

RADICLE SCIENCE

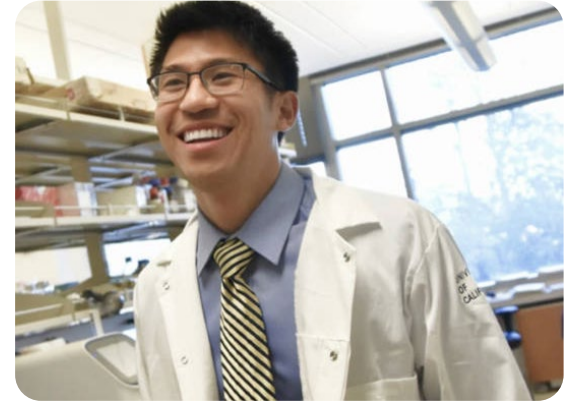
Democratizing clinical trials to transform
health & wellness products into democratized
precision solutions

THE EMERALD CONFERENCE

Produced by MJBizScience

Jeff Chen, MD, MBA

Physician, Scientist, Entrepreneur, Founder and former Exec Director of UCLA Cannabis Research Initiative (one of world's first), Editor at Healthline Media (86M visitors/month), U.S. patent holder



Pelin Thorogood, M.Eng, MBA

Tech CEO, Big Data & Analytics Expert, Entrepreneur, Philanthropist, Trustee & Treasurer of UC San Diego Foundation, Co-Founder & President of Wholistic Foundation (history's largest donor to cannabinoid research)



Our Radicle vision is a world where health and wellness products are...

Validated*

Trusted

Recommended**

Personalized



*“At its core, Radicle is a **Rebellion** against the status quo of healthcare and research and a **Movement** towards democratized, personalized consumer health products that have the potential to deliver well-being for all future generations.”*

Radicle Science Co-founders & Rebels With a Cause

*Objective evidence of safety and effectiveness

**By healthcare providers

A Radicle solution

Data transforms health and wellness products into democratized precision solutions

10x cheaper and faster studies that are:

1. Virtual
2. Direct to consumer
3. Large Scale
4. Intentionally Heterogeneous



Radicle ACES

Advancing CBD Education
& Science



THE EMERALD
CONFERENCE

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RESEARCH TEAM

- Principal Investigator
 - Kelsey Laird, PhD (Adjunct Faculty, California Institute of Integral Studies)
- Co-Investigators
 - Jessica Saleska, PhD/MPH (Director of Research, Radicle Science)
 - Emily Pauli, PharmD (Chief Research Officer, Radicle Science)
 - Jeff Chen, MD/MBA (Co-founder & CEO, Radicle Science)

- Collaborators:
 - Miroslav Backonja, MD (Clinical Professor, University of Washington)
 - Chris Colwell, PhD (Professor, UCLA)
 - Derek Loewy, PhD (Director of Behavioral Sleep Medicine at Scripps Clinic Sleep Center)
 - Ethan Russo, MD (Founder and CEO of CReDO Science)
 - Kate Taylor, PhD (Associate Professor, UCLA)
 - Jill Waalen, MD/MPH (Co-Director of Biostatistics at Scripps Research)

STUDY DESIGN

- 4-week, open-label
- Randomized with a waitlist control arm
- 2820 participants aged 21 and older, with prior symptoms of anxiety, sleep disturbance, and/or chronic pain
- 2704 randomized across 13 CBD products (208 each)
- 296 randomized to a waitlist control
- Primary Objective: participants' change in well-being from baseline, compared to a waitlist control
- Secondary Objective: participants' change in pain, sleep disturbance, and/or feelings of anxiety from baseline, compared to a waitlist control

Radicle Timeline

- Q1 2021
 - Study design
- Q2 2021
 - Study build on tech platform
 - IRB
- Q3 2021
 - Recruitment
 - Product shipment
 - Study launch
 - Study completion
- Q4 2021
 - Personalized Health Reports sent to all participants
 - Brand Reports sent to all brands

