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An investigation of mismatch negativity in current and ex-cannabis users using a feature controlled method

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An investigation of mismatch negativity in current and ex- cannabis users using a feature controlled method

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Aims: The Mismatch Negativity (MMN) is a brain event-related potential marker of sensory memory and prediction error. Studies have found reduced MMN amplitude in long-term cannabis users, and in ex-cannabis users, relative to non-user controls. These groups have not been directly compared. A criticism of previous research is a lack of control for perceptual differences between the deviant and standard tone within the oddball sequence of a multifeature paradigm, which may enhance N1 and therefore overestimate MMN. The current study investigated the use of a novel, feature-controlled extraction method to further explore MMN in chronic users, ex-users and controls. Method: 39 chronic users, 16 ex-users and 44 non-user controls completed a multi-feature MMN paradigm with duration (100 ms), frequency (1200 Hz) and intensity (90 dB) deviants (deviants 6%; standards 82%, 50 ms, 1000 Hz, 80 dB), with runs preceded by trains of deviants presented as standards. MMN was extracted using (i) the traditional method (deviant – oddball standard) and (ii) a feature-controlled method (deviant – perceptually identical stimuli presented as standards prior to the oddball sequence). Results: A main effect of Method type indicated the traditional method produced larger MMN amplitude estimates for all groups and deviant conditions. A main effect of Group was identified for frequency MMN indicating reduced MMN in chronic users compared to controls. In ex-users, frequency MMN was reduced relative to controls using the traditional method, but only at trend level for the feature-controlled method. No differences between chronic and ex-users were identified for any deviant condition with either method. Conclusions: Reduced frequency MMN in chronic and 33-month abstinent users suggests chronic use may lead to early sensory information processing deficits that persist after cessation of use. These data demonstrate the utility of a feature-controlled method of examining MMN, and suggest the traditional method may overestimate MMN due to stimulus perceptual differences enhancing N1.

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