long term reaction to stressor)



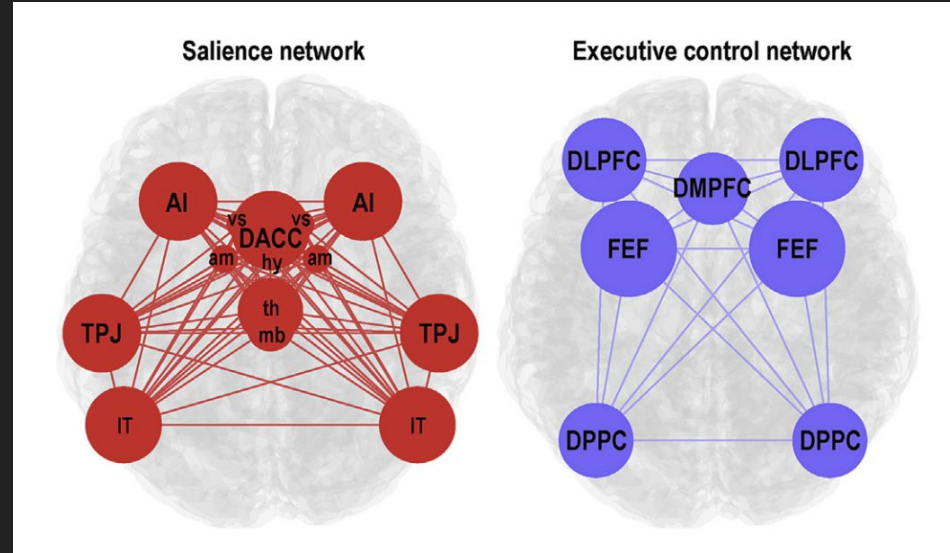
Neuromodulators- Norepinephrine

Norepinephrine is released by the
Adrenals & nervous system

Associated with acute stressors, (fight
or flight)



Macroscopic circuits- SN and ECN



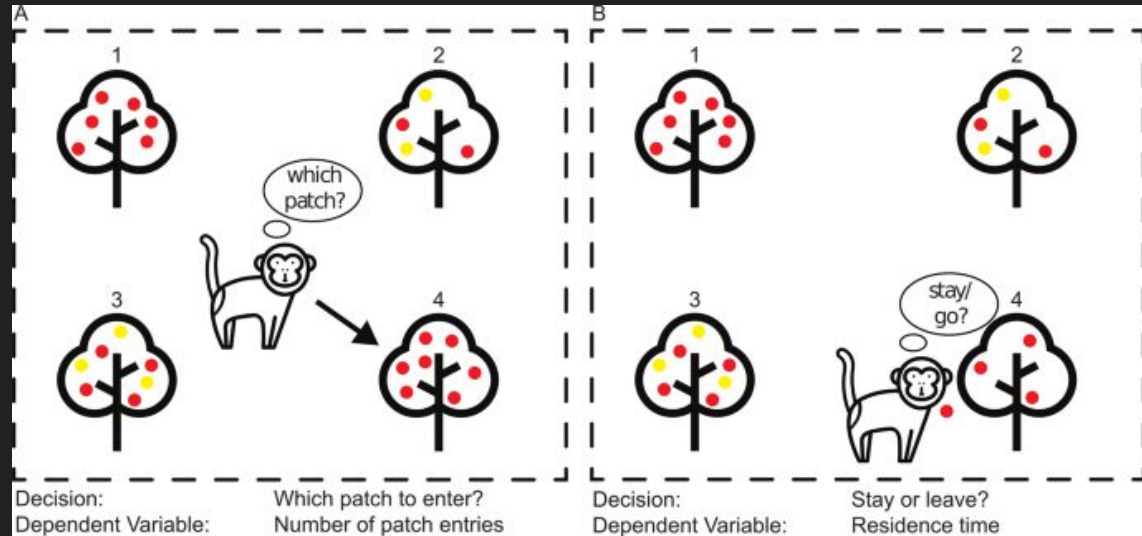
Why Decision Making?

Decision Making involves weighing the presented choices and making decision according to individual biases.



