

CASE IN CONTEXT

Cannabis Improves Stuttering: Case Report and Interview with the Patient

Natalia Szejko,^{1,2,*i} Carolin Fremer,³ Franziska Baacke,⁴ Martin Ptok,⁴ and Kirsten R. Müller-Vahl^{3,ii}

Abstract

Introduction: Speech dysfluency, often referred to as stuttering, is a frequent speech disorder encountered in about 5% of children. Although in the majority of people affected, symptoms improve in adulthood, in some patients, stuttering persists and significantly impairs everyday functioning and quality of life. Treatment for stuttering includes speech therapy, cognitive behavioral therapy, and relaxation techniques. However, a substantial number of patients do not benefit sufficiently from these treatment strategies or are even treatment resistant.

Methods: We present the case of a 20-year-old male with treatment-resistant stuttering, who markedly improved after treatment with medicinal cannabis.

Results: Besides improved speech fluency as assessed by several phoniatric tests, we observed remission of (social) anxiety, improved mood, and reduced stress, resulting in an overall improvement of quality of life after cannabis therapy. The patient, in addition, reported improved attention, concentration, and sleep, increased self-confidence, and better social life. No side effects occurred. Over a time period of more than a year, treatment was equally effective. In an interview, the patient describes his personal view and the influence of cannabis-based treatment on his life.

Conclusions: Medicinal cannabis could be effective in treatment of refractory stuttering, but these preliminary data have to be confirmed in controlled studies.

Keywords: cannabis; stuttering; phoniatrics; anxiety; depression

Introduction

Stuttering is a speech dysfluency characterized by repetitions, prolongations, and blocks. In most cases, stress, excitement, and speaking in front of a group further deteriorate stuttering. Typically, symptoms vary from day to day.¹ Hence, stuttering may influence not only communication with other people but also patients' quality of life, interpersonal relationships, and job performance. Not surprisingly, patients suffering from stuttering often have a negative self-perception and develop social anxiety, and in some cases, even depression.² Moreover, secondary behaviors such as eye blinking, jaw jerking, and involuntary movements of extremities may occur,³ further contributing to functional impairment.

Childhood-onset stuttering is common and occurs in 5–10% of children. Although stuttering improves in most cases, in about 1% of patients, it persists into adulthood.^{2,4} Negative prognostic factors are older age at stuttering onset, higher frequencies of stuttering-like dysfluencies, lower speech sound accuracy, lower expressive and receptive language skills, male sex, and positive family history.⁵ The etiology of stuttering is multifactorial and involves mainly abnormal neurotransmission⁶ and genetic changes.^{7–9}

Speech therapy is the only treatment that has been shown to be effective in the treatment of stuttering.¹⁰ Although data are conflicting, alternatively, other treatments have been suggested such as use of electronic devices,¹¹ cognitive behavioral therapy, and

Departments of ¹Neurology and ²Bioethics, Medical University of Warsaw, Warsaw, Poland.

³Clinic of Psychiatry, Socialpsychiatry and Psychotherapy, Hannover Medical School, Hannover, Germany.

⁴Clinic of Phoniatrics and Pediatric Audiology, Hannover Medical School, Hannover, Germany.

ⁱORCID ID (<https://orcid.org/0000-0001-6160-9221>).

ⁱⁱORCID ID (<https://orcid.org/0000-0002-7181-7419>).

*Address correspondence to: Natalia Szejko, MD, PhD, ScD, Department of Neurology, Medical University of Warsaw, Banacha 1a, 02-091 Warsaw, Poland, E-mail: natalia.szejko@wum.edu.pl

other forms of therapeutic interventions, including mindfulness¹² and psychotherapy based on parent-child interaction.¹³ Currently, no pharmacological intervention is proven to be effective in the treatment of stuttering.¹⁴

We present the case of a 20-year-old male patient with persistent, treatment-resistant, childhood-onset stuttering, whose speech dysfluency significantly improved after use of cannabis. Along with the case description, we present the results of extensive psychological and phoniatric assessments before and after use of medicinal cannabis. Finally, in an interview, the patient describes his personal view and the influence of cannabis-based treatment on his life.

