



Transcranial Direct Current Stimulation and objective and subjective indexes of exercise performance



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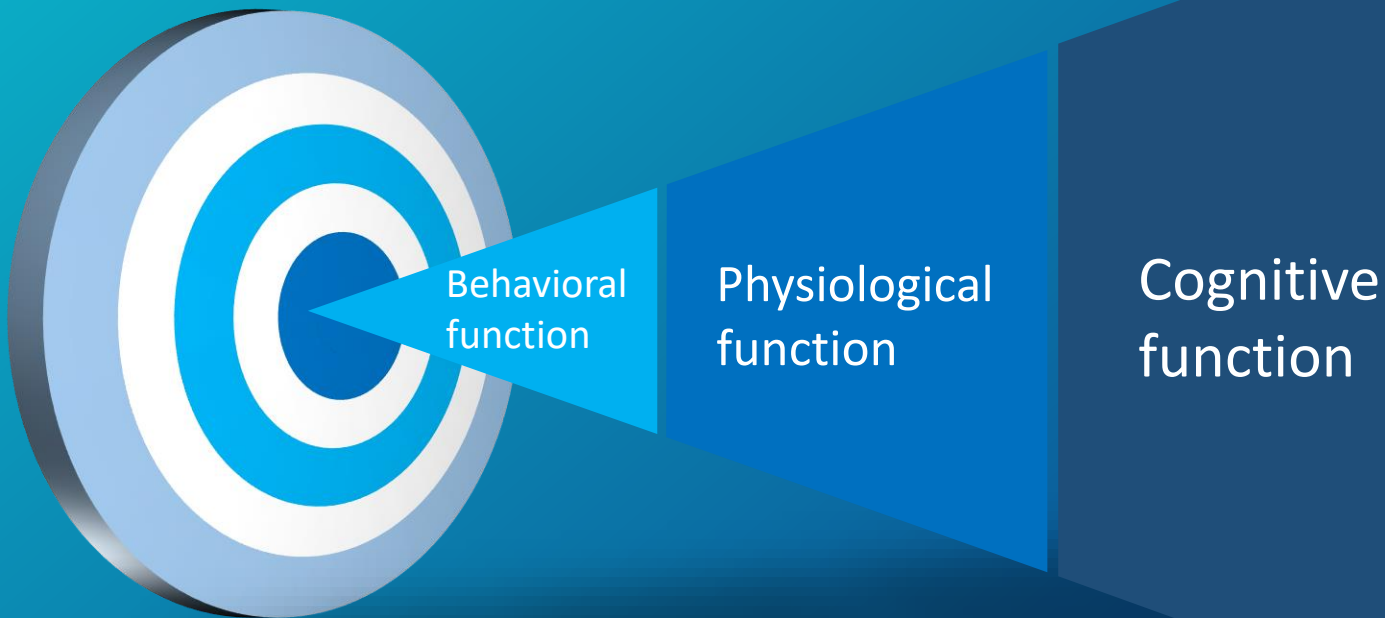


