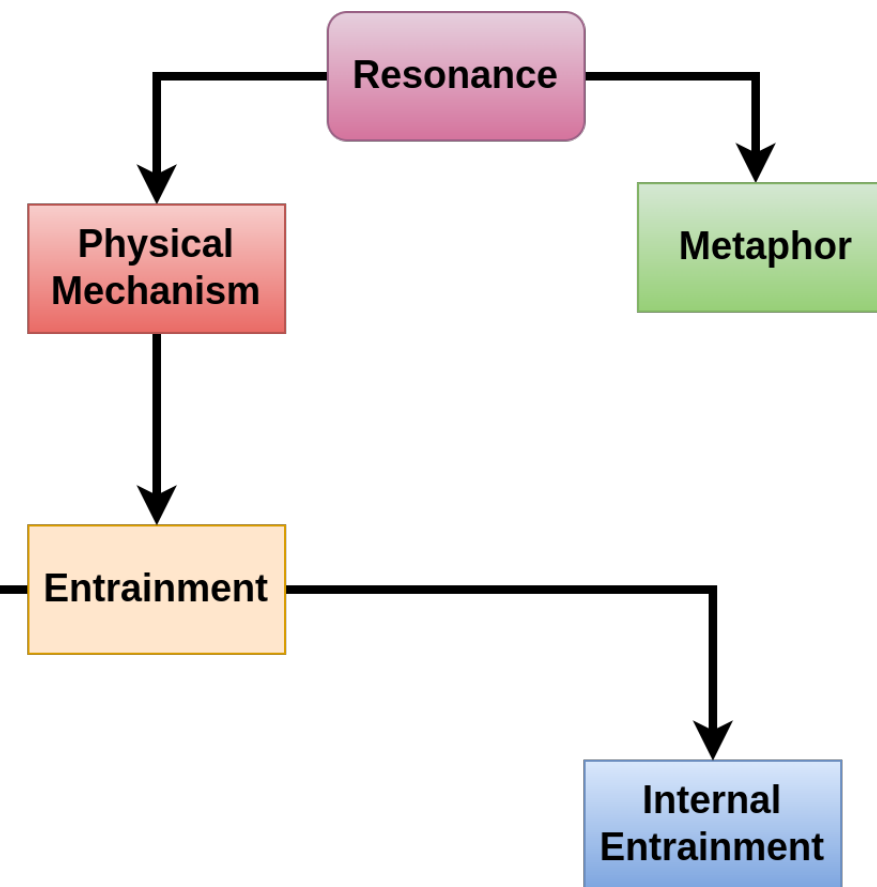


Resonance



Stimulus-Response Correlation

Inter-Subject Correlation

Brain2Brain Synchronization

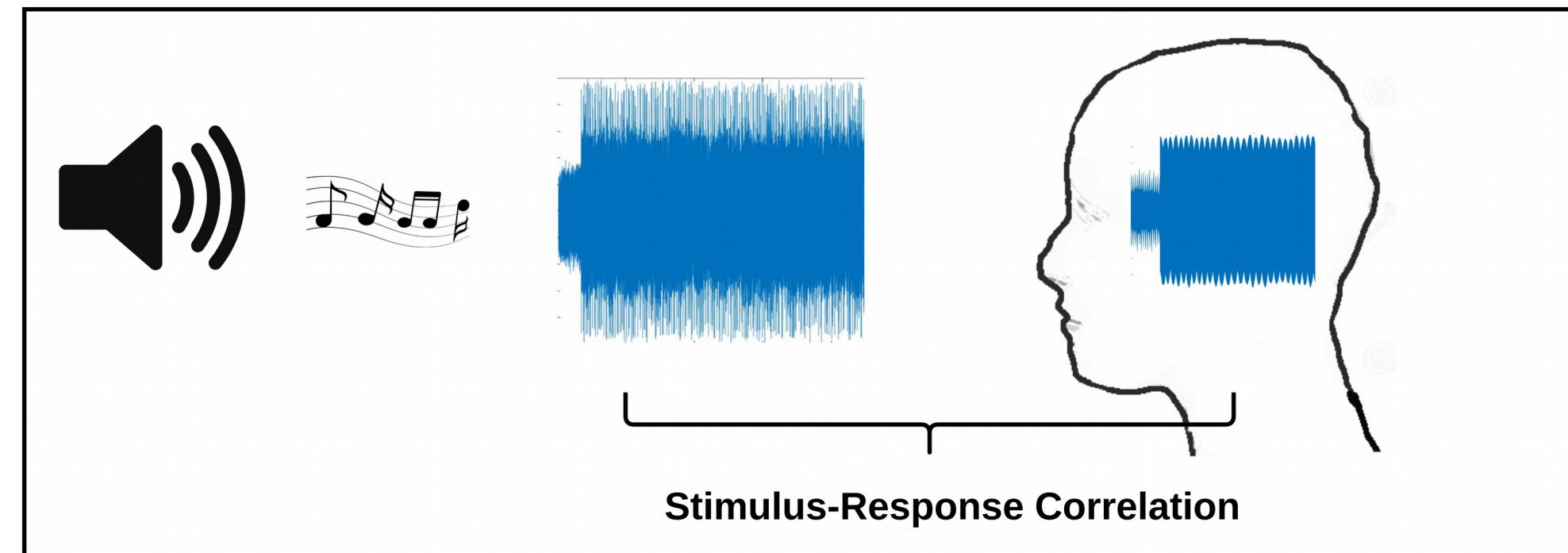
Coupled internal systems

Decoupled internal systems

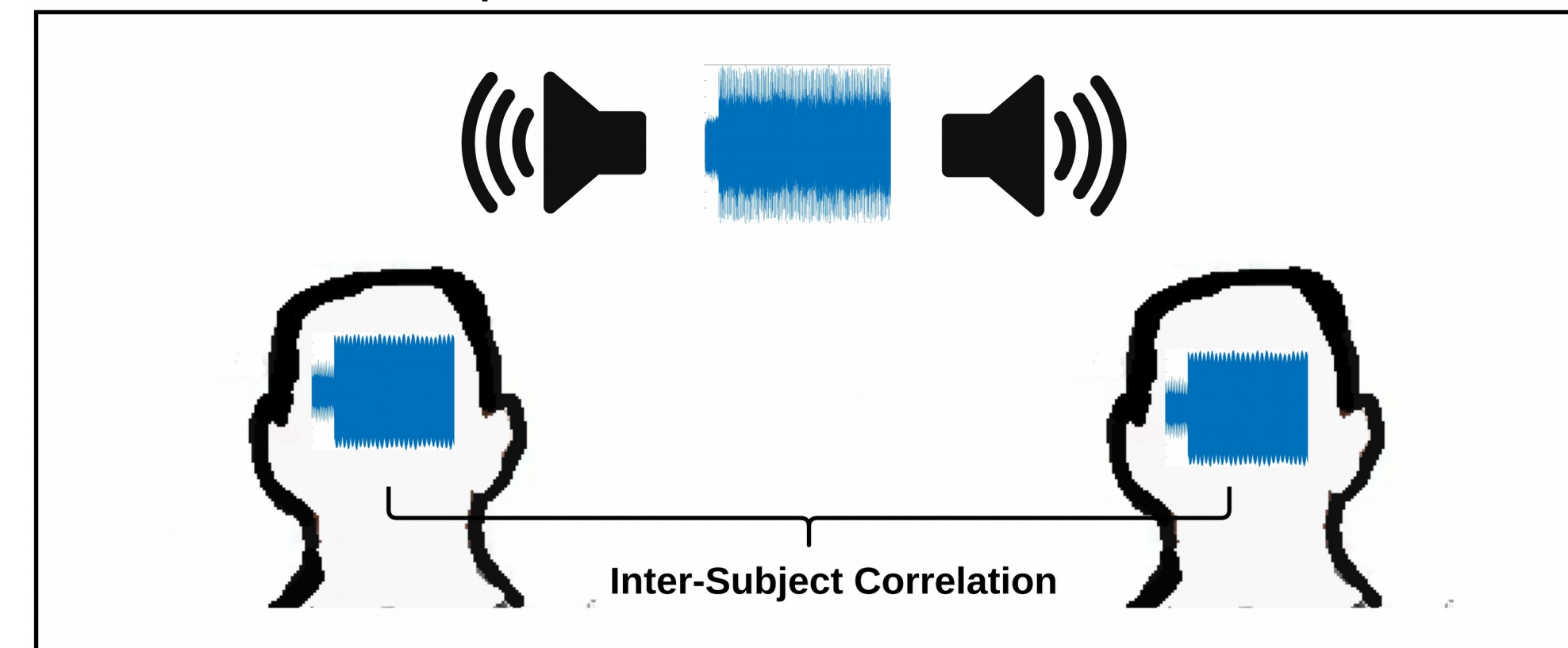
Resonance can be distinguished as a metaphor and physical mechanism. Neural resonance is a physical phenomenon that refers to the synchronization and amplification of brain oscillations to features of internal/external oscillators. Entrainment is a type of resonance, which can be further defined as external and internal.