Case Description

The male patient presented in our clinic for the first time at the age of 20, specifically asking for initiation of cannabis-based treatment. He reported that stuttering had started in early childhood. Speech therapy was initiated already at the age of 5 years. From age of 7 years, he attended a special school for children suffering from stuttering. He further reported that stuttering waxes and wanes and is most pronounced at the beginning of a conversation and under stress. In addition, he described himself as a “nervous person,” also suffering from nail biting and teeth grinding, but no other co-existing conditions. He has no history of other relevant diseases, never used other illicit drugs than cannabis, and lives completely abstinent from alcohol for many years. Interestingly, his father also suffered from stuttering in childhood. After graduation from secondary school, he completed his training as an electrician and currently works in this profession fulltime in three shifts. Because of speech dysfluency, he was not only bullied at school but is also afraid of speaking in public. He described having problems with social contacts and when talking to new people. All this resulted in generally low social activities and only very few friendships. Furthermore, he developed sleeping problems and nightmares.

During childhood, he had been treated not only as an outpatient for many years but also in an inpatient setting without significant improvement. During the last years, he had received different medications not remembered by name to improve his “nervousness.” Once, a drug used for treatment of attention-deficit/hyperactivity disorder had been used without any beneficial effect. To improve his sleeping problems, lorazepam had been administered. At the time of first consultation in our clinic, he used zopiclone (1–2 tablets,

7.5 mg each/day) and zolpidem (1–2 tablets, 10 mg each/day) to improve his sleeping problems.

At the age of 18 years, by accident, he noticed that use of cannabis resulted not only in a significant improvement of his sleep but also of the stuttering. Therefore, he started to vaporize 0.5–1 g street cannabis per day. With respect to stuttering, he reported that after use of cannabis, he was able to speak “normal” with reduced speaking rate and improved fluency without muddling and slurring of syllables and letters. Finally, he felt less nervous and was able to concentrate better. All this resulted in a marked improvement of his quality of life. Beneficial effects of cannabis lasted for more than 1 year and were confirmed by friends and family members. No side effects were noticed.

His first consultation in our clinic was motivated by the fact that he lost his driving license the year before after having been tested positive for tetrahydrocannabinol (THC) at a traffic check. Because of the remarkable effect reported by the patient, we initiated legal treatment with medicinal cannabis. Since THC content of previously used street cannabis was unknown, initially, two different cannabis strains were prescribed with low (*Bediol*: 6.3% THC and 8% cannabidiol [CBD]) and high (*Bedrocan*: 22% THC and 1% CBD) content of THC with a starting dose of 50 mg/day administered through vaporizer. For continued treatment, he decided for a combination of both strains with a high amount of *Bedrocan* (0.3–0.7 g/day) and a low amount of *Bediol* (about 0.05 g/day). After up-titration, he reported that he is “more than satisfied” with the treatment resulting not only in significant improvements of speech fluency, nervousness, and sleep but also of attention and concentration without any side effects. The improvement would be so significant that his fiancée would be able to identify whether he had used cannabis solely on the basis of his speech fluency.

Psychological and Phoniatic Assessments

To identify comorbid psychiatric diseases, we performed a variety of psychological tests at baseline (before initiation of medicinal cannabis) and after 3 months of treatment with *Bedrocan* (Table 1).

Psychological tests

- (1) Beck Anxiety Inventory (BAI)¹⁵: a 21-question multiple-choice self-report inventory for measuring the severity of anxiety.
- (2) Liebowitz Social Anxiety Scale (LSAS)¹⁶: to assess social phobia and its influence on patient’s life.

Table 1. Psychological Tests Before (Baseline) and After 3 Months of Treatment with Medicinal Cannabis

Scale	Baseline		Treatment with cannabis	
	Score	Rating	Score	Rating
BAI	14	Mild anxiety	0	No anxiety
BDI	14	Mild depression	2	Minimal depression
LSAS	65	Marked social phobia	8	No social phobia
PSS	34	High perceived stress	13	Low perceived stress
QOLAS		20		4
VAS		60		100

BAI, Beck Anxiety Inventory (range 0–63 with higher scores indicating more anxiety); BDI, Beck Depression Inventory (range 0–63, with higher scores indicating more depression); LSAS, Liebowitz Social Anxiety Scale (range 0–144, cutoff 30); PSS, Perceived Stress Scale (range 0–40, cutoff 14); QOLAS, Quality of Life Assessment Schedule (range 0–50, with higher scores reflecting poorer quality of life); VAS, The Visual Analog Rating Scale of Health-Related Quality of Life (range 0–100, with higher scores reflecting better quality of life).