Participating Products

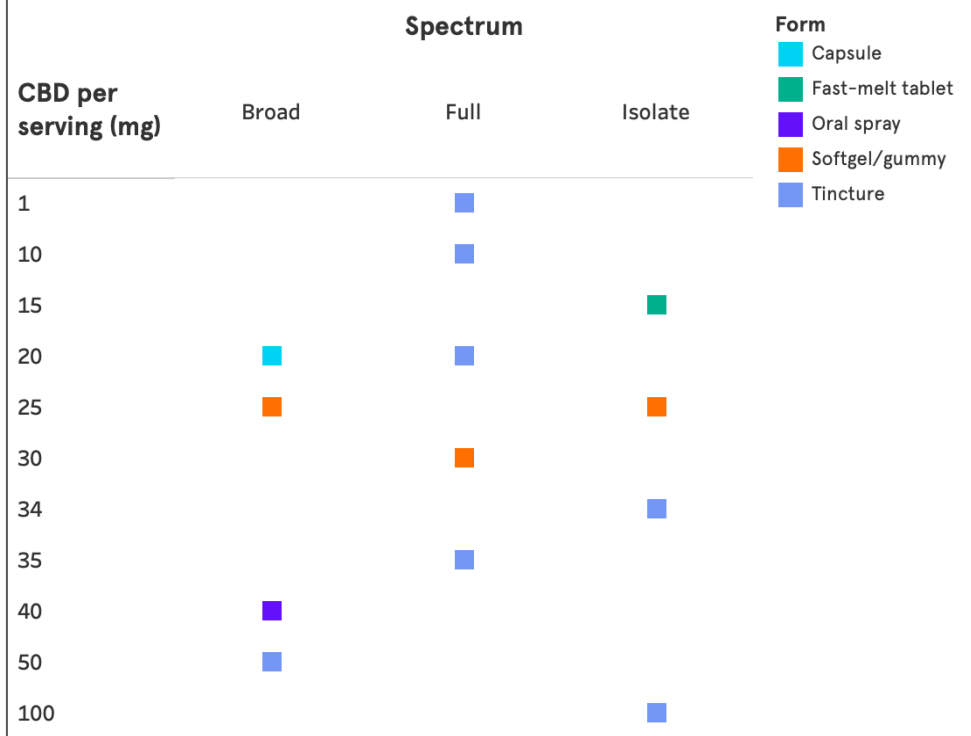


Study products

- Products took the form of capsules, fast-melt tablets, tinctures, softgels, gummies, and an oral spray
- Products varied by CBD dosage, mode of absorption and spectrum

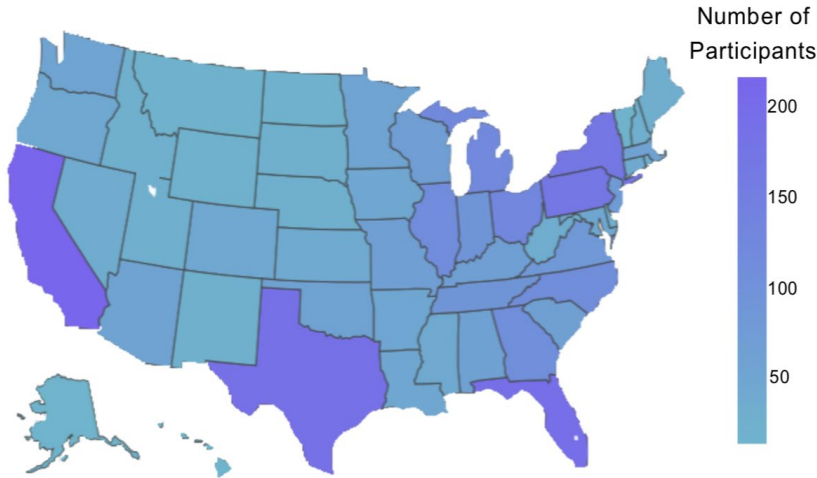
*N=2820

Summary of Radicle ACES Study product characteristics

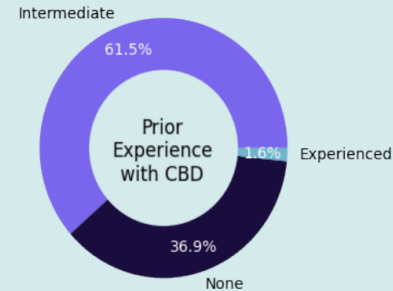


Demographics

Participants resided in all 50 states, though most live in California, Texas and Florida



Most (94%) of the participants were female while 6% were Male



Over one third of participants had never tried CBD, and nearly two thirds had only tried it a few times

The majority (81.5%) of participants in the study were White, followed by Black (8.7%), Asian or Pacific Islander (3.1%), and other races (6.7%)

Methods

Linear mixed models to compare key outcomes for:

(1) Each product vs. waitlist control

(2) Product characteristics

- spectrum and CBD dose

(3) Participant characteristics

- evaluating three-way interaction between CBD x time x [*sex/age/prior CBD use*]

Impact on well-being & anxiety

Taking any CBD product led to significant improvements across all health outcomes, relative to waitlist control.

