Effects of Green vs. Grayscale Nature Images on Pain and Drug Demand in an MTurk Sample

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Background & Aims

- Over 20% of adults in the U.S. suffer from **chronic pain** (Rikard et al., 2023).
- Individuals increasingly report **self-medication** to manage their pain with **cannabis** and **alcohol**, which can be associated with risks (e.g., increased substance use, substance misuse; Alford et al., 2016; Asselin et al., 2022; Brennan et al., 2005).
- Determining **novel non-drug alternatives** to manage pain and reduce substance use may therefore be **valuable**.
- One promising area of research that has shown initial efficacy in pain reduction and reduced substance use is visual exposure to nature, specifically **green nature** (i.e., greenspace; Berry et al., 2021; Stanhope et al., 2020; Ulrich, 1984).

Study Aim: To test the effectiveness of visual exposure to green versus grayscale-colored nature images for reducing self-reported pain and hypothetical drug purchasing (i.e., drug demand).

Methods

- 15-20-minute online study conducted on Amazon Mechanical Turk (MTurk).
- Participants
  - Adults ages 18-90 who have used alcohol or cannabis in the past 12 months and suffer from chronic pain (N = 25), read, write, and understand English, in the U.S., and ≥ 95% approval rating.
- Manipulation
  - Within-subject design, participants viewed a green or grayscale nature slideshow across two sessions (5 min, order randomized).




Methods

- Measures
  - **McGill Short-Form Pain Questionnaire** – 15 items
    - e.g., "Do you experience stabbing pain?"
  - **Pain Catastrophizing Scale (PCS)** – 13 items
    - e.g., "I worry all the time about whether the pain will end."
  - **Acute Pain – Post-Slideshow** – 1 item
    - e.g., "Please move the slider on the line below to indicate your current level of pain. In a level of 0-10, where level 0 means no pain and level 10 means pain as bad as it could possibly be."
  - **Cannabis Purchase Task** – 20 prices ($0-$60)
    - e.g., "How many grams of cannabis would you purchase now to use during the next week at the price of $1 per gram?"
  - **Alcohol Purchase Task**– 17 prices ($0-$30)
    - e.g., "How many alcoholic drinks would you consume during the 5-hour period if they were $0 each?"
- Data Analysis
  - Removed nonsystematic data (Stein et al., 2015), n = 3.
  - Exponentiated demand equation (Koffarnus et al., 2015); k = 2.27 (cannabis) & k = 1.76 (alcohol).
  - Mann-Whitney U tests to examine group differences in the behavioral economics purchase task.
  - Paired sample t-tests to examine group differences in pain.

Results

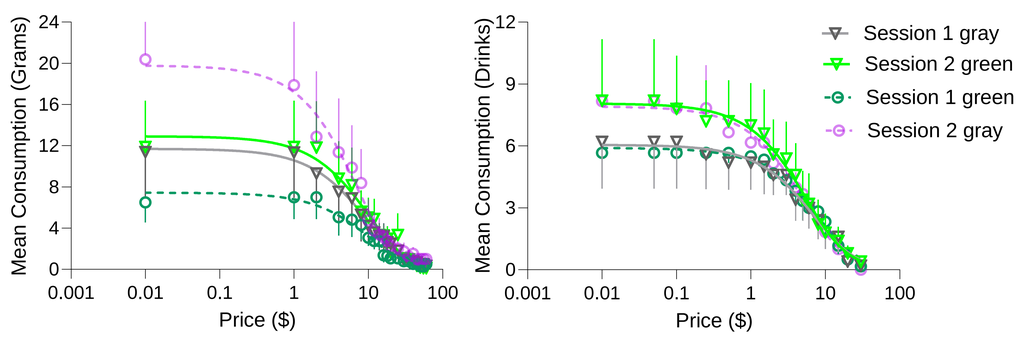

Figure 1. Simulated purchasing by cannabis users (left panel; n = 5 Session 1 gray & Session 2 green; n = 4 Session 1 green & Session 2 gray) and alcohol users (right panel; n = 7 Session 1 gray & Session 2 green; n = 6 Session 1 green & Session 2 gray). Lines represent the nonlinear regression fit of the exponentiated demand equation to the mean data points. R^2 range .97 - .99.

Table 1. Cannabis and alcohol demand parameters (mean)

Cannabis	Intensity (Q_0)	Elasticity (α)	p	Alcohol	Intensity (Q_0)	Elasticity (α)	p
Session 1 gray	12.86	0.01314	ns	Session 1 gray	6.14	0.01052	ns
Session 2 green	13.57	0.00830	ns	Session 2 green	8.17	0.00821	ns
Session 1 green	7.44	0.00410	ns	Session 1 green	6.10	0.00639	ns
Session 2 gray	20.86	0.00193	ns	Session 2 gray	8.32	0.00540	ns

Table 2. Paired samples t-test comparing green vs. grayscale slideshow for acute pain – post-slideshow and PCS

Group	N	Mean	SD	t	df	p
Green slideshow – Post Acute Pain	22	4.05	2.40	-1.022	21	.318
Gray slideshow – Post Acute Pain	22	4.36	2.34			
Green slideshow – PCS	22	24.91	13.03	-0.332	21	.743
Gray slideshow – PCS	22	25.41	12.02			

Results

Table 3. Sample characteristics

Age *[M (SD), range]*	45 (13.1), 22-69
Gender [n, (%)]	
Female	11 (50)
Male	10 (45.5)
Non-binary	1 (4.5)
Days in the past month they experienced pain	27 (5.9)
McGill Short-Form Pain Scores *[M (SD), range]*	22.6 (10.6), 7-42
Alcohol users (preferred substance)	11 (50)
Cannabis users (preferred substance)	11 (50)
Alcohol + cannabis co-users	18 (81.8)
Taking medications to manage their pain	18 (81.8)
Using alcohol to help cope with pain	15 (71.4*)
Using cannabis to help cope with pain	18 (94.7*)
Alcohol + cannabis co-use to help cope with pain	12 (66.7*)

* Using alcohol to help cope with pain total sample size n = 21; Using cannabis to help cope with pain total sample size n = 19;.

Discussion

- Data collection is ongoing. Results are unclear on the effect green and grayscale nature visual stimuli have on pain and drug demand.
- However, preliminary data support the prospect of the green nature slideshow to reduce demand (particularly intensity) for cannabis. The results for alcohol are unclear.
- Initial data show the possibility of an order effect of color scale exposure for cannabis users. Green nature slideshows reduced cannabis consumption compared to their grayscale counterparts.
- Specifically, when the green nature slideshow was presented first and grayscale slideshow second, potential order effects were most pronounced (mean consumption lower for green vs grayscale).
- Despite lack of significance, exposure to the green scale slideshow slightly reduced acute pain and pain catastrophizing compared to the grayscale slideshow, regardless of substance use preference.
- Limitations: small sample size, crowdsourcing platform, lack of diversity, and self-reported pain and substance use.
- More research in this area is needed to examine the possibility of using green nature visual stimuli (e.g., slideshows) and actual nature exposure as a complementary treatment target for those who experience pain and self-medicate with substances and/or take medication to manage their pain. Additionally, further research is required to understand the underlying mechanisms of this nature stimuli effect.

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