

# Non-Invasive Laser Light Therapy Could Improve Short-Term Memory by Up to 25 Percent

By University of Birmingham December 8, 2022



According to new research, laser light therapy is effective in improving short-term (working) memory.

**In a study published on December 2 in the journal *Science Advances*, laser light therapy has been shown to be effective in improving short-term memory.**

Laser light therapy, which is non-invasive, could improve short-term, or working memory in people by up to 25 percent. This is according to new research demonstrated by scientists at the [University of Birmingham](#) in the UK and Beijing Normal University in China.

Called transcranial photobiomodulation (tPBM), the treatment is applied to an area of the brain known as the right prefrontal cortex. This area is widely recognized as important for working memory. In their experiment, the research team demonstrated how working memory improved among research participants after just several minutes of treatment. They were also able to track the changes in brain activity using electroencephalogram (EEG) monitoring during treatment and testing.

Previous research studies have shown that laser light treatment will improve working memory in mice. Additionally, human studies have shown tPBM treatment can improve accuracy, speed up reaction time, and improve high-order functions such as attention and emotion.

However, this is the first study to confirm a link between tPBM and working memory in humans.

Dongwei Li, a visiting PhD student in the University of Birmingham's Centre for Human Brain Health, is co-author on the paper. He said: "People with conditions like ADHD

(attention deficit hyperactivity disorder) or other attention-related conditions could benefit from this type of treatment, which is safe, simple and non-invasive, with no side-effects."

In the study, scientists at Beijing Normal University carried out experiments with 90 male and female participants aged between 18 and 25. Participants were treated with laser light to the right prefrontal cortex at wavelengths of 1064 nm, while others were treated at a shorter wavelength, or treatment was delivered to the left prefrontal cortex. To rule out the placebo effect, each participant was also treated with a sham, or inactive, tPBM.

After tPBM treatment over 12 minutes, the participants were asked to remember the orientations or color of a set of items displayed on a screen. The participants treated with 1064 nm laser light to the right prefrontal cortex showed clear improvements in memory over those who had received the other treatments. While participants receiving other treatment variations were able to recall between 3 and 4 of the test objects, those with the targeted treatment were able to remember between 4 and 5 objects.

Data, including from electroencephalogram (EEG) monitoring during the experiment was analyzed at the University of Birmingham and showed changes in brain activity that also predicted the improvements in memory performance.

The researchers do not yet know precisely why the treatment results in positive effects on working memory, nor how long the effects will last. Further research is planned to investigate these aspects.

Professor Ole Jensen, also at the Centre for Human Brain Health, said: "We need further research to understand exactly why the tPBM is having this positive effect, but it's possible that the light is stimulating the astrocytes – the powerplants – in the nerve cells within the prefrontal cortex, and this has a positive effect on the cells' efficiency. We will also be investigating how long the effects might last. Clearly, if these experiments are to lead to a clinical intervention, we will need to see long-lasting benefits."

Reference: "Transcranial photobiomodulation enhances visual working memory capacity in humans" by Chenguang Zhao, Dongwei Li, Yuanjun Kong, Hongyu Liu, Yiqing Hu, Haijing Niu, Ole Jensen, Xiaoli Li, Hanli Liu and Yan Song, 2 December 2022, *Science Advances*.

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