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ScienceDirect

Psychiatry Research 157 (2008) 279–282

PSYCHIATRY RESEARCH

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Brief report

Affect processing and positive syndrome schizotypy in cannabis users

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Received 24 January 2006; received in revised form 6 October 2006; accepted 6 February 2007

Abstract

While cannabis is associated with positive syndrome schizophrenia (SZ), it is unclear whether cannabinoids are also related to negative symptoms such as affective blunting. We examined whether cannabis use is associated with schizotypy and utilized event-related potentials (ERPs) to assess affect processing. Cannabis users demonstrated increased P300 amplitudes for unpleasant trait words, and demonstrated higher positive syndrome schizotypy which correlated with levels of cannabis use. The cannabis group also exhibited lower negative syndrome schizotypy. The lack of blunted responses during the affect ERP and decreased negative subscale schizotypy scores provide evidence that the endocannabinoid theory of schizophrenia may be primarily relevant in relation to positive syndrome SZ.

Keywords: Marijuana; Schizophrenia; Event-related potentials

1. Introduction

The acute behavioral effects of cannabis include perceptual distortions, paranoia, and occasional hallucinations, along with concomitant disruptions in short-term memory, attention, concept formation, and motor coordination (Iversen, 2003). The similarities between these effects and the positive syndrome of schizophrenia (SZ) have led to a cannabinoid model of psychosis (Emrich et al., 1997; Skosnik et al., 2001).

One of the most salient negative syndrome traits observed in SZ consists of affective blunting, in which patients exhibit an inability to respond appropriately to emotional stimuli. Related to these traits are direct experimental findings in which SZ patients show deficits in the recognition of affective stimuli (Hooker and Park, 2002; Paradiso et al., 2003). While previous studies have shown increased positive and decreased negative syndrome schizotypy in cannabis users (Skosnik et al., 2001; Nunn et al., 2001), direct assessments of affect recognition have not been carried out in cannabis users.

The current experiment assessed semantic affect recognition in current cannabis users versus drug-free

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0165-1781/$ - see front matter
doi:10.1016/j.psychres.2007.02.010

controls, and utilized event-related brain potentials (ERPs) to determine the status of affect processing. The affective task was adapted from Cacioppo et al. (1994) in which the late positive potential (P300) was used to assess information processing operations while performing a dichotomous affective categorization task (evaluating pleasant versus unpleasant trait words). The three factors of schizotypy, namely Positive (Cognitive–Perceptual), Negative (Interpersonal), and Disorganized, were measured psychometrically using the Schizotypal Personality Questionnaire (SPQ; Raine, 1991).

2. Methods

2.1. Subjects

The subjects consisted of current cannabis users ($n=12$) and healthy drug-free controls ($n=14$). The participants were screened via clinical interviews and questionnaires for a history of mental illness, head injury, and the use of other drugs of abuse. In addition, levels of schizotypy were determined via the SPQ (Raine, 1991). Drug use was determined using the time-line follow back approach, as has been described previously (Skosnik et al., 2006). Inclusion into the cannabis group included use of cannabis (smoked joints) at a rate of at least once per week. Subjects had a mean age of 22.6 years (S.D. = 4.1) and a mean of 14.1 years (S.D. = 1.7) of education. The mean weekly rate of cannabis use in the cannabis group (during the past month) was 9.2 smoked joints (S.D. = 6.8). There were no significant differences between the groups in age or years of education.

2.2. Apparatus and stimuli

Stimuli were projected onto a computer screen 0.75 m in front of the subjects while in a sound attenuated booth. The affective stimuli consisted of words or phrases with emotion-inducing content, as have been used previously (Cacioppo et al., 1994). The categories were as follows: 1) pleasant trait words (e.g. *Kind Father*, *Flowing River*, *Ice Cream*); 2) unpleasant trait words (e.g. *Rotting Corpse*, *Wife Beater*, *Baby Killer*). Non-affective stimuli (an “x” or “o”) were utilized in the visual oddball control task.

For the affective categorization task, an evaluatively positive context was established by presenting 20% unpleasant trait words (the oddballs). Oddballs in the non-affective condition also occurred with a probability of 20%. There were a total of 270 affective trials, and 90 visual oddball trials. The affective and visual conditions were run in two separate blocks, and the order was counterbalanced across subjects.

2.3. EEG recording

Electroencephalographic (EEG) activity was measured over the Pz, Cz, and Fz scalp locations based on the international 10–20 system and referenced to linked mastoids (Jasper, 1958). Vertical electrooculographic (VEOG) activity was measured by supra- and infra-orbital electrodes. All interelectrode impedances were kept under 10 kΩ and the EEG and VEOG signals were amplified by a Grass Model 12A5 amplifier with a bandpass of 0.1–30 Hz (6-dB roll-off). Ocular movement artifact correction was applied using Gratton’s algorithm (Gratton et al., 1983), and the artifact rejection criterion was ±150 μV.

2.4. Procedure

All cannabis subjects were asked to refrain from cannabis use for 24 h prior to the experiment. Subjects performed a dichotomous affective categorization task in which they indicated whether each slide was pleasant or unpleasant by pressing a keypad with the right index finger. Subjects were instructed to respond when the slide was removed from the screen (1000 ms after slide onset) in order to minimize motor artifacts. Each word was presented for 1000 ms, and the interstimulus interval (ISI) was 1900 ms. During the ISI the participants indicated whether the stimulus was affectively pleasant or unpleasant. During the visual oddball task, an “x” (20% probability) was embedded in a series of “o” stimuli, and the subjects similarly made judgments whether the stimulus was an “x” or “o”.

2.5. Data reduction and statistical analysis

EEG recordings were epoched and averaged separately for pleasant and unpleasant target stimuli and baseline corrected to the mean of the 128-ms prestimulus period. The ERP waveforms were then digitally low-pass filtered at 10 Hz. Neuroscan was used to select and record the amplitude and latency of the largest positive potential at Pz between 300 and 900 ms following stimulus onset. The amplitude and latency of the largest positive potential at Cz and Fz that was within +100 ms of the largest Pz were then recorded. After averaging within each condition, target (oddball) waveforms were subtracted from the non-target waveforms in order to obtain difference waveforms. Group means for the difference P300 amplitudes/latencies and SPQ scores