Using smartphone technology to track real-time changes in anxiety/depression symptomology among Florida cannabis users

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Releaf App™ Technology
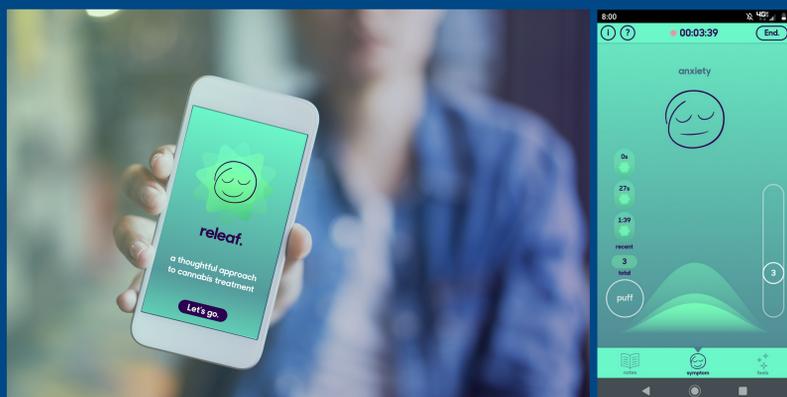
Background / Present Study

- Recent work has shown cannabis to be effective in treating a variety of symptoms including depression and anxiety (1-4)

- This work utilizes smartphone technology which allows for larger amounts of real-time data collection from cannabis users

- Releaf App™ technologies has been used worldwide by researchers, healthcare professionals, and cannabis product manufacturers to collect data on the performance of cannabis use

- The present study uses Releaf App™ to assess self-reported experiences of cannabis users in Florida, with a focus on how cannabis alters symptoms of anxiety and depression along with its relationship to dose, amount of use, consumption method, gender, and age

References

1. Stith, S. S., Vigil, J. M., Brockelman, F., Keeling, K., & Hall, B. (2019). The association between cannabis product characteristics and symptom relief. Scientific Reports, 9(1), 2712

2. Stith, S. S., Vigil, J. M., Brockelman, F., Keeling, K., & Hall, B. (2018). Patient-reported symptom relief following medical cannabis consumption. Frontiers in Pharmacology, 9, 916

3. Li, X., Diviant, J. P., Stith, S. S., Brockelman, F., Keeling, K., Hall, B., & Vigil, J. M. (2020). The effectiveness of cannabis flower for immediate relief from symptoms of depression. The Yale Journal of Biology and Medicine, 93(2), 251-64

4. Cuttler, C., Spradlin, A., & McLaughlin, R. J. (2018). A naturalistic examination of the perceived effects of cannabis on negative affect. Journal of Affective Disorders, 235: 198-205

Procedure

- Data was analyzed using linear mixed-effects modeling in R v.4.0.3

- Data was analyzed at the session and user level

- Fixed effects were the predictors of interest:

- Changes in symptom severity across cannabis sessions (start vs. end), dose, symptom type (anxiety vs. depression), combustion method, age, and gender

Table 1. Descriptive statistics of variables collected from participants in the study.

Variable	N	Mean, SD (or %)	Min. Max Values
Age	404	36.53, 11.39	13 - 74
Gender			
Male	164	40%	
Female	241	60%	
Symptomology			
Depression	7752	41%	
Anxiety	5311	59%	
Relief	13063	3.03, 3.28	-9-10
Symptom Start	13063	5.46, 2.96	0-10
Symptom End	13063	2.43, 2.48	0-10
Doses	13063	7.77, 6.12	1-60
Combustion Type			
Smoke (Joint, Pipe)	188	45%	
Vape	230	55%	

Results – Session level of Analysis

- Data collection was from 3/30/18 to 12/19//21: 418 users provided 13063 sessions in total

- Session amount: 79% of users had fewer than 10, 21% had more than 10, mode = 3 (34%)

- After controlling for symptom start levels (1), symptom severity was significantly lower at end of session – Figure 1