- (3) Beck Depression Inventory (BDI)¹⁷: a 21-item self-report rating inventory that measures characteristic symptoms and severity of depression.
- (4) Perceived Stress Scale (PSS)¹⁸: a 14-item instrument designed to measure the degree to which situations in one's life are appraised as stressful.
- (5) Quality of Life Assessment Schedule (QOLAS)¹⁹: a 15-item instrument that measures 5 conceptual domains of quality of life: material and physical well-being, relationships with other people, social, community, and civic activities, personal development, and fulfillment and recreation.
- (6) The Visual Analog Rating Scale of Health-Related Quality of Life (VAS)²⁰: ranging from 0 to 100 with 100 meaning perfect health.

To assess type and severity of stuttering, in addition, we used a wide range of measurements before and 1–3 h after treatment with vaporized medicinal cannabis (0.3 g *Bedrocan* plus 0.05 g *Bediol*). The patient was instructed to use cannabis in a manner that achieves the best possible treatment outcome during testing.

Phoniatric examinations

- (1) Objective measures, including percentage of stuttered syllables out of all spoken syllables (stuttering events and interjections) and measurement of time needed to complete speech and reading tasks.
- (2) External perceptive measures, including symptom description and quantitative assessments such as voice power, body language, eye contact, speech volume, speech rate, and length of utterance.

- (3) Stuttering Severity Instruments (SSI-4)²¹: a recording of frequency of stuttering events (percent of syllables stuttered) in spontaneous speech and reading. It also measures the mean duration of the three longest stuttering events and non-speech accompanying symptoms (e.g., head movements and movements of the extremities).
- (4) Functional Outcome Assessment Instrument (FOAI)²²: to assess therapy effects regarding feelings, attitudes, and behavior.
- (5) Perception of Stuttering Inventory (PSI)²³: to record the extent of avoidance of speech behavior and speech situations.
- (6) Speech Situations Checklist (SSC)²⁴: to record situation-dependent negative emotional reactions during speech and the extent of interruption of the fluency of speech.
- (7) Shortened Form of the Erickson S-Scale of Communication Attitude (S24)²⁵: for assessment of the attitude toward communication of adult stutterer.

Results

Based on psychological tests performed at baseline before initiation of cannabis therapy, the diagnoses of marked social phobia, mild general anxiety, mild depression, and high perceived stress were made. As a consequence, quality of life was significantly impaired as assessed by QOLAS and VAS (for details see Table 1). After a 3-month treatment with medicinal cannabis, both anxiety remitted, and depression, stress, and quality of life improved significantly (Table 1).

Phoniatric examinations confirmed the diagnosis of stuttering and demonstrated that voice power was partially creaky, body language introverted with many eye contact interruptions, and speech rate decently slowed down (Table 2). Length of utterance was characterized by elliptical style and reduced syntactic structures (Table 2) with overall moderate stuttering severity as

Table 2. Observations by a Phoniatrist Franziska Baacke [FB] with Respect to Secondary Symptoms Before and After Cannabis Administration (0.3 g *Bedrocan* and 0.05 g *Bediol*)

Parameter/symptom	Before cannabis	After cannabis
Voice power	Partially creaky	Powerful, clear
Body language	Introverted, introspective	Extrovert
Eye contact	Many eye contact interruptions	Eye contact is maintained
Speech volume	Appropriate	Appropriate
Speech rate	Decently slowed down	Regular
Length of utterance	Elliptical style, reduced syntactic structures	Extended

Table 3. Results of the Stuttering Severity Instruments Before and After Cannabis Administration (0.3 g *Bedrocan* and 0.05 g *Bediol*)

SSI domain	Before cannabis (points)	After cannabis (points)
Symptom frequency		
Spontaneous speech Reading	10	5
Duration of the three longest stuttering events	8 (= 2 sec)	4 (= 0.5 sec)
Accompanying motor behavior	8	2
Total (percentiles)	26 (41–60)	11 (12–23)
Severity	Moderate	Minor