The first online Sport Neuroscience Seminar

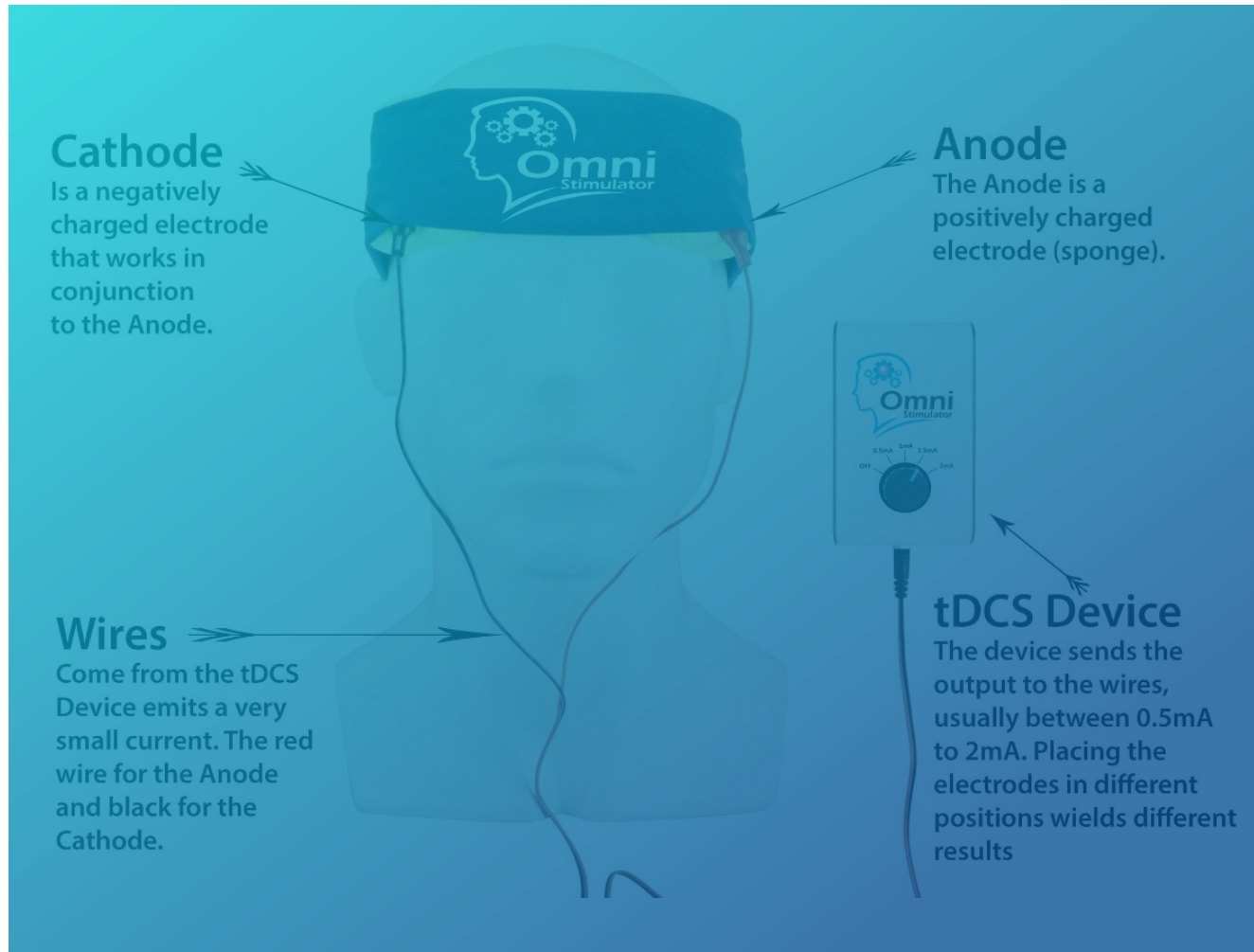
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The brain is the body's chief commander

How the brain can limit or improve the body's function and regulate it in general?



Transcranial Direct Current Stimulation

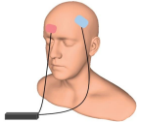


tDCS is a **non-invasive** brain stimulation technique that has been widely used in Neuroscience, as it has been deemed an effective and safe method to induce cortical changes by depolarizing (**anodal**) or hyperpolarizing (**cathodal**) neurons' resting membrane potential.

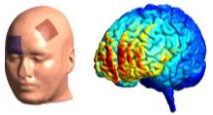
Nonetheless, there is still restrictions.

Be Careful

tDCS can be used as a neuromodulatory ergogenic resource for healthy individuals to change physical performance.



The effects of tDCS vary from person to person



The safety of tDCS for repeated and long-term use in healthy individuals has not yet been established

Procedure



tDCS are usually used for 20 minutes before intensive training.