These effects were significant at every time point of the study (i.e., at weeks 1, 2, 3 and 4).*

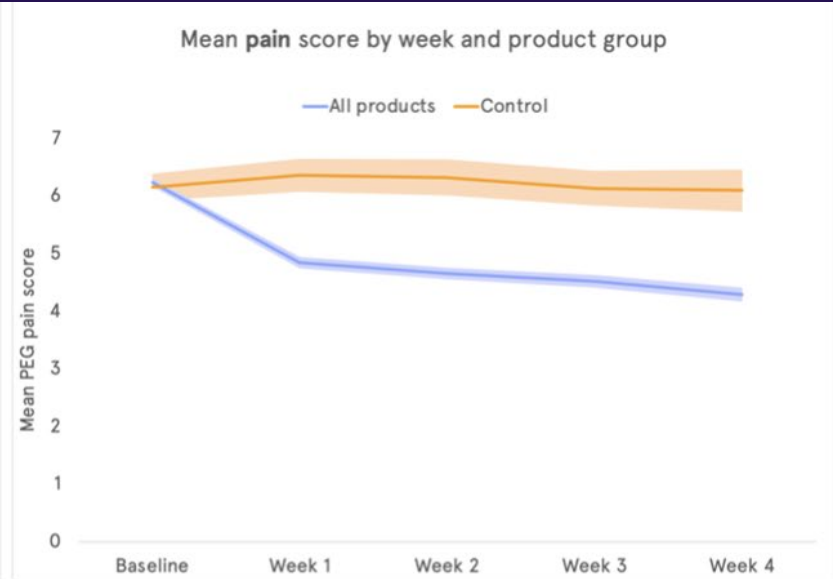
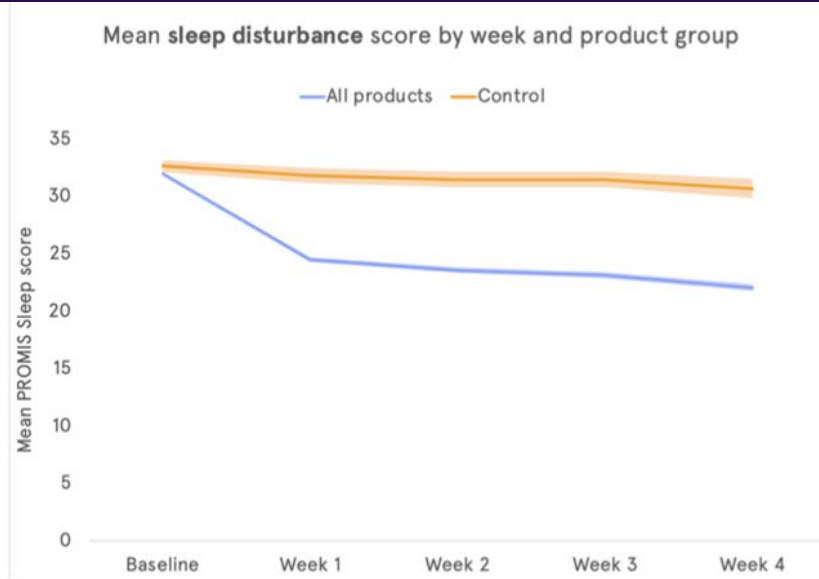


*Based on linear mixed models (random intercepts with unstructured residual errors) comparing the effects of taking any CBD product (pooled) to waitlist control, and comparing each CBD product (individually) to waitlist control. We corrected for multiple comparisons using Bonferroni correction.

Impact on sleep & pain

Taking any CBD product led to significant improvements across all health outcomes, relative to waitlist control.

