

Brain Activity during remote information access

Results:

Illusory own-body perception (IOBPs) such as out of body experiences (OBEs) and distortion of body parts have attracted most interest when reported by patients suffering near-death experiences, but they have also been reported to occur spontaneously in patients with epilepsy, during dreams and have been induced by electrical stimulation of the right temporoparietal junction (TPJ). However, the neurophysiological mechanisms involved in IOBPs remain elusive. The aim of this study was to investigate under which conditions transcranial brain stimulation (TBS) can induce IOBPs.

Most remarkably, we found that only inhibition of the TPJ induced IOBPs. Neither high-frequency TBS of the TPJ nor low-frequency TBS of a control site induced such effects. Thus, our effects were area and frequency specific. Although none of the subjects reported OBEs, low-frequency TBS of the TPJ induced illusory own-body perceptions such as twitching sensations and illusory movements of body parts. Spectral EEG analyses revealed that IOBPs could only be induced, if the deactivation of the TPJ was associated with the deactivation of the frontopolar cortex. Our data imply that the impairment of a temporoparietal *and* a frontal network is necessary for IOBPs. In a further study we investigated the effects of TBS during REM sleep on own-body perception in dream reports. Compared with sham stimulation, a significant decrease in the amount of movements in the dream report was found only after inhibitory TBS.

These studies reveal novel approaches for probing the neurobiology of IOBPs in the awake and the sleeping mind and might provide new insights in understanding the pathophysiology of neuropsychiatric disorders associated with abnormal own-body perceptions.

Published Work:

1. Peer reviewed journal articles

Karim AA (2010). Transcranial cortex stimulation as a novel approach for probing the neurobiology of dreams: Clinical and neuroethical implications. *International Journal of dream research*. 3(1): 17-20.

Noreika, V., Windt, J., Lenggenhager, B. & Karim, A. A. (2010). New Perspectives for the study of lucid dreaming: From brain stimulation to philosophical theories of self-consciousness. *International Journal of Dream Research*. 3(1), 27-36.

Krippel M & Karim AA*, (2011). Theory of Mind and its neuronal correlates in forensically relevant disorders. *Nervenarzt*. 82: 843-852.

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Klein E, Mann A, Huber S, Bloechle J, Willmes K, Karim AA, Nuerk HC & Moeller K. (2013). Bilateral bi-cephalic tDCS with two active electrodes of the same polarity modulates bilateral cognitive processes differentially. Plos One. 8(8): e71607. doi: 10.1371/journal.pone.0071607

Karim AA, Daltrozzi J, Thielscher A, Kotchoubey B. (under rev.) Debunking the role of the temporoparietal junction in out of body experience. Cerebral Cortex.

2. Books and Book chapters

Karim AA, Birbaumer N. (2013). Neuroprothesen. In: Claßen & Schnitzler, editor. Interventionelle Neurophysiologie. Stuttgart: Thieme Verlag. 291-298.

Areas of interest:

Neuropsychiatry and Psychotherapy, Neuroplasticity, Brain stimulation

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