SSI, Stuttering Severity Instruments.

measured by SSI (Table 3). After administration of 0.3 g of *Bedrocan* and 0.05 g of *Bediol*, stuttering improved not only when reading a text but also during spontaneous speech. In addition, fewer stuttering events and interjections occurred, and less time was needed for the reading task (Table 4). Compared to pretreatment, after treatment, eye contact with the examiner was better maintained and other secondary symptoms observed by the examiner improved (Table 2). According to SSI-4, primary symptoms such as stuttering frequency as well as secondary symptoms such as additional motor actions improved from “moderate” to “low” severity after use of cannabis (Table 3). As assessed by FOAI, before treatment, the patient was uncomfortable in speaking situations, felt ashamed, and tended to avoid conversations. After treatment, he reported to feel more satisfied in his speaking behavior, more comfortable when speaking,

Table 4. Stuttering Events and Interjections, As Well As Time Needed to Complete Each Speech and Reading Task Before and After Cannabis Administration (0.3 g *Bedrocan* and 0.05 g *Bediol*)

Task	Before cannabis	After cannabis
	No. (N) of stuttering events (%), No. (N) of injections (%)	
Read out words	N=0 (0%), N=0 (0%)	N=0 (0%), N=0 (0%)
Read out sentences	N=0 (0%), N=0 (0%)	N=1 (1.25%), N=0 (0%)
Reading text „Spaß an der Schleuse“	N=15 (3.54%), N=2 (0.47%) (reading time: 4:11 min)	N=7 (1.65%), N=0 (0%) (reading time: 3:32 min)
Re-narration of the reading text	N=2 (4.44%), N=5 (11.11%)	N=0 (0%), N=4 (7%)
Speaking in rows	N=2 (6.89%), N=0 (0%)	N=0 (0%), N=0 (0%)
Repeating words	N=0 (0%), N=0 (0%)	N=0 (0%), N=0 (0%)
Spontaneous language survey	N=22 (3.7%), N=28 (4.71%) (words per statement: 594/30 = 13.3)	N=8 (0.86%), N=16 (1.73%) (words per statement; 926/26 = 35.62)

and more open about his stuttering (Fig. 1), and being able to better cope with communicative demands in everyday life. According to PSI, the patient had increased avoidance behavior such as making excuses not to speak or using as few words as possible, which declined after treatment with cannabis (Fig. 2). Similarly, after use of cannabis, the patient noticed a reduced frequency of stuttering in all described situations (as assessed by SSC) (Fig. 3), felt that he was more talkative and less nervous when speaking, and had more confidence in his ability to speak (according to S24) (Fig. 4).

Conclusions

We report the case of a patient with treatment-resistant stuttering, who significantly benefitted from treatment with medicinal cannabis with self-experienced improvement of speech fluency, sleeping problems, and nervousness, resulting in improved quality of life. Use of a wide variety of psychological and phoniatric assessments confirmed self-reported improvements with reduced depression, anxiety, and stress, improved reading, spontaneous speech, eye contact, comfort in speaking situations, and communicativeness, as well as reduced stuttering events and frequency, and avoidance behavior after cannabis treatment.

Although for some time, there is a vivid discussion among patients about beneficial effects of cannabis on speech fluency, until today, no study has been published. Up to now, there is only one single case report available, describing two patients with Gilles de la Tourette syndrome, who suffered from a specific type of complex vocal tics called speech blocking tics and palilalia, respectively, resembling stuttering.²⁶ In these 16- and 19-year-old male patients, treatment with medicinal cannabis and dronabinol, respectively, resulted in a significant improvement of motor and vocal tics and psychiatric comorbidities, and speech blocking tics.