- **External Entrainment** involves brain waves correlated to musical rhythms, amplifying/dampening human rhythms while watching/listening to movies/music, brain to brain synchronization between trainer and practitioner during guided meditation.
- **Internal entrainment** describes the frequency or phase coupling between different oscillatory systems in the body. For instance, coupling effects can be observed in the internal coherence between brain areas and in the phase-amplitude coupling between global slow frequency brain rhythms and local fast frequency brain rhythms, such as in the gamma-theta interaction complex which is thought to underpin working memory.

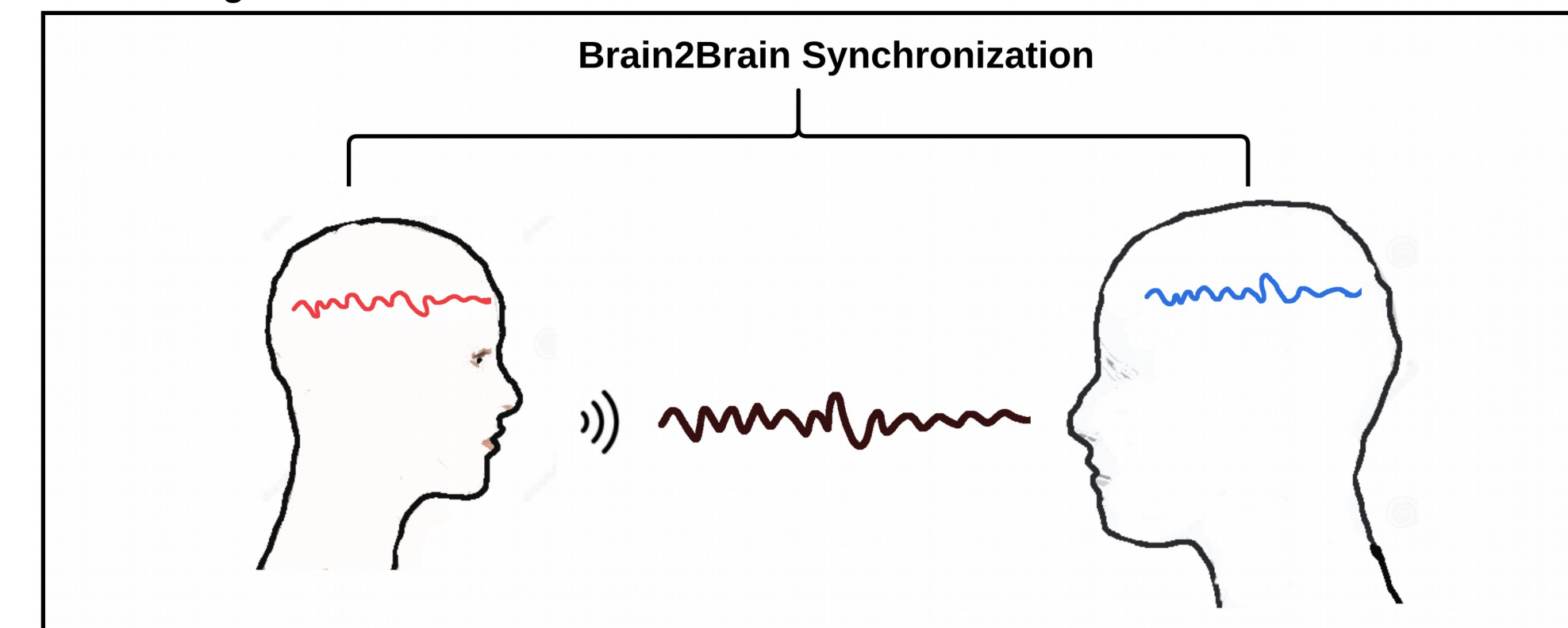
External Entrainment



Stimulus-Response correlation (SRC) computes the time-varying features of stimulus with brain responses.

