

THERAPY: ADVANCED RED LIGHT BED THERAPY (Photobiomodulation)

CONDITION: Cognitive Decline - Age-related and vascular disease-related

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Beneficial neurocognitive effects of transcranial laser in older adults

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ABSTRACT

Transcranial infrared laser stimulation (TILS) at 1064 nm, 250 mW/cm² has been proven safe and effective for increasing neurocognitive functions in young adults in controlled studies using photobiomodulation of the right prefrontal cortex. The objective of this pilot study was to determine whether there is any effect from TILS on neurocognitive function in older adults with subjective memory complaint at risk for cognitive decline (e.g., increased carotid artery intima-media thickness or mild traumatic brain injury).

We investigated the cognitive effects of TILS in older adults (ages 49-90, n = 12) using prefrontal cortex measures of attention (psychomotor vigilance task (PVT)) and memory (delayed match to sample (DMS)), carotid artery intima-media thickness (measured by ultrasound), and evaluated the potential neural mechanisms mediating the cognitive effects of TILS using exploratory brain studies of electroencephalography (EEG, n = 6) and functional magnetic resonance imaging (fMRI, n = 6). Cognitive performance, age, and carotid artery intima-media thickness were highly correlated, but all participants improved in all cognitive measures after TILS treatments. Baseline vs. chronic (five weekly sessions, 8 min each) comparisons of mean cognitive scores all showed improvements, significant for PVT reaction time ($p < 0.001$), PVT lapses ($p < 0.001$), and DMS correct responses ($p < 0.05$).

The neural studies also showed for the first time that TILS increases resting-state EEG alpha, beta, and gamma power and promotes more efficient prefrontal blood-oxygen-level-dependent (BOLD)-fMRI response. Importantly, no adverse effects were found.

These preliminary findings support the use of TILS for larger randomized clinical trials with this non-invasive approach to augment neurocognitive function in older people to combat aging-related and vascular disease-related cognitive decline.

Keywords: Attention; Brain photobiomodulation; EEG; Infrared laser; Memory; fMRI.

Conflict of interest statement: the authors declare that they have no conflict of interest.