EXPERIMENT 3: ***Prestimulus Alpha Oscillations Predict Between Subjects Visual Perception Performance, Hanslmayr et al., 2007***

**Introduction**

* In this experiment researchers analysed the role of alpha oscillations in visual perception performance.

**Objective**

* Study the mechanisms of how we perceive the world around us.

**Protocol**

* Stimulus: peri-threshold visual stimulus, namely a laser beam which was flashed always in the same location (centrally)
* Participants had to be capable to detect different letters (different stimuli): this was not a detection task (Experiment 2) but a ***discrimination task****.*
* Types of stimuli:
  + After a fixation***cross*** appeared for 1500-1700 ms, a ***target stimulus*** was shown very shortly (57 ms).
  + Thereafter, a mask which consisted of an ***overlay of all four target stimuli (p,q,b,d)*** appeared. The subjects were instructed to respond as fast as possible to the four target stimuli by pressing one of four buttons.
* Stimulus parameters (target stimulus) identical but counterbalanced across all trials for each participant.

**Method**

* the experiment was tested over *thirty subjects*, fifteen *perceivers* (***P+***) and fifteen *non-perceivers* (***P-***), that were undergone a *peri-threshold visual stimulus* during *EEG* recording
* the visual stimulus was presented very shortly (*some milliseconds*) after the appearance of a fixation cross in the led screen and, eventually, masked with other similar stimuli for some more time
* in particular, the stimulus was a randomly chosen letter in , namely the same symbol subjected to a reflection over the axis, and the mask was made up of the superimposition of all the four letters
* *perceivers* were those subjects able to recognize the input stimulus in *50%* of the cases, while *non-perceivers* never managed to guess it
* The ***EEG is recorded prior to the stimulus presentation*** because the objective is performing a ***pre-stimulus analysis*** to ***understand the relationship between pre-stimulus EEG recorded activity and stimulus discrimination.***



* oscillatory activity in theta, alpha, beta, and gamma frequency bands was recorded and calculated by means of *Time-Frequency Analysis*
* the scalp map indicates that ***alpha power was strongest at the parieto-occipital electrode leads.***
* the scatterplot between alpha power and perception performance shows that the relative amount of alpha power predicts how good participants are performing; the strict line indicates an ***inverse relationship.***
* the plot (Power Spectrum – FFT of the resting condition recorded prior the start of the experiment) shown that the only noticeable difference between ***P+*** and ***P-*** can be found in the power of *alpha bands* (9-11 Hz is the band of alpha 8-14 Hz) in a time window of *500ms* prior to the presentation of the stimulus. ***Perceivers (P+) showed significantly lower alpha power amplitudes than Non-Perceivers.***

**Results**

* the results of this study show that prestimulus oscillations can be used to predict perception performance between subjects and ***synchrony in the alpha frequency band, as measured by power, inhibited visual perception***
* Participants with ***higher alpha power*** are those ***less able to differentiate the target from the other letters***
* The higher the level of alpha, the more participants had problems in differentiating the target from the other letters.