

Delayed bipolar and ganglion cells neuroretinal processing in regular cannabis users: The retina as a relevant site to investigate brain synaptic transmission dysfunctions

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<https://doi.org/10.1016/j.jpsychires.2018.04.021>

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Abstract

Cannabis use is widespread worldwide, but the impact of smoking cannabis regularly on brain **synaptic transmission** has only been partially elucidated. The **retina** is considered as an easy means of determining dysfunction in brain synaptic transmission. The **endocannabinoid system** is involved in regulating **retinal** synaptic transmission, which might also be affected by tobacco. Previous preliminary results have shown impairments in retinal **ganglion** cell response in cannabis users. Here, we test the extent to which earlier retinal levels—bipolar cells and photoreceptors—are affected in cannabis users, i.e. by the association of tobacco and cannabis.

We recorded pattern (PERG) and flash (fERG) **ERG** in 53 regular cannabis users and 29 healthy controls. Amplitude and peak time of P50 and N95 (PERG) and of a- and b-waves (fERG) were evaluated. Cannabis users showed a significant increase in PERG N95 peak time and in fERG light-adapted 3.0 b-wave peak time, compared with controls ($p = 0.0001$ and $p = 0.002$, respectively; Mann-Whitney U test). No significant difference was found between the groups in terms of wave amplitude ($p = 0.525$ and $p = 0.767$ for the N95 and light-adapted 3.0 b-wave amplitude respectively; Mann-Whitney U test). The results demonstrated delayed ganglion and bipolar cell responses in cannabis users. These results reflect a delay in the transmission of visual information from the retina to the brain. This retinal dysfunction may be explained by an effect of cannabis use on retinal synaptic transmission. Main limitations of these results concern tobacco and alcohol use that differed between groups. The consequences of these anomalies on visual perception along with the molecular mechanisms underlying this retinal dysfunction should be explored in future human and animal studies.

Keywords

Cannabis, ; Endocannabinoid system, ; Retina, ; Retinal information processing, ; Electroretinogram, ; Synaptic transmission, ;