

Case report

# Cannabis improves symptoms of ADHD

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## Abstract

Attention-deficit/hyperactivity disorder (ADHD) is characterized by attention deficits and an altered activation level. The purpose of this case investigation was to highlight that people with ADHD can benefit in some cases from the consumption of THC. A 28-year old male, who showed improper behaviour and appeared to be very maladjusted and inattentive while sober, appeared to be completely inconspicuous while having a very high blood plasma level of delta-9-tetrahydrocannabinol (THC). Performance tests, which were conducted with the test batteries ART2020 and TAP provided sufficient and partly over-averaged results in driving related performance. Thus, it has to be considered, that in the case of ADHD, THC can have atypical effects and can even lead to an enhanced driving related performance.

**Keywords:** ADHD, cannabis, performance, driving

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## Introduction

Assessing the performance or impairment of cannabis users is generally problematic as there is no stringent proof of a linear dose-effect relationship between the concentration of delta-9-tetrahydrocannabinol (THC) in blood and THC-induced impairment. The cause of the absence of such a relationship has not been identified. In this context it is rarely considered that the missing correlation may be due in part to a conceivable positive effect of cannabis on the behaviour and performance of individuals. Recently, Adriani et al. [1] gave evidence that cannabinoid agonists reduce hyperactivity in a spontaneously hypertensive rat strain, which is regarded as a validated animal model for attention deficiency hyperactivity disorder (ADHD). There was also a significantly better treatment retention of cocaine dependent patients with comorbid ADHD among moderate users of cannabis compared to abstainers or heavy users [2].

ADHD was long considered a disorder limited to children and adolescents. It has now been proven that ADHD symptoms may persist into adulthood [3,4]. Individuals suffering from ADHD characteristically have an increased drive to move around and are unable to calm down. They are lacking in directed planning of their actions and the ability to assess the impact of their decisions. Their ability to organize day-to-day activi-

ties is reduced, they usually have a poor short-term memory, are forgetful and tend to work in a chaotic and inefficient way. Emotionally, they are prone to impulsive outburst, excessiveness and instability [5,6]. This present case study describes a male, 28 years of age, who was diagnosed with attention deficit hyperactivity disorder (ADHD), and whose response to THC suggests that such a positive effect may exist. Considering that the subject applied for the reinstatement of his driving licence gives particular significance to psycho-physical performance deficits caused by ADHD. Numerous studies have shown that various performance functions, such as divided attention, selective attention, long-term attention and vigilance are impaired [7].

## Case Description

The subject had a record of several violations of the German drug control law. He also had a record of numerous violations of traffic laws, including speeding, running of a red traffic light and driving under the influence of cannabis during which a high THC concentration in blood had been detected.

Seven years ago, the subject had been diagnosed with ADHD (ICD 10 F90.0) for the first time, and that diagnosis had been assessed repeatedly and independently since by several psychiatric units. There was some

evidence from his carrier that typical symptoms were already present in childhood, they were, however, not properly recorded. Comorbidities such as addiction, including cannabis, or personality disorders were absent. He had been treated over a period of about 12 months through a combination of methylphenidate (Ritalin®, 20-30 milligram/day) and behaviour therapy. Being not sufficiently efficacious, the medication was stopped. A subsequent certificate by a specialist for general medicine suggests that ADHD symptoms were much improved under cannabis and that dronabinol (THC) had been prescribed, even though ADHD is not indicated for this drug.

Prior to the first contact the subject had been advised not to consume any medicinal or recreational drug. During that first visit he showed grossly conspicuous behaviour. His attitude was pushy, demanding and lacking distance. He expressed impatience, for example by drumming his fingers on the table. He also constantly shifted position, folded arms behind his head or leaned over the table in front of him. He was not open to discussing the potential impairment of driving skills caused by cannabis consumption. As the conversation continued and he was informed of the preconditions for a positive assessment of his suitability to operate a vehicle, his behaviour became even more conspicuous and aggressive. Finally, he got up, grabbed the table, leaned forward and shouted that he needed a driving license and that he needed cannabis. Overall he showed behaviour typical of persons who suffer from ADHD. During this visit, an appropriate performance of the tests was impossible.

