

Background

- Cannabis use has been linked to a decrease in motivation, which has been coined *amotivational syndrome*
- Past literature for amotivational syndrome has had mixed findings

Aims

- Investigate whether there are differences in effort-based decision making on the Effort Expenditure for Rewards Task (EEfRT) in frequent adult cannabis users and healthy controls
- Determine whether frequent cannabis users and healthy controls differ in self-reported apathy
- Examine whether behavioral performance on the EEfRT is correlated to self-reported apathy

Participants

- 30 cannabis users and 30 controls, matched on age, sex, race, ethnicity, income, and education level
- Average age: 22.6 years old

Exclusionary Criteria

- Pregnancy
- Neurological or serious medical conditions requiring treatment
- Current use of prescription psychotropic or steroid medication
- Self-reported medical diagnosis of any psychiatric disorder
- Prenatal exposure to alcohol or drugs

Cannabis Users

- Cannabis use on ≥ 3 days/week in the past year; less than 15 lifetime illicit substance use occasions

Controls

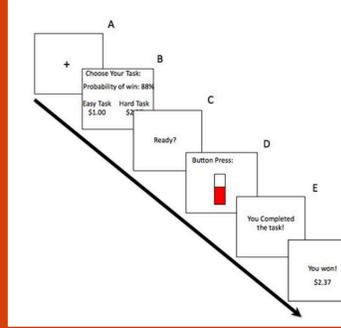
- ≤ 1 day/month of cannabis use in the past year
- No past month cannabis use, heavy drinking, or lifetime illicit substance use

Methods

- Abstinence from substance use 12 hours prior to the study
- Breathalyzer/urine toxicology screen
- Repeated measures Analysis of Covariance, controlling for depressive symptoms and alcohol use; Spearman's correlation

Effort Expenditure for Rewards Task

- 20-minute computer-based task
- Easy Task (Low Effort)
 - 'L' key with index finger (30 button presses in 7 seconds)
- Hard Task (High Effort)
 - 'S' key with pinky finger (100 button presses in 21 seconds)
- Probability ranges: 12%, 50%, 88%
- Reward magnitude ranges: \$1.24-4.30



Demographic, Substance Use, Psychological Characteristics

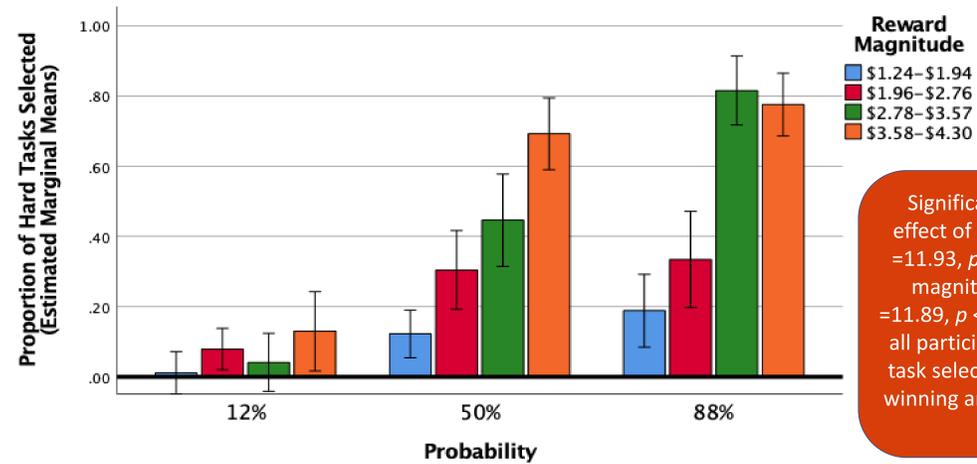
	Cannabis Users (N=30)	Controls (N=30)	U, X ² , t	p
Age	23.8	21.4	566	0.08
Sex (M/F)	18/12	18/12	<0.001	1.00
Age at first use of cannabis	16.63(2.93)	18.50 (2.38) ¹	1.22	0.23
# of cannabis use days in past 30 days	20.7(8.89)	0	900.0	<0.001
# of alcohol use days in past 30 days	5.90(4.84)	2.47(3.27)	-3.41	0.001
Beck Depression Inventory (BDI-II) Total Score	7.47(5.97)	3.27(2.49)	-2.90	0.005
Apathy Evaluation Scale (AES) Total Score	43.30(7.06)	47.07(5.19)	297.0	0.02

Note. Mean (standard deviation).