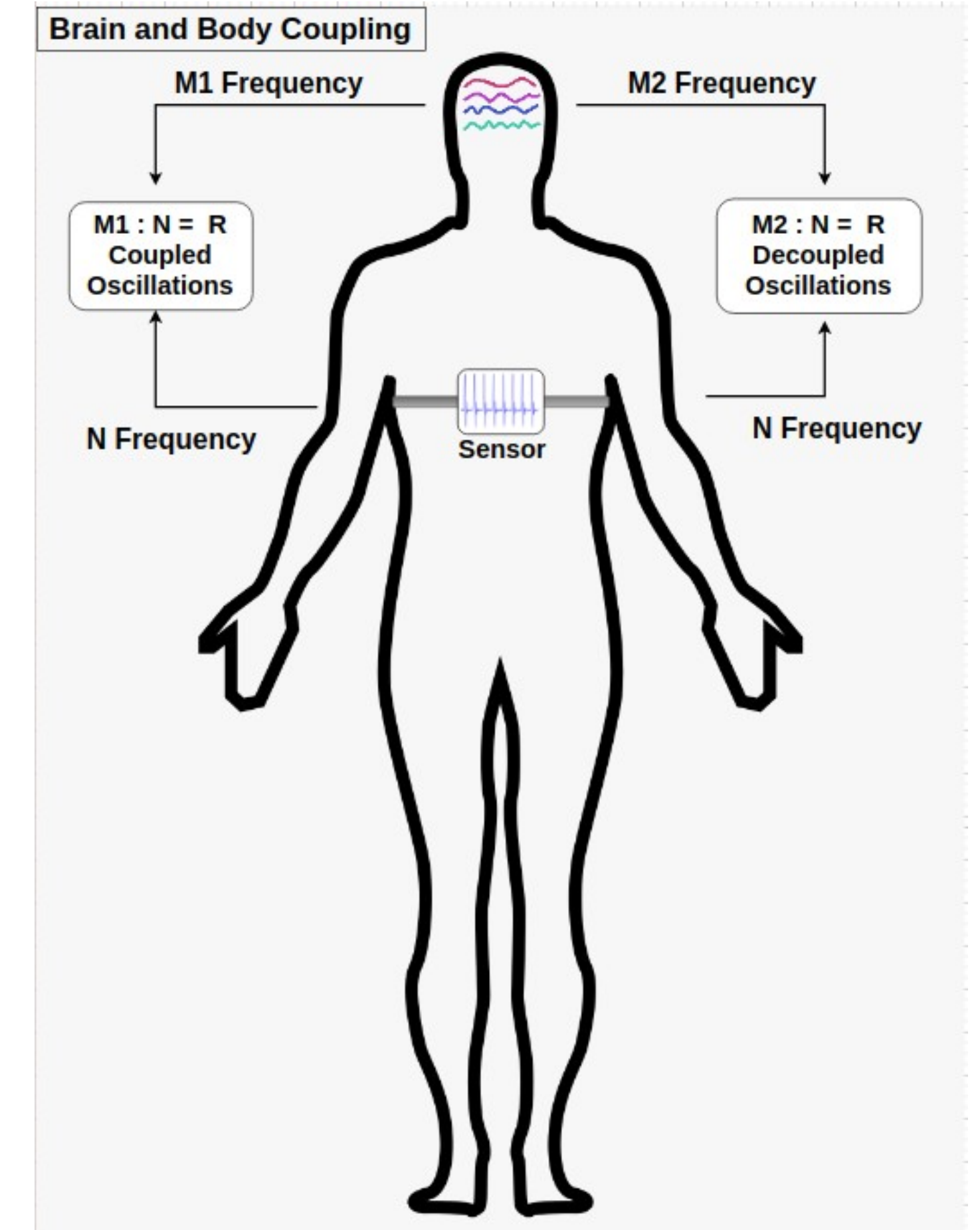


Inter-Subject Correlation computes the similarity between two brain responses listening to the same stimulus.



Brain2Brain synchronization between two neural responses.

Internal Entrainment



Recent work (Klimesch) has shown entrainment effects between body and brain oscillations.

We aim to create a framework for the measurement and analysis used to decode the brain oscillations in naturalistic scenarios. Entrainment and resonance are theoretically informed mechanisms describing how subjects are likely to respond to naturalistic stimuli that is oscillatory in nature. A framework of resonance/entrainment can therefore inform how the brain will respond to stimuli in naturalistic scenarios. We maintain a github repository <https://github.com/Pandey-Pankaj/Resonance-Toolbox> to cover the following aspects:

- Resources for external and internal entrainment
- Publicly available brain imaging datasets
- Codes for implementing and computing the relationship