Foraging task

Simple task, involves making
explore/exploit decision,
evolutionarily crucial



Relation between foraging and stress

Stress == overexploitation

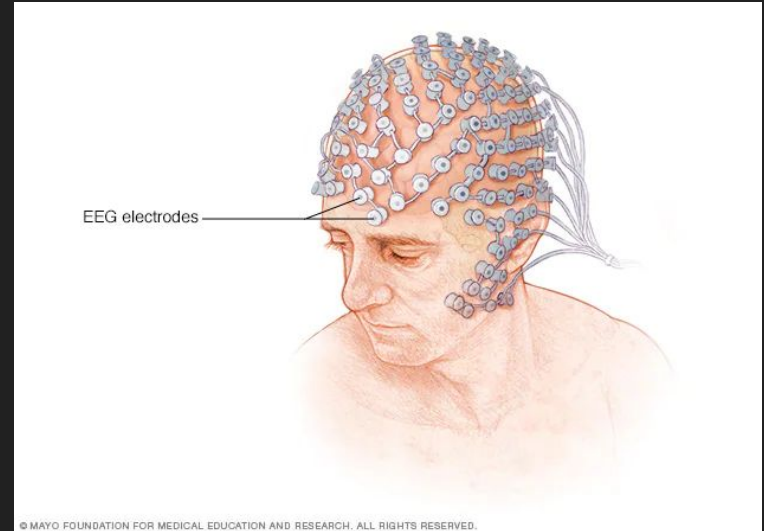
Underestimation of unknowns
(pessimism)



Electroencephalography (EEG)

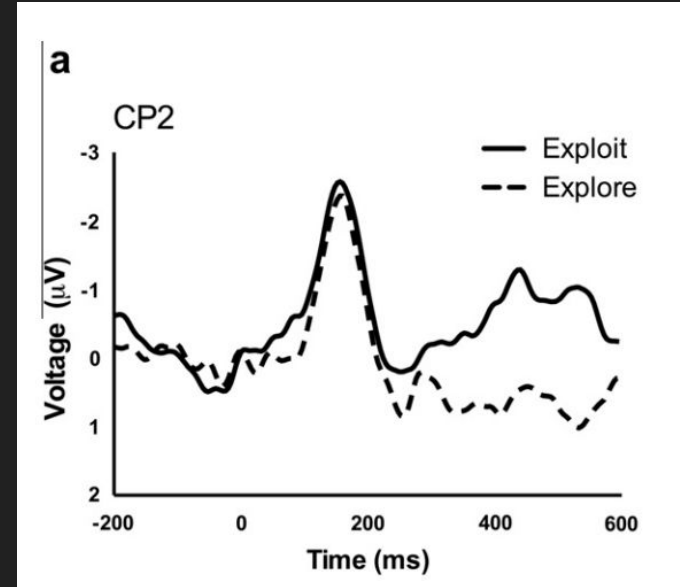
Easy, cheap measurement of brain activity

High temporal resolution



EEG and explore/exploit

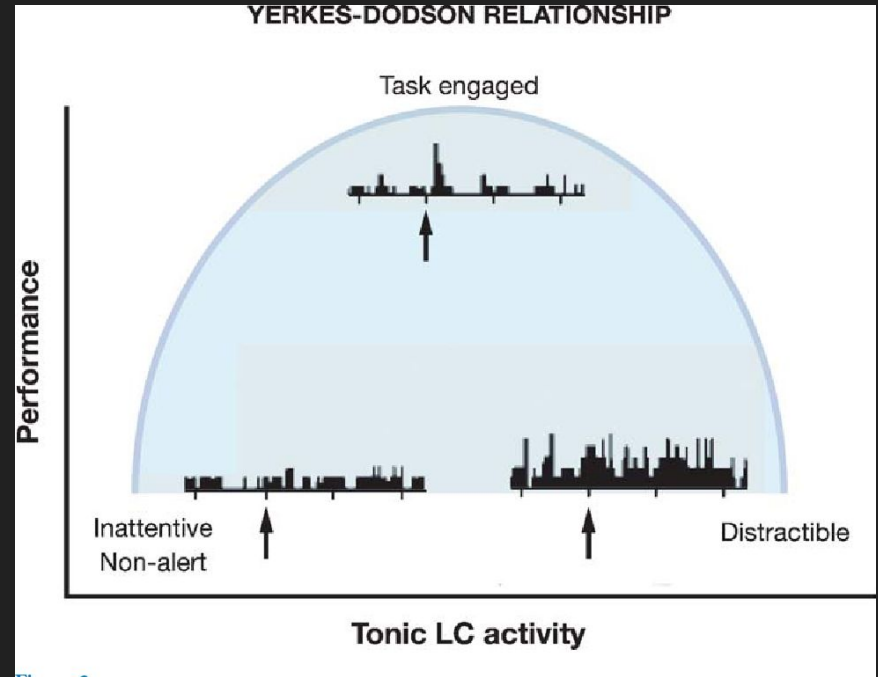
There is evidence that the P300 component of EEG has higher amplitude when the person is in exploratory mode