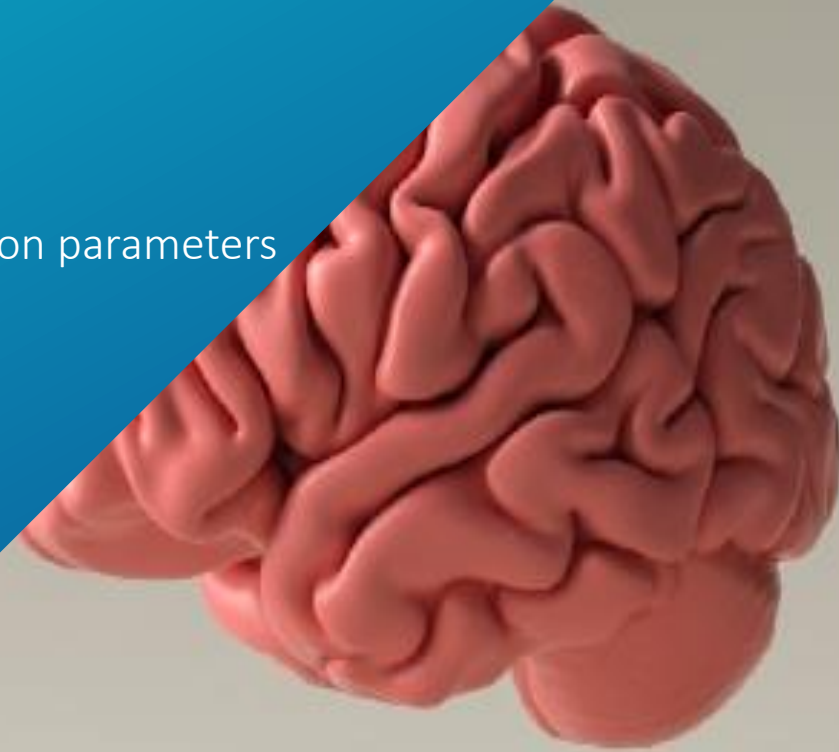
The effects of tDCS could last up to 90 min after only 10e20 min of stimulation.