These effects were significant at every time point of the study (i.e., at weeks 1, 2, 3 and 4).*

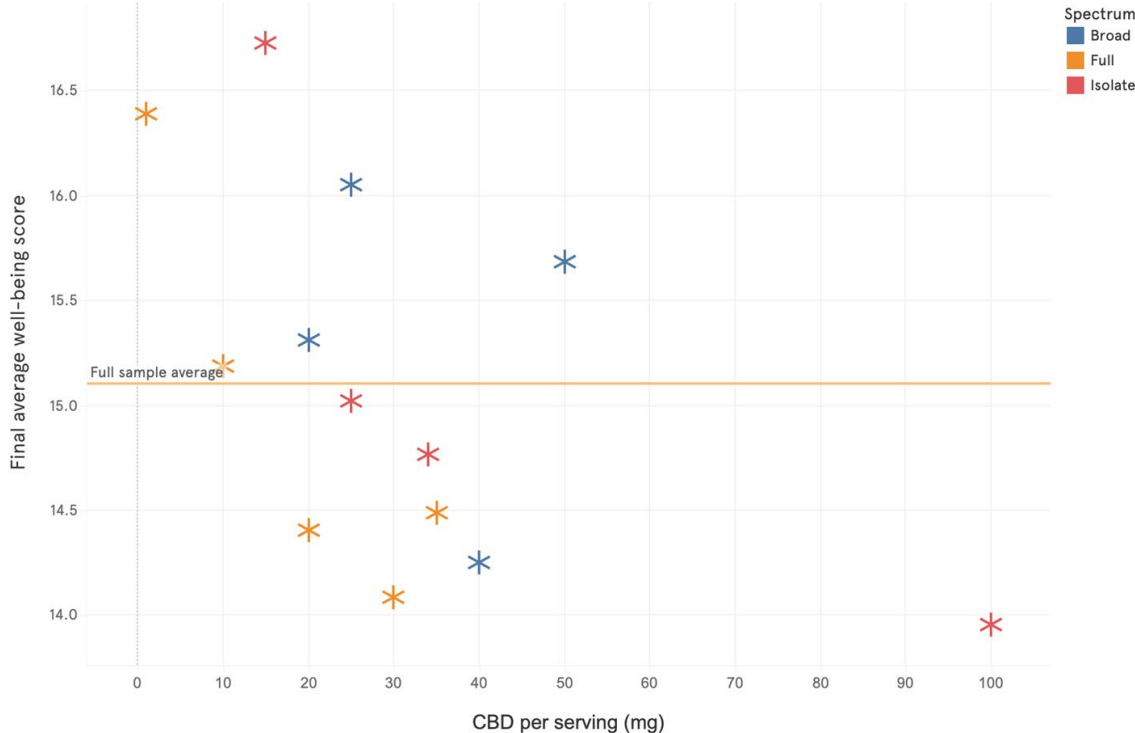


*Based on linear mixed models (random intercepts with unstructured residual errors) comparing the effects of taking any CBD product (pooled) to waitlist control, and comparing each CBD product (individually) to waitlist control. We corrected for multiple comparisons using Bonferroni correction.

Outcomes

- Largest improvements observed in the **first week** of using product
- Participants experienced a **71%** improvement in their **well-being** score, on average
- **63%** of participants with **anxiety** experienced a clinically meaningful improvement
- **61%** of participants with **sleep difficulties** experienced a clinically meaningful improvement
- **47%** of participants with **pain** experienced a clinically meaningful improvement