- Although doses, symptom type, and consumption method were significant predictors of relief, their effects were small and should be interpreted with caution

- No effects of age or gender (or interactions)

Figure 1
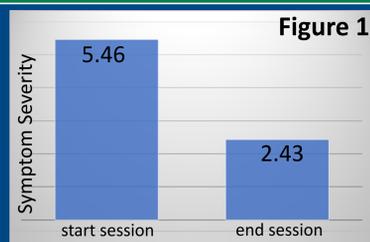
	relief				
Predictors	B	β	95% CI B	95% CI β	p
(Intercept - Relief)	-0.32	-0.25	-0.55 – -0.09	-0.31 – -0.19	0.006
Symptom Start	0.43	0.38	0.41 – 0.44	0.37 – 0.40	<0.001
Doses	0.03	0.05	0.02 – 0.03	0.04 – 0.06	<0.001
Symptom [Depression]	0.05	0.02	0.01 – 0.09	0.00 – 0.03	0.011
Consumption Method [Vape]	0.19	0.06	0.07 – 0.31	0.02 – 0.09	0.002

Positive Relief (68%)
No Relief (27%)
Negative Relief (5%)
Each bar represents an average relief for an user (n = 418)

Results – User Level of Analysis

- Most users reported positive relief (73%) compared to negative and no relief groups (27%) (groups merged for analysis)

- **Anxiety:** Positive relief group had significantly more sessions (Fig. 2) and doses (Fig.3) compared to negative / no relief group
- Higher proportion of users vaped (Fig. 4) and lower proportion of users smoked joints in positive relief group
- No differences in age or gender

- **Depression:** Positive relief group had significantly more sessions than negative / no relief group (Fig. 5)
- Doses showed a small effect but was not significant
- No differences in age, gender, consumption method between groups

- **Conclusions:** Symptom relief of depression /anxiety is comparable to previous work using similar technology (1-4)

- Smartphone technology is useful to measure real-time changes in user experiences

- Future work should focus on the causal nature of cannabis use and symptom relief
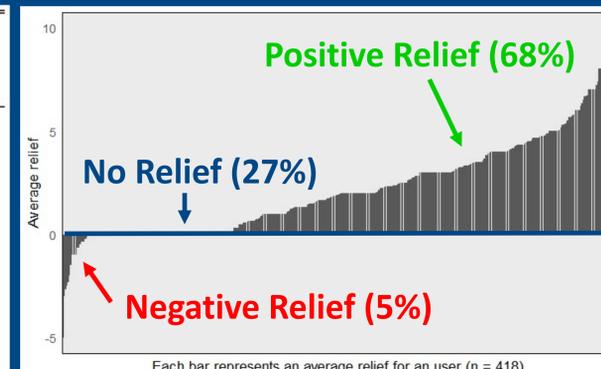
Anxiety - Independent Samples T-Test

		Statistic	df	p		Effect Size
number_of_sessions	Welch's t	3.10	293.97	0.002	Cohen's d	0.27
mean_symptom_start	Welch's t	3.53	163.60	<1001	Cohen's d	0.42
mean_symptom_end	Welch's t	-7.94	151.89	<1001	Cohen's d	-0.96
mean_doses	Welch's t	2.91	242.72	0.004	Cohen's d	0.31
vape_proportion	Welch's t	2.16	170.16	0.032	Cohen's d	0.25
joint_prop	Welch's t	-2.08	147.97	0.039	Cohen's d	-0.25

Depression - Independent Samples T-Test

		Statistic	df	p		Effect Size
number_of_sessions	Welch's t	2.03	168.58	0.044	Cohen's d	0.23
mean_symptom_start	Welch's t	1.85	73.44	0.069	Cohen's d	0.31
mean_symptom_end	Welch's t	-6.28	72.21	<1001	Cohen's d	-1.07
mean_doses	Welch's t	1.48	85.05	0.142	Cohen's d	0.24

Figure 2

Figure 3

Figure 4

Figure 5