Different electrode assemblies

Different stimulation parameters

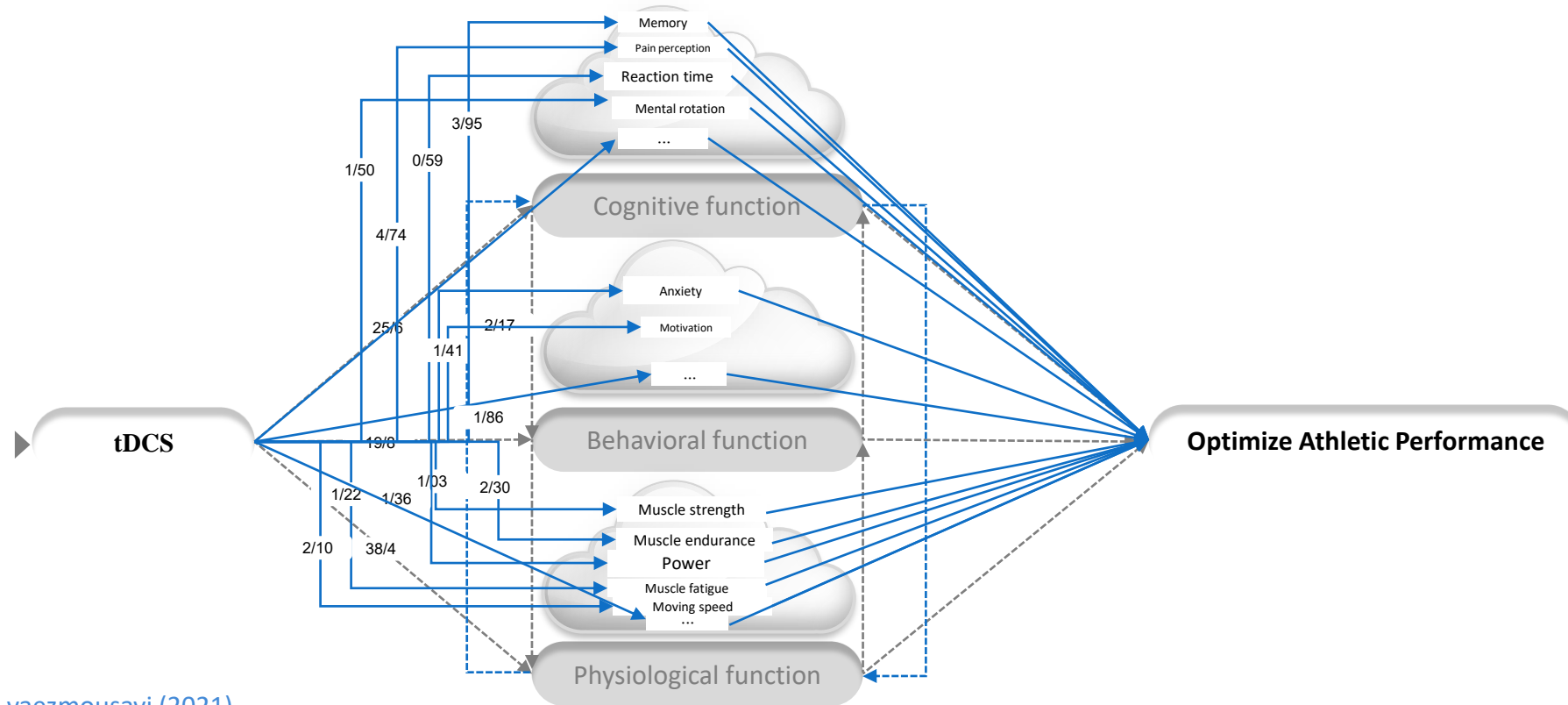
Electrode size and position

Different brain areas



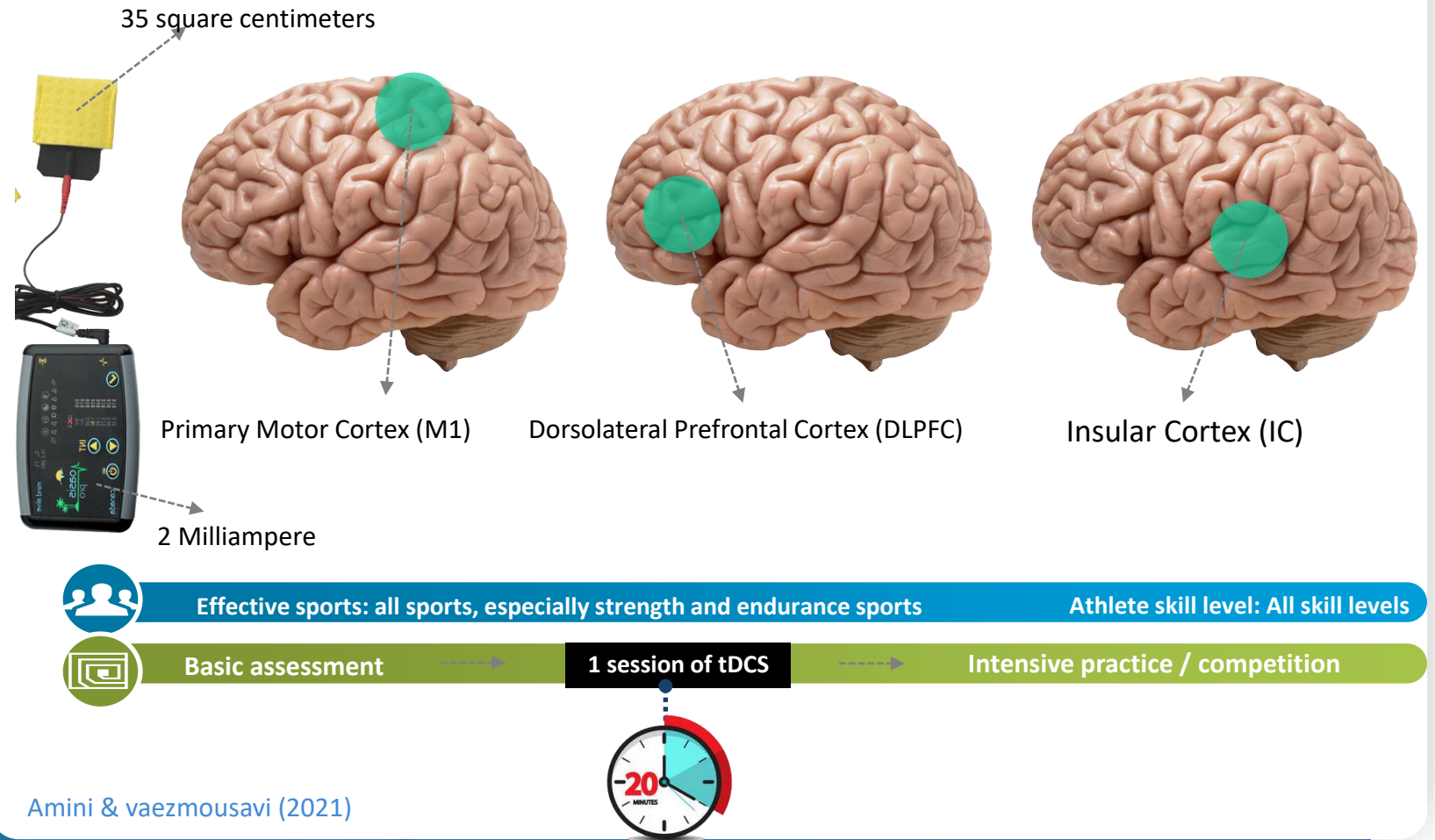
Effectiveness

The effect of transcranial electrical stimulation on performance optimization of athletes



Amini & vaezmousavi (2021)

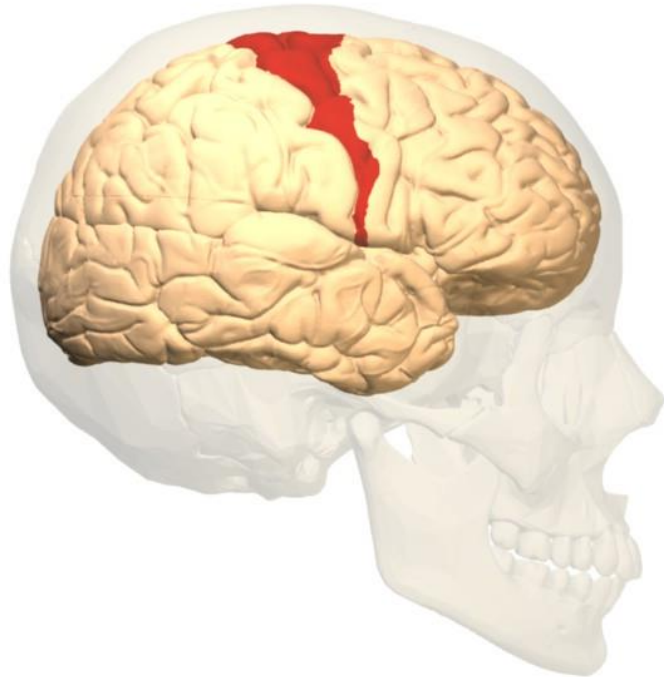
tDCS is used in a specific area of the brain to improve function



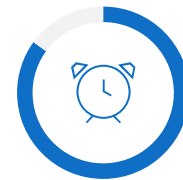
Amini & vaezmousavi (2021)

Primary Motor Cortex (M1)

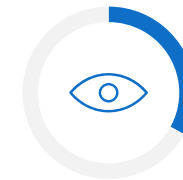
The primary motor cortex, or M1, is located on the precentral gyrus and on the anterior paracentral lobule on the medial surface of the brain. Of the three motor cortex areas, stimulation of the primary motor cortex requires the least amount of electrical current to elicit a movement.



Each neuron in the motor cortex contributes to the force in a muscle. As the neuron becomes active, it sends a signal to the spinal cord, the signal is relayed to a motoneuron, the motoneuron sends a signal to a muscle, and the muscle contracts. The more activity in the motor cortex neuron, the more muscle force.



