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Alpha wave blocks your mind for distraction, but not continuously

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Alpha waves were long ignored, but gained interest of brain researchers recently. Electrical activity of groups of brain cells results in brain waves with different amplitudes. The so called alpha wave, a slow brain wave with a cycle of 100 milliseconds seems to play a key role in suppressing irrelevant brain activity. The current hypothesis is that this alpha wave is associated with pulses of inhibition (every 100 ms) in the brain.

Mathilde Bonnefond and Ole Jensen (Radboud University Nijmegen, The Netherlands) discovered that when distracting information can be anticipated in time there is an increase of the power of this alpha wave just before the distracter. Furthermore, the brain is able to precisely control the alpha wave so that the pulse of inhibition is maximal when the distracter appears. Indeed, between pulses of inhibition, there is still a window where the brain is excitable. 'It is like briefly opening a door to look what's happening outside. This enables us to detect an unexpected but important or dangerous event. But to avoid to be distracted by completely irrelevant information, it is better if the inhibition is active when a distracter is presented. It could be seen as a mechanism slamming the door of the brain on intruders'. The results are published by the scientific journal Current Biology at October 4.

The researchers designed an experiment in which timing of suppressing information was crucial for performance. The subjects were trained to do a memory task in a strict rhythm. Those subjects that were able to synchronize their alpha activity with the rhythm in which irrelevant distracters were presented had the highest score on the task. This is an

unconscious process by the way. The researchers presume that the ability to adjust alpha activity to the expected distracting information might play a role when we actively sample the environment.

Experimental set up

Eighteen volunteers were tested with a non-invasive brain-wave recording technique, magnetoencephalography (MEG). The volunteers had to do a working memory task (i.e. maintaining some information in their memory over a period of a few seconds) during which the waves generated by their brain were recorded. In each trial, they had to remember four letters presented on a screen every one second. After that, a distracter was briefly presented. The distracter was either another letter (strong distracter) or a symbol (weak distracter). Participants were asked to ignore the distracter (control experiments were ran to make sure they followed the instructions). One second after the distracter, another letter was briefly presented and the participants had to determine whether this letter was similar to one of the four letters they had to remember earlier

The experiment consisted of blocks of trials with only one type of distracter (strong or weak) presented after the letters to remember in each trial. Very importantly, the time before the distracter was always the same so that the subjects could anticipate the timing of presentation of the distracter. The alpha waves were stronger before the strong distracters than before the weak distracters, confirming that these waves close our brain for distracting information.

More information: Bonnefond et al.: 'Alpha oscillations serve to protect working memory maintenance against anticipated distracters', *Current Biology*, print issue October 23, 2012, online October 4