Product characteristics & well-being improvement

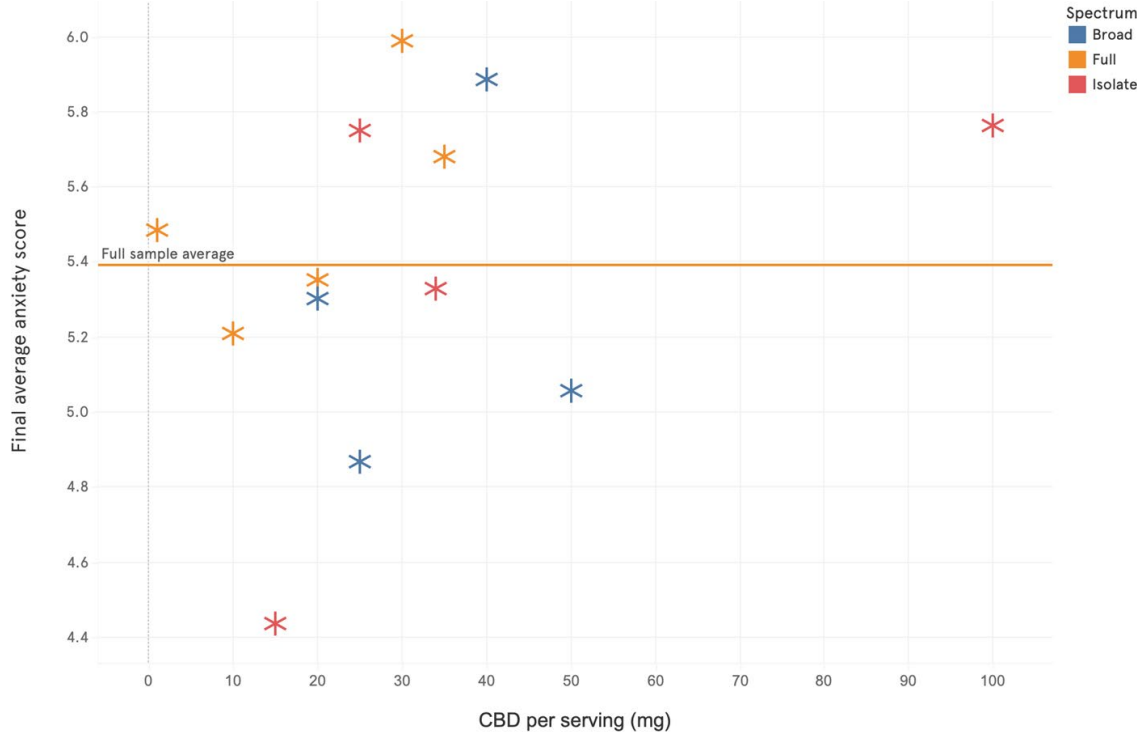


Average Who-5 Well-being score at week 4 by daily CBD dose. Color shows details about spectrum.

Certain lower dosage groups (1-15 mg CBD per serving) outperformed higher dosage groups in well-being

No significant differences by spectrum

Product characteristics & anxiety improvement

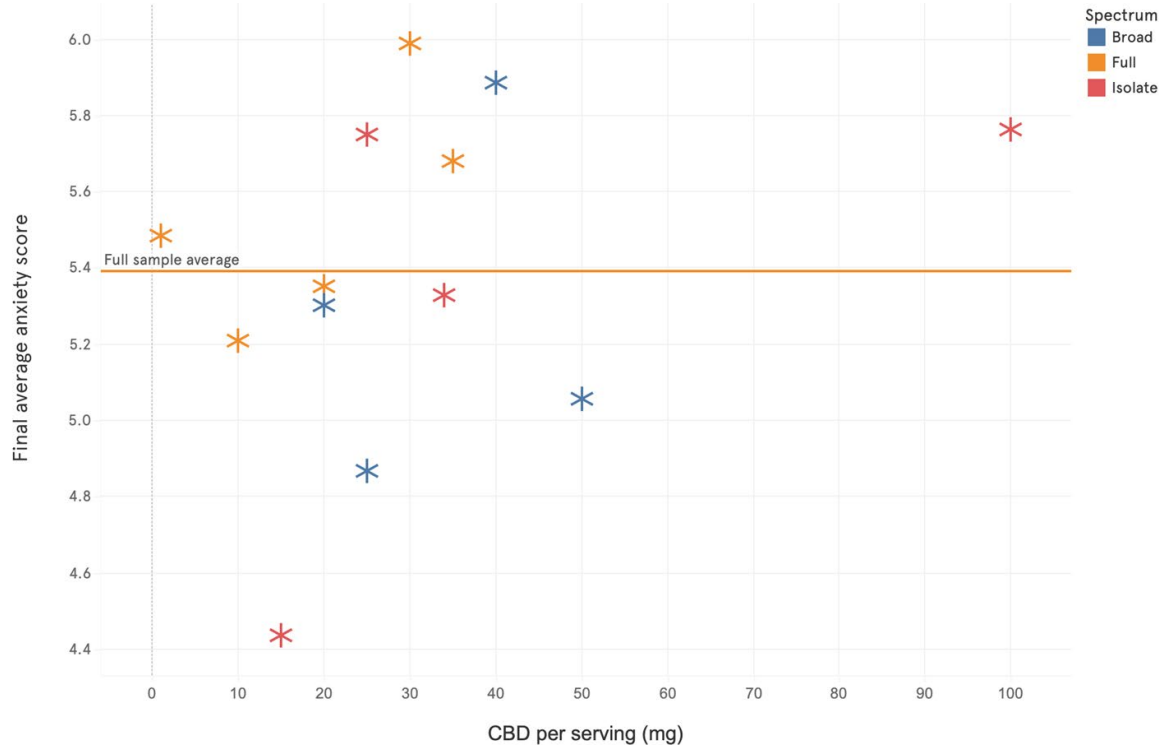


Average GAD-7 Anxiety score at week 4 by daily CBD dose. Color shows details about spectrum.

