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Association between increased retinal background noise and co-occurrent regular cannabis and alcohol use,

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Abstract
Background
Cannabis consumption is widespread across the world, and the co-occurrence of cannabis use and alcohol consumption is common. The study of background noise - resting-state neural activity, in the absence of stimulation - is an approach that could enable the neurotoxicity of these substances to be explored. Preliminary results have shown that delta-9-tetrahydrocannabinol (Δ9-THC) causes an increase in neural noise in the brain. Neurons in the brain and the retina share a neurotransmission system and have similar anatomical and functional properties. Retinal function, evaluated using an electroretinogram (ERG), may therefore reflect central neurochemistry. This study analyses retinal background noise in a population of regular co-occurrent cannabis and alcohol consumers.
Methods
We recorded the flash ERGs of 26 healthy controls and 45 regular cannabis consumers, separated into two groups based on their alcohol consumption: less than or equal to 4 glasses per week (CU ≤ 4) or strictly >4 glasses per week (CU >4). In order to extract the background noise, the Fourier transform of the pseudo-periodic and sinusoidal signals of the 3.0 flicker-response sequence was calculated. This sequence represents the vertical transmission of the signal from cones to bipolar cells. The magnitude of the background noise is defined as the average of the magnitudes of the two neighbouring harmonics: harmonic −1 (low frequency noise) and harmonic +1 (high frequency noise).
Results
The magnitude of harmonic −1 was significantly increased between the groups CU > 4 (6.78 (±1.24)) and CU ≤ 4 (5.69 (±1.80)) among regular users of cannabis and alcohol. A significant increase in the average magnitude of the two harmonics was found between the groups CU > 4 (5.12 (±0.92)) and CU ≤ 4 (4.36 (±1.14)). No significant difference was observed with regard to the magnitude of the harmonic +1.
Conclusions
The increase in background noise may reflect the neurotoxicity of cannabis, potentiated by alcohol consumption, on retinal neurons dynamic. This neural disruption of the response generated by retinal stimulation may be attributable to altered neurotransmitter release.

Keywords
Retinal background noise
Cannabis
Alcohol
Retina
Electroretinogram