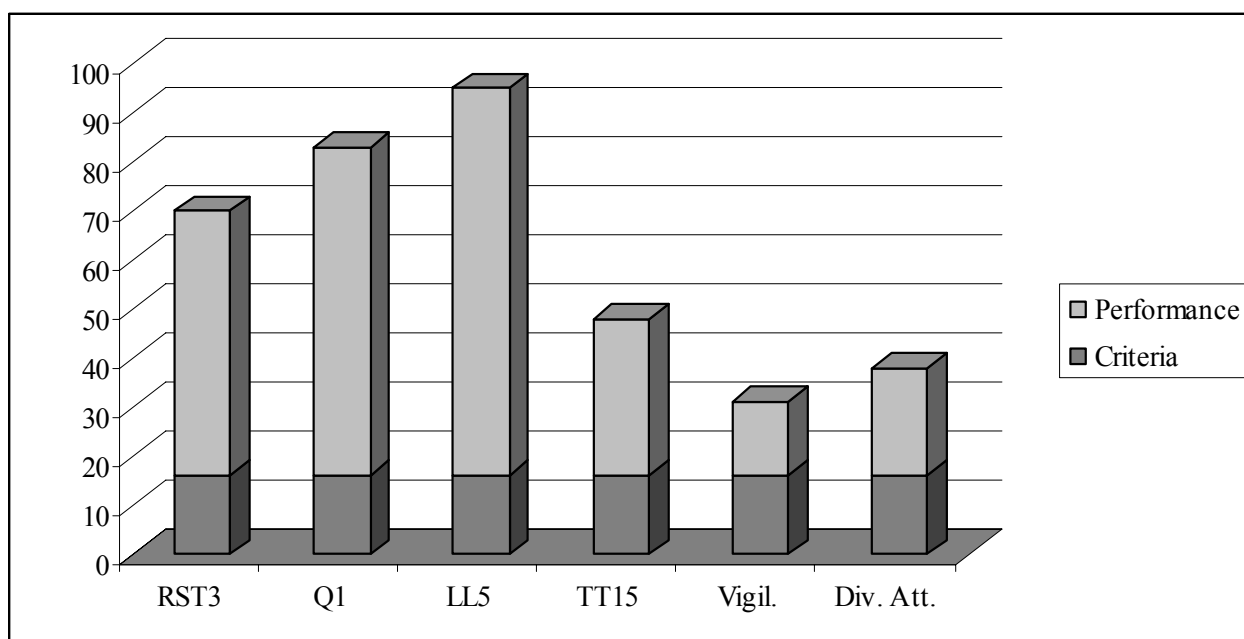
He was then offered to undergo, at a later time, a test of the impact of dronabinol on performance. During this appointment he appeared fundamentally changed and

was not disturbed at all. He stated that he had stopped smoking cannabis, was taking dronabinol on a regular basis and that he had consumed it just two hours ago. He appeared calm, but not sedated, organized and restrained. Unlike during the first meeting he was able to accept and discuss arguments. When trying to make clear that THC was indispensable for his quality of life he became more engaged but without losing restraint. Rather, he was understanding of the position of the expert and indicated that the path to get back his driver license may be long but that he was willing to undertake it. His behaviour, motor function, mood and consciousness did not give any indications of a prior use of a psychoactive substance.

The tests of performance functions that are relevant to driving skills involved the four subtests of ART2020, a computer-controlled test system, which is commonly used to assess driving performance. These subtests evaluate complex reactions (RST3), sustained attention (Q1), directed attention (LL3) and visual surveying and perception (TT15). In addition the functions of “vigilance” and “divided attention” were tested with the attention test module (TAP).

The results of these tests (see Fig. 1) showed that the subject met, in all of the functions tested by ART2020, not only minimum criteria but that he achieved average or, in some areas, even above-average results. In the very demanding tests for “vigilance” and “divided attention” categories he also showed average performance. ADHD or acute effects of THC by themselves would usually impair performance particularly in these tests.

A blood sample was taken after completion of the tests. It showed a very high concentration of THC (71 ng/mL serum), of the psychoactive metabolite 11-hydroxy-



**Figure 1:** Subjects actual performance and minimum criteria.

THC (30 ng/mL serum) and of the main non-psychoactive metabolite 11-nor-delta-9-carboxy-THC (251 ng/mL serum). Such levels indicate recent as well as frequent consumption of THC-containing matters, and the analyte pattern also suggests smoking. Detection of cannabitol in hair (5.3 ng/mg) along with THC (3 ng/mg) gives evidence that the medication could not have been the only source of the THC.

Only much later did the subject, who had been arrested for a drug offence a few days after the second visit, report that he had not consumed pharmaceutical dronabinol products but instead smoked cannabis just before the tests, since it was much less costly.

### Conclusions

The present case report suggests that individuals suffering from ADHD, a dysfunction with a symptomatic change in activity levels, may - in some cases - benefit from cannabis treatment in that it appears to regulate activation to a level which may be considered optimum for performance. There was evidence, that the consumption of cannabis had a positive impact on performance, behaviour and mental state of the subject. The present observation corroborates previous data of Müller-Vahl et al. [8] suggesting that in patients suffering from Tourette syndrome, treatment with THC causes no cognitive defects. Gilles de la Tourette syndrome is a neurobehavioral disorder associated with motor and vocal tics as well as behavioural and cognitive problems. The authors also hypothesized that the effects of cannabinoids in patients may be different from those in healthy users suggesting an involvement of the central cannabinoid receptor systems in the pathology of the disorder. The same conclusion may be drawn from previous studies [1, 2] and the present case report, although more information on these atypical effects should be provided and the underlying mechanisms are still to be elucidated.

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