Certain lower dosage groups (1-15 mg CBD per serving) outperformed higher dosage groups in well-being

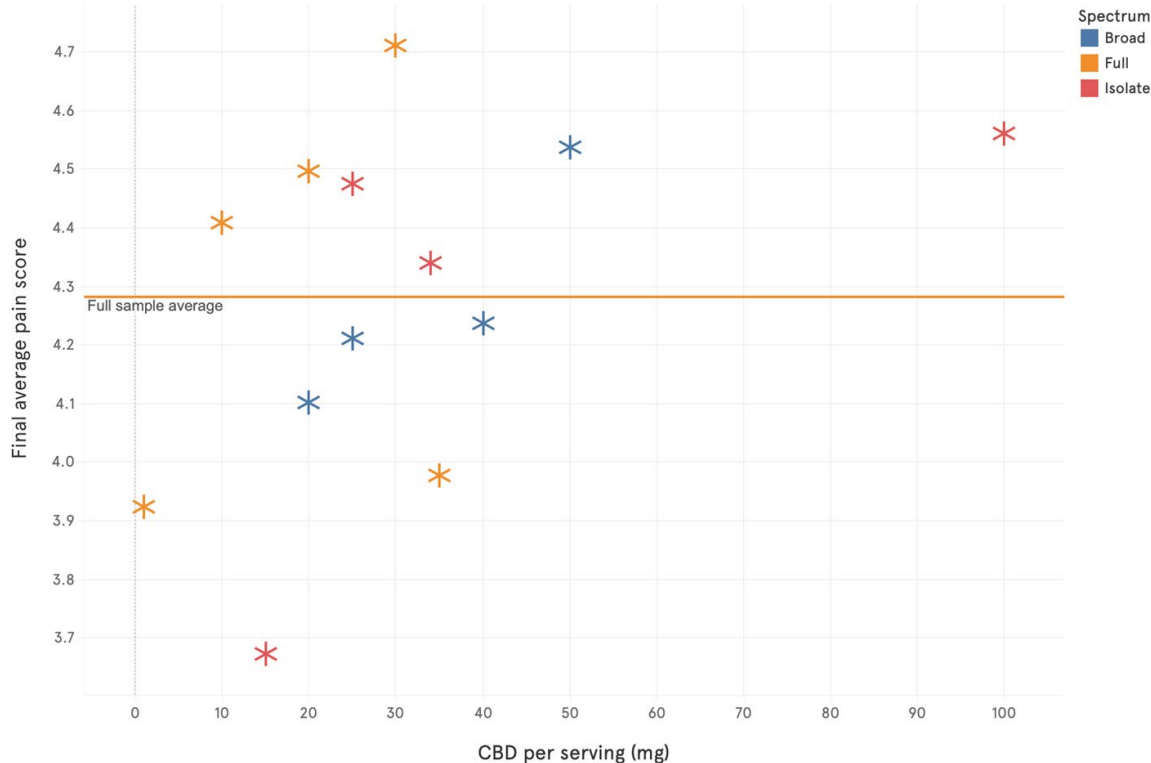
No significant differences by spectrum

Product characteristics & sleep disturbance improvement



No significant differences by CBD dose or spectrum for sleep quality

Product characteristics & pain improvement



Certain lower dosage groups (1-15 mg CBD per serving) outperformed higher dosage groups in well-being

No significant differences by spectrum

Key Findings

- **Taking any CBD product led to significant improvement across all health outcomes, relative to waitlist control**
- Side effects were rare (~10%) and mild
- There were **no** significant differences by participant sex, age or prior CBD use
- There were **no** significant differences by CBD spectrum
- Lower doses of CBD per serving (1 to 15 mg) often outperformed higher doses for the improvement of well-being, anxiety and pain