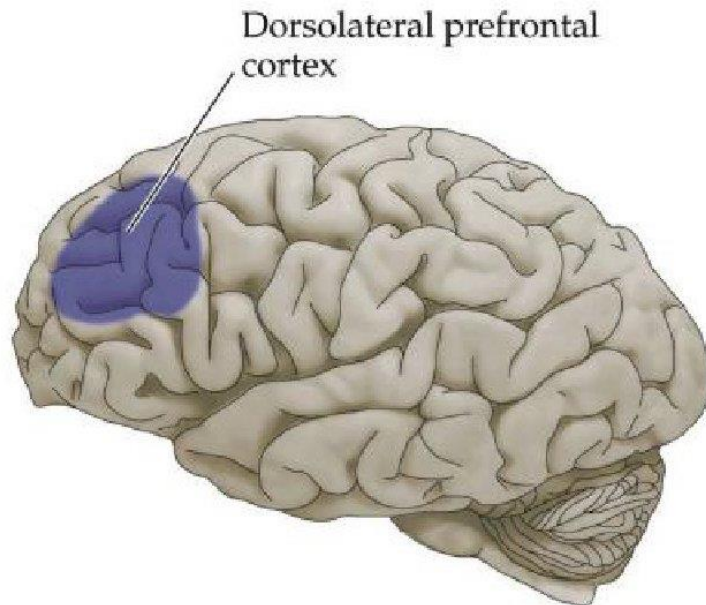
**Delay muscle
fatigue**



**Adjust pain
perception**

Dorsolateral Prefrontal Cortex (DLPFC)

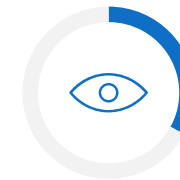
The dorsolateral prefrontal cortex (DLPFC or DL-PFC) is an area in the prefrontal cortex of the brain of humans. It is one of the most recently derived parts of the human brain.



The dorsolateral prefrontal cortex has been found to be involved in superordinate control functions for various cognitive tasks such as decision making, novelty detection, working memory, conflict management, mood regulation, theory of mind processing, and timing.



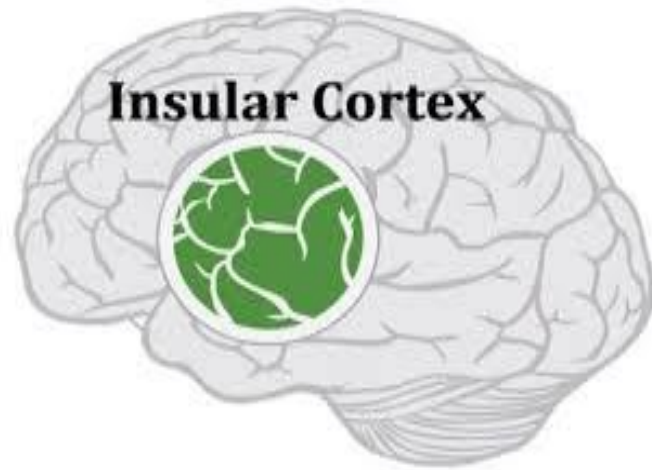
Delay mental fatigue



Control perception effort

Insular Cortex (IC)

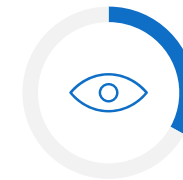
The insular cortex of the adult brain is buried in the lateral fissure and covered by the frontal and parietal opercula as well as the temporal lobe.



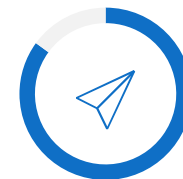
The insular cortex links sensory experience and emotional valence. In addition to sensory signals from within the body, the insula receives sensory information from the environment.



Adjust
homeostasis



Improved motor
control



Promoting self-
awareness



The Last Word

Transcranial direct-current stimulation improves the performance of athletes.

but

Extensive research is needed to implement tDCS. And its use in the sports community should be done with caution.

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Q&A



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