LC-NE system phasic and tonic activity

Phasic- allows focus on given task

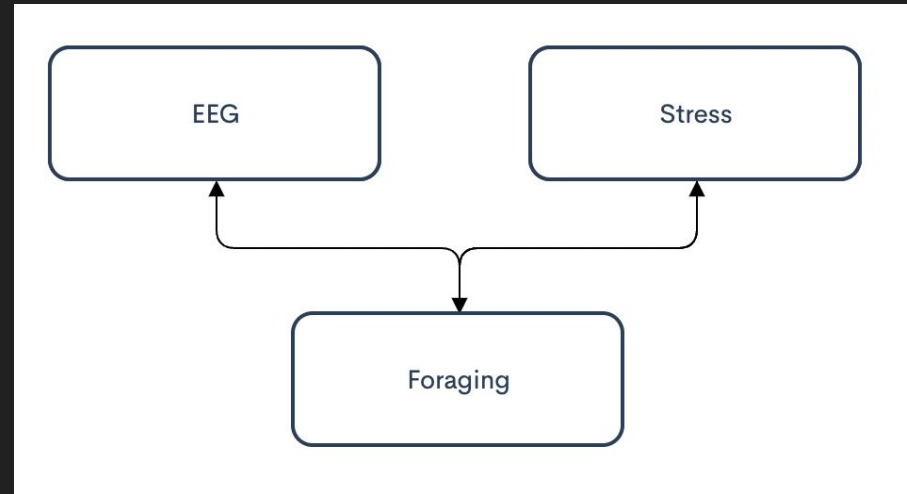
Tonic- allows distributed focus, for better task analysis



Summary

What we discussed-

- Stress, and its importance
- Decision Making (Foraging)
- EEG
- Relation between above three



Conclusion

The connection was necessary to understand different nuances of stress, which would be difficult to understand alone.



Thank You!

Hypothesis

People with chronic and short-term stress will show over-exploitative behavior in a foraging task, verifiable through a lower amplitude in the P300 component of EEG.

This will be a simple and easy method to determine stress levels of a person.

Task Involved- Foraging

- Simple explore-exploit task
- Person has to maximise fruit output
- Output from a given forage decreases with continuous exploitation

Why foraging

It is connected to us deeply due to our ancestors being hunter gatherers for a very long time.

Thus, we can expect a more natural behavior, compared to other tasks like BART, or multi armed bandit.

Connection of EEG with foraging

The P300 component of EEG is sensitive to the mode of the person- exploitative or explorative.

The LC-NE (Locus Coeruleus-Norepinephrine) system is much more active during exploration, and it is linked to the amplitude of the P300 component of ERP.

Neural Correlates

Two modes of LC-NE system- phasic and tonic.

Phasic mode is useful in performing a given task (with no exploration/exploitation involved) better. Like if we asked a person to physically do foraging in a forage, so he will need phasic activity to do better.

Phasic mode ensures that the person performs efficiently, along with having the feature of multi-level information analysis.

Neural Correlates-2

Tonic mode is useful in explore/exploit type situations.

Person when needs to analyse not just the contents of the task, but the task itself, then this mode useful.

Does cause short term performance drop, but better in long term in certain situations.

Person goes through multiple exploit-explore cycles (phasic-tonic cycles) to perform well.

Experimental Design

Person will give task, and all events will be timed* (appearance of choice, delay after that, appearance of fruit output, delay after that)

EEG will be recorded simultaneously*.

Cortisol can be measured at last if person is suspected to be stressed.

Conclusion

Overall we can find if a person is stressed or not, by using a combination of decision making tasks, and EEG measurement. This is an easy and quick method to find stress levels of a person.

Stress levels can be quantified by standardising the game-performance and P300 component of EEG, and comparing with those.