Beneficial effects after treatment with cannabis observed in this patient might be explained in different ways. First, it can be speculated that cannabis results in a modulation of the dopaminergic neurotransmission through a stimulation of the endocannabinoid system (ECS),^{27,28} since basal ganglia circuits and the dopaminergic system have been suggested to be involved in the pathophysiology of stuttering.^{1,6,29} Second, the ECS is the most important stress modulatory system in the brain, and therefore improvement in stuttering may be explained by reduced stress and excitement, which typically worsens stuttering.³⁰ In line with this hypothesis, we were able to

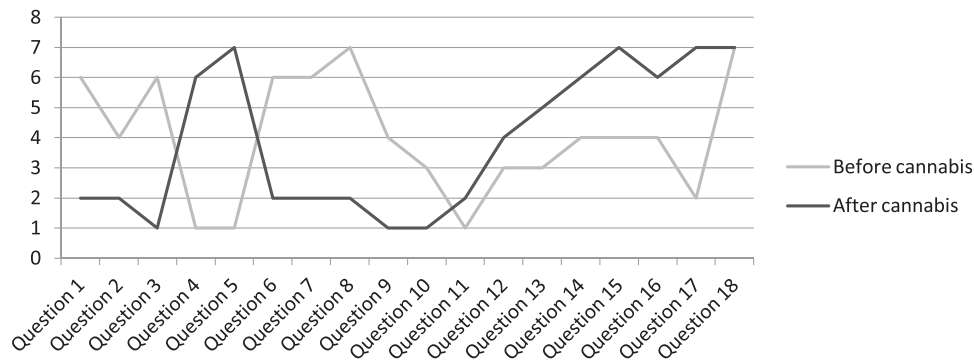


FIG. 1. Results of FOAI before and after cannabis administration (0.3 g *Bedrocan* and 0.05 g *Bediol*). FOAI, Functional Outcome Assessment Instrument.

demonstrate reduced perceived stress after treatment with cannabis. Third, treatment with cannabis resulted in remission of both general and social anxiety as assessed by BAI and LSAS. Accordingly, it can be speculated that speech fluency improved secondary to reduced anxiety. Finally, it can be assumed that not only improved speech fluency but also reduced stress and anxiety, in combination with improved mood and sleep contributed to patient’s marked improvement in quality of life.

In summary, this is the first case report of a patient suffering from impairing and treatment-resistant stuttering, who markedly improved after treatment with medicinal cannabis. Based on patient’s self-report and reports of family and friends, as well as several established assessments, use of cannabis resulted not only in an improvement of stuttering but also remission of

(social) anxiety, and reduced depression and stress, as well as improved sleep, attention, concentration, self-confidence, social life, and overall quality of life without any side effect. Importantly, treatment effects did not decrease over time. Limitations of this single case study are the selection of only a limited number of instruments to assess quality and severity of stuttering. Test quality was partly suboptimal and might have been influenced by learning.

Interview with the Patient

In the following, we present an interview with the patient describing his own view on treatment with medicinal cannabis.

K.R.M.-V.: Thank you very much for agreeing to this interview. May I first ask you to briefly describe, how the stuttering has affected your life in recent years?

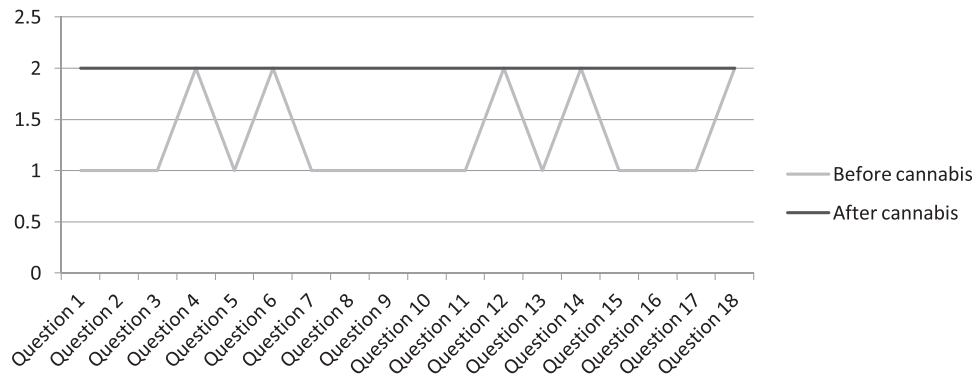


FIG. 2. Results of PSI before and after cannabis administration (0.3 g *Bedrocan* and 0.05 g *Bediol*). PSI, Perception of Stuttering Inventory.

