



International Parkinson and Movement Disorder Society

# Cannabis and Parkinson's Disease Tremor

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## INTRODUCTION

In a survey of PD patients in Europe, 25% of participants reported cannabis use and of those, 31% reported improvement of resting tremor (Venderova et al, 2004). Furthermore, a small, open-label, observational study of patients reporting severe PD-related pain and tremor not controlled with medication experienced significant improvements in tremor and rigidity by smoking cannabis (Lotan et al., 2014). To date, the impact of cannabis on PD tremor has never been formally evaluated using motion sensors or qualitative methodology.

**The objective of this study was to describe the effect of cannabis on Parkinson's disease (PD) tremor using advanced motion detection technology and qualitative interviews.**

## MATERIALS AND METHODS

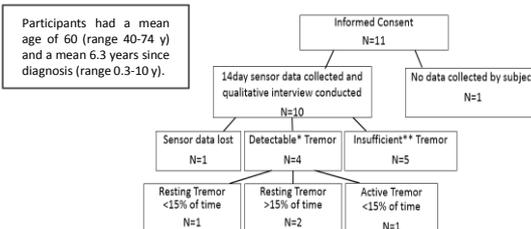
Individuals with a diagnosis of PD who were using cannabis according to Washington state law (USA) consented to wearing an Opal movement monitor provided by APDM, Inc. (Portland, OR) for 14 days and logging all cannabis use in a journal. The frequency and amplitude of the tremor were recorded during all waking hours. Participants were instructed to alert the motion sensor by pressing a button each time cannabis was used. For this analysis, the tremor duration and magnitude during the hour prior to inhaled cannabis was compared to the hour following use.

Tremor detection was based on 3 channel gyroscope sensor data used in spectral analysis. A linear parametric model was used to decompose the power spectral density (PSD) of each two-minute. The units of the PSD were (radians/s)<sup>2</sup>/Hz. Based on recordings from subjects without tremor, we determined a tremor threshold to minimize false detections which was applied to each 2 min period. Tremor magnitude was defined as the total signal power in units of (radians/s)<sup>2</sup> associated with tremor in the PSD.

Participants returned the sensors after 2 weeks, at which time they participated in a audio recorded interview, which was manually transcribed and checked for accuracy. Interviewers were trained to ask open-ended, non-leading questions and each participant was asked the same standardized questions to elucidate their perception of the effects of cannabis on their PD symptoms.

## RESULTS

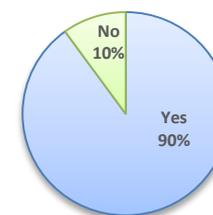
### Study Participants



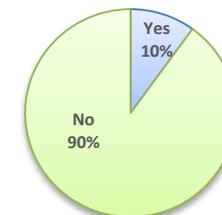
### Qualitative Interviews

All ten participants who completed the 14 days elected to partake in the follow-up recorded interview, in which they were asked an identical series of questions to guide the information-gathering session.

Do you think cannabis helped your PD symptoms?



Do you think cannabis worsened your PD symptoms?



If so, which ones...

	Helped with	Side Effects
1	Pain, muscle stiffness, depression, tremor, cognitive buffer, anxiety, double vision, sleep. "It's just a very noticeable shift...to a better place."	Sleepiness, social stigma, driving concerns
2	Sleep, head discomfort, anxiety, muscle stiffness. "...it made me feel great...it really makes all the difference"	Initial increase in tremor, morning sluggishness
3	Handwriting, relaxation, tremor	Social stigma, dry throat from smoke
5	No noticeable changes	Sluggish
6	Toe cramping	Cost
7	Tremor, relaxation, nausea from PD medications	Psychoactivity, impaired impulse control
8	Tremor, sleep, increases appetite, energy	Psychoactivity, short term memory loss, somnolence, paranoia
9	Sleep, pain, relaxation, tremor, stress, perspective	High doses "too much"
10	Relaxation, sleep, anxiety	Paranoia, somnolence, cachinnation
11	Sleep, calming, aches, tremor, increases appetite, improves energy, reduces vivid dreams/ REM sleep behavior disorder, fatigue	Somnolence, coughing

Improved sleep was an unsolicited theme during the qualitative interviews, with 60% of individuals reporting improvements.

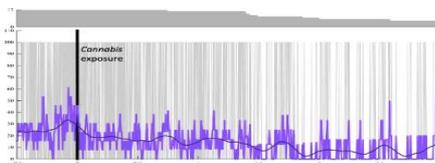
The one participant who reported cannabis worsening symptoms specifically described, "sometimes it speeds up the tremor at the start" but "then it relaxes it".

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### Tremor Detection and Response to Cannabis

ID	% of Time Tremor Detected (Min-Max)	Number of Button	% of Time Tremor	% of Time Tremor	Difference in % of Time	p-Value
1	0.5 (0.2-0.8)	18	0.435	0.507	0.072	0.826
3	<b>34.4 (14.6-50.3)</b>	31	<b>46.852</b>	<b>34.881</b>	<b>-11.971</b>	<b>0.009</b>
5	0.9 (0.4-2.4)	13	1.204	0.234	-0.97	0.094
6	0.3 (0.0-0.8)	56	0.217	0.225	0.008	0.912
7	2.6 (1.4-3.4)	8	2.925	2.337	-0.588	0.591
8	<b>17.8 (0.0-32.9)</b>	12	<b>27.174</b>	<b>14.158</b>	<b>-13.016</b>	<b>0.013</b>
9	3.9 (0.7-19.1)	12	9.839	0.797	-9.042	0.009
10	2 (0.00-7.7)	11	2.767	1.161	-1.606	0.037
11	0.9 (0.0-2.3)	49	1.295	0.968	-0.327	0.466

There was a statistically significant (bold) decrease in PD tremor in participants who had a measurable tremor >2% of the time and had more than 10 cannabis exposures over the observation period.



Data analysis was for the one hour prior to the one hour following cannabis exposure. Sensor data suggest tremor reduction is sustained for at least three hours following exposure.

## CONCLUSIONS

Most of the subjects recruited for this study had a very mild intermittent tremor that could not be reliably detected by the motion sensor. In those with a persistent tremor, there was a consistent decrease in the tremor persistence and in detected tremor magnitude following cannabis use. Future studies should enroll subjects with a more pronounced tremor, use consistent cannabis strains, doses, and delivery system as well as utilize extended observation periods for uniform comparison across subjects.

**The qualitative interviews suggest patients perceive cannabis to have therapeutic potential for PD symptom management. These data suggest further investigation of cannabis for impaired sleep is warranted.**

## REFERENCES

Lotan I, et al. (2014). Cannabis treatment for motor and non-motor symptoms of PD: an open-label observational study. *Clinical Neuropharmacology*;37:41-44

Venderova K, et al. (2004). Survey on cannabis use in PD: subjective improvement of motor symptoms. *Movement Disorders*;19:1102-1106.