

## **Unleashing the hidden powers of the mind through manipulating belief in cognitive enhancement devices**

### **ABSTRACT:**

#### **Background**

Despite the availability of different cognitive enhancement techniques (e.g., brain stimulation; microdosing), the efficacy of these techniques has been contested and it is unclear to what extent effects can be attributed to placebo- and expectancy-effects.

#### **Aims**

This project investigated whether people can be induced to experience cognitive enhancement by using different placebo-induction procedures.

#### **Method**

We presented participants with a sham brain stimulation device (Study 1 & 2A and 2B) or with a placebo cognitive enhancement pill (Study 3), allegedly capable to improve their performance. We used verbal suggestion to induce expectations about the effects (all studies), a performance conditioning procedure (Study 2A), a false feedback conditioning procedure (Study 2B) and a subjective experience conditioning procedure (Study 3).

#### **Results**

In all studies we found that people's subjective performance was in line with the induced expectations. However, we did not observe an effect on objective performance (e.g., on EEG measures in association with error-detection or on creativity) in any of the studies. Highly suggestible participants overall experienced the strongest improvement in subjective performance.

#### **Conclusions**

Expectations about cognitive improvement can contribute to placebo-effects in relation to the use of cognitive enhancement devices. Future studies on cognitive enhancement techniques should aim to measure participants' expectations, could use more ecologically valid tasks and measures and should include individual difference measures related to suggestibility and belief in neuromyths.

#### **Keywords**

Neuroenchantment, Placebo-effect, Cognitive Enhancement, Brain-Stimulation

#### **Published Work:**

van Elk, M., Groenendijk, E., & Hoogeveen, S. (2020). Placebo Brain Stimulation Affects Subjective but Not Neurocognitive Measures of Error Processing. *Journal of Cognitive Enhancement*, 4, 389-400. <https://doi.org/10.1007/s41465-020-00172-6>

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van Elk, M. (2019). Socio-cognitive biases are associated to belief in neuromyths and cognitive enhancement: A pre-registered study. *Personality and Individual Differences*, 147, 28-32. <https://doi.org/10.1016/j.paid.2019.04.014>

Maij, D. L., & van Elk, M. (2018). Getting absorbed in experimentally induced extraordinary experiences: Effects of placebo brain stimulation on agency detection. *Consciousness and Cognition*, 66, 1-16. <https://doi.org/10.1016/j.concog.2018.09.010>

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