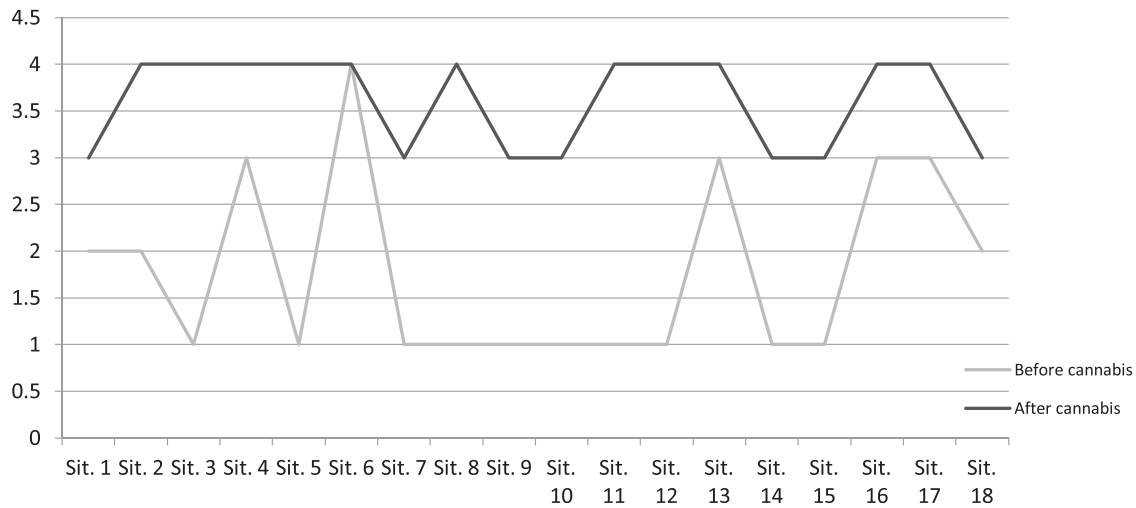


FIG. 3. Results of the SSC before and after cannabis administration (0.3 g *Bedrocan* and 0.05 g *Bediol*). SSC, Speech Situations Checklist.

Patient: It all started in the 2nd grade. At that time, it was noticed that I stutter and stammer. Therefore, from the 3rd grade on, I went to a speech therapy school, where I was more or less forced to read aloud. But since this made it even worse, I refused to go to another speech therapy school from the 5th grade on. As a child, I was in treatment with a pedagogue and with different doctors and was even in a speech clinic. My parents wanted to know, what was going on and where it was coming from.

K.R.M.-V.: Your parents obviously suffered a lot from your speech problems? But what about you?

Patient: I never wanted to accept that I couldn't talk fluently. Deep inside myself I knew, I can talk. There were brief moments, when I could suddenly speak fluently without stuttering. But that happened very rarely.

K.R.M.-V.: Can you give some examples, how these problems affected your life?

Patient: At school I was frequently portrayed as stupid. The worst thing for me were presentations. I had nightmares for weeks beforehand. The teachers never accepted having someone in the class, who couldn't speak well and that there might be other options than giving oral presentations. Later, I was always panic-

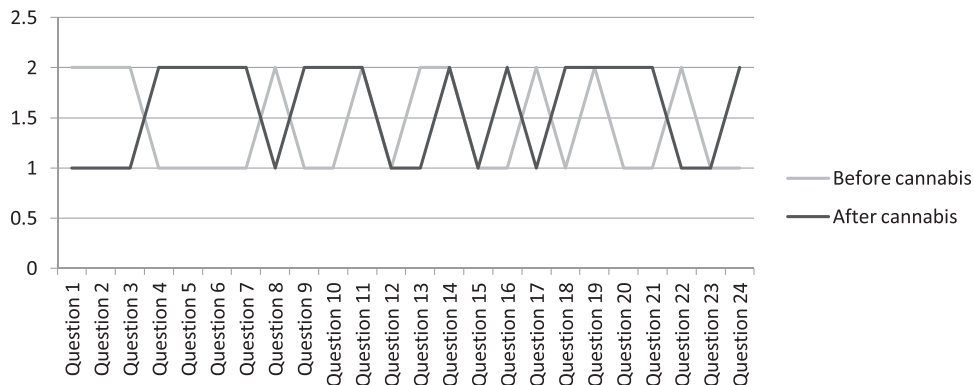


FIG. 4. Results of S24 before and after cannabis administration (0.3 g *Bedrocan* and 0.05 g *Bediol*). S24, Shortened Form of the Erickson S-Scale of Communication Attitude.