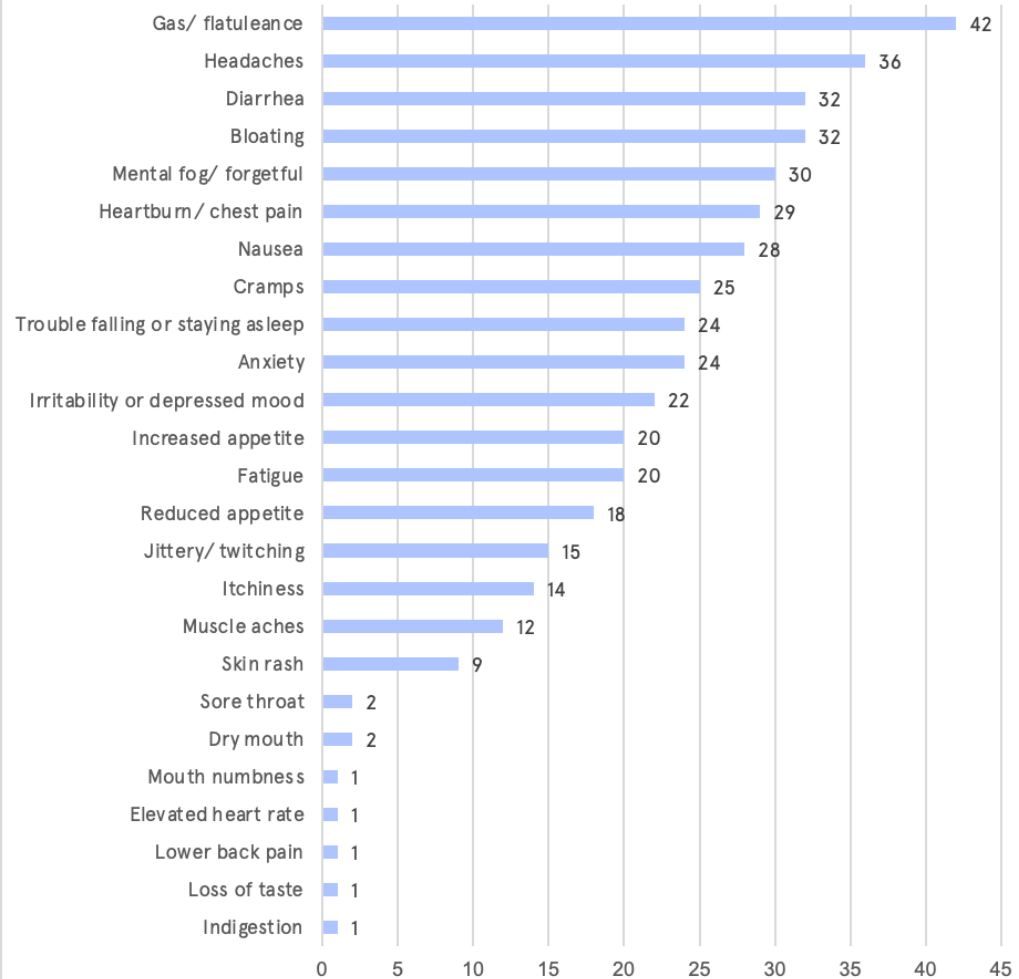
What types of people experienced the greatest improvements?

- There were no significant differences in the effect of taking any CBD product between males and females
- There were no significant differences in the effect of taking any CBD product between naive, moderate and experienced CBD users
- There were no significant differences in the effect of taking any CBD product between different age groups

Side effects

Approximately 10% of participants reported any side effect from taking a CBD product

Frequency of reported side effects



Caveats

- Cannot disentangle placebo effects
- Female gender skew of study participants
- Limited comparability between products by single characteristic
 - Multifactorial diversity of attributes
 - Suggestion serving
 - Form factor
 - Formulation

What does this all mean?

Results of this study suggest that comparable populations taking these CBD products could experience **significant improvements** in well-being, anxiety, sleep quality and pain in **just 4 weeks**.

They also suggest that these products have a **favorable safety profile**, as few side effects were reported (most of which were mild).

Finally, for the products in this study, our results suggest that effects may vary based on the amount of **CBD per serving**.

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Thank You!

For more information:
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Cofounder/CEO

We want to hear from you!

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the presentation.**