¹Note. Only 4 controls reported lifetime cannabis use.

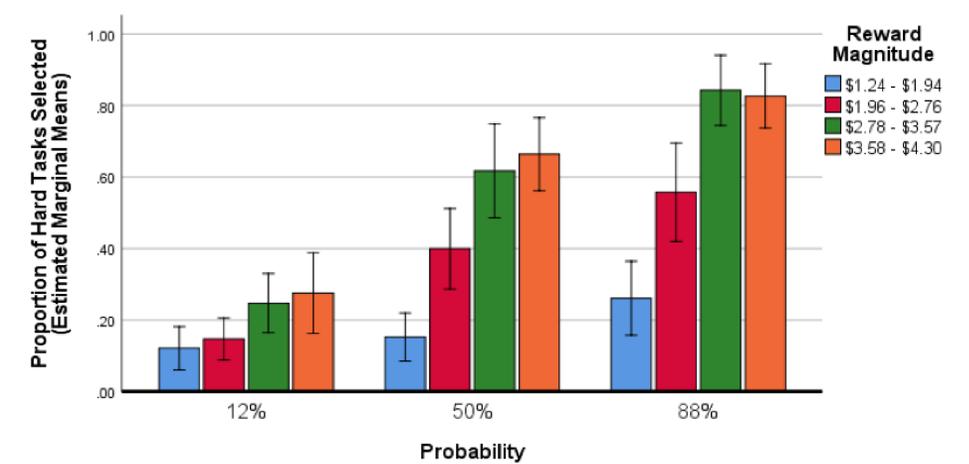
Results

Proportion of Hard Tasks Selected by Trial Type for Healthy Controls



Covariates appearing in the model are evaluated at the following values: log transform of TLFB alcohol total = .5561, Log transform of BDI total score = .6698
Error bars: 95% CI

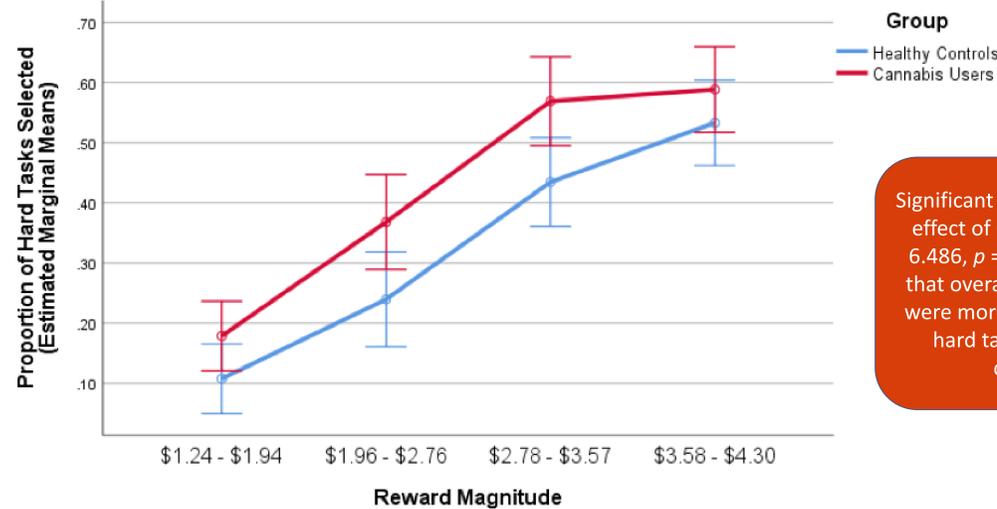