stricken about job interviews. Going in there and knowing you can't communicate well. Especially, if you're nervous. Nervousness is an important factor that has a negative effect on my speaking. I always wanted to be a policeman, but therefore you have to be able to speak fluently. That's why I haven't been able to do that.

K.R.M.-V.: What effect did that have on you?

Patient: I experienced such symptoms as nightmares, anxiety or thoughts of running away. In a village, you know each other, and you know the students from the 1st grade. Talking in front of the whole class was absolutely impossible.

K.R.M.-V.: How was it with friendships and hobbies? Did the stuttering have an influence on that as well?

Patient: It had an effect, of course. I already had friends, but if you can't communicate and are always just a listener, of course it's difficult. Listening is nice, but you also want to tell stories and experiences and actively participate in a discussion. Very few people were willing to accept that. Often, I heard, "What is wrong with you?"

K.R.M.-V.: Can you please tell us, what changed after you started using cannabis?

Patient: My whole speech function improved. The flow of speech is much more fluid. I think much less about what and how to pronounce. I then just talk without thinking how to pronounce something or what alternative words I can find to talk more fluently. That all ceased. Otherwise, you think a lot more about what you can even say and how—this stopped after use of cannabis.

So now, I can inform a group of 20 colleagues at work, what was going on, what problems we had or what we can do better. Now, I can take an active part in the working world and no longer seem like a disinterested employee. I no longer have the thought that I might seem to be as interested as other colleagues, who tend to speak more. Most people think that I feel more like working now, but that's not the case at all. I am the same person as before, but now I simply talk more. Things are much better with the boss and colleagues now. On top of that, I can now fall asleep without any problems.

K.R.M.-V.: Do you think that these changes will also have an impact on your professional life in the future?

Patient: I am working at a large company. I'm happy to keep it that way as I'm completely satisfied. Of course, I now have a chance of getting a pay rise, as I can tell the boss, what I did at work. I can also imagine moving internally to a position, where I have to talk more, which I would never have thought of doing before.

K.R.M.-V.: Is there an impact on your personal life as well?

Patient: I talk much more with my friends and my fiancée. After all, a relationship thrives on exchanging ideas and communicating. I also talk more openly and extensively, which I would have never done before, because it would have been much more awkward, with much more interruptions. In the past, I thought I'd rather say nothing at all. Of course, that's also very good for my relationships with my partner, family and friends as well as for other activities, particularly, fishing, practicing sports or e-biking.

K.R.M.-V.: Is there anything that you do now that you avoided or didn't like doing before starting using cannabis?

Patient: I now trust myself to do a shift handover on my own at work. Before, I always sent other colleagues ahead. Now I can tell them alone, what happened and don't need anyone to help. That's really great.

K.R.M.-V.: Could you also give some examples from your private life? How did your life change?

Patient: For example, we started doing game nights now. When people get together over dinner, I talk more. It's also more fun to hang out with friends.

K.R.M.-V.: How has your quality of life changed as a result of the cannabis-based therapy?

Patient: The therapy resulted in a significant improvement in my quality of life, which I never experienced before, but always wanted. I knew, what it was like to be able to talk fluently and what I would do differently. Now I am able to do things differently, and of course I'm much happier because of it. My life improved drastically due to this new treatment.

K.R.M.-V.: What do your family and friends say about this kind of therapy?

Patient: My family and especially my parents and also my siblings were very negative at the beginning. They thought I could die from it. My family doctor said, she would never prescribe cannabis to me, because then I would not be able to work any longer. But now I have been able to clear up the prejudices quite well. Now that everyone sees that I'm getting better, everything is fine. But they are still a little hesitant.

K.R.M.-V.: Do you experience any side effects from the cannabis-based therapy?

Patient: I have absolutely no side effects. On the contrary, I am more active, more rested, more relaxed, I am much more efficient at work. I can remember many things better, can listen better. Before, my fiancée often said that I was not listening properly. Now I can remember, what she said. I can't list any negative qualities.

K.R.M.-V.: Is there anything else you would like to address?

Patient: Last week I participated in the Medical and Psychological Examination, or MPU for short, to regain my driver's license. The psychologist already informed me that everything went well and that I will get my driver's license back—despite the cannabis treatment.

K.R.M.-V.: Thank you very much for informing us so openly about your situation. I wish you all the best.

Ethics Statement

Ethical review and approval were not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study. Written informed consent was obtained from the individual for the publication of any potentially identifiable image or data included in this article.

Author Disclosure Statement

Kirsten Müller-Vahl has received financial or material research support from EU (FP7-HEALTH-2011 No. 278367, FP7-PEOPLE-2012-ITN No. 316978) DFG: GZ MU 1527/3-1 and GZ MU 1527/3-2, BMBF: 01KG 1421, National Institute of Mental Health (NIMH), Tourette Gesellschaft Deutschland e.V. Else-Kröner-Fresenius-Stiftung, GW pharmaceuticals, Almirall Hermal GmbH, Abide Therapeutics, and Therapix Biosciences.

She has received consultant's honoraria from Abide Therapeutics, Boehringer Ingelheim International GmbH, Bionorica Ethics GmbH, CannaMedical Pharma GmbH, Canopy Growth, Columbia Care, CTC Communications Corp., Demecan, Etypharm GmbH, Eurox Deutschland GmbH, Global Praxis Group Limited, MCI Germany, Lundbeck, Sanity Group, Stadapharm GmbH, Synendos Therapeutics AG, and Tilray.

She is an advisory/scientific board member for CannaMedical Pharma GmbH, Bionorica Ethics GmbH, CannaXan GmbH, Canopy Growth, Columbia Care, Etypharm GmbH, IMC Germany, Leafly Deutschland GmbH, Sanity Group, Stadapharm GmbH, Synendos Therapeutics AG, Syqe Medical Ltd., Therapix Biosciences Ltd., Tilray, von Mende Marketing GmbH and Wayland Group.

She has received speaker's fees from Aphria Deutschland GmbH, Almirall, Cogitando GmbH, Emalex, Eurox Deutschland GmbH, Ever pharma GmbH, Meinhardt Congress GmbH, PR Berater, Spectrum Therapeutics GmbH, Takeda GmbH, Tilray, Wayland Group.

She has received royalties from Deutsches Ärzteblatt, Der Neurologie und Psychiater, Elsevier, Medizinisch Wissenschaftliche Verlagsgesellschaft Berlin, and Kohlhammer.

She served as a guest editor for *Frontiers in Neurology* on the research topic "The neurobiology and genetics of Gilles de la Tourette syndrome: new avenues through large-scale collaborative projects", is an associate editor for "Cannabis and Cannabinoid Research" and an Editorial Board Member of "Medical Cannabis and Cannabinoids" und "MDPI-Reports" and a Scientific board member for "Zeitschrift für Allgemeinmedizin".

Funding Information

This study was conducted in absence of any external funding.

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Cite this article as: Szejko N, Fremer C, Baacke F, Ptok M, Müller-Vahl KR (2021) Cannabis improves stuttering: case report and interview with the patient, *Cannabis and Cannabinoid Research* 6:5, 372–380, DOI: 10.1089/can.2021.0060.

Abbreviations Used

BAI = Beck Anxiety Inventory
 BDI = Beck Depression Inventory
 CBD = cannabidiol
 ECS = endocannabinoid system
 FOAI = Functional Outcome Assessment Instrument
 LSAS = Liebowitz Social Anxiety Scale
 PSI = Perception of Stuttering Inventory
 PSS = Perceived Stress Scale
 QOLAS = Quality of Life Assessment Schedule
 S24 = Shortened Form of the Erickson S-Scale
 of Communication Attitude
 SSC = Speech Situations Checklist
 SSI = Stuttering Severity Instruments
 THC = tetrahydrocannabinol
 VAS = The Visual Analog Rating Scale of Health-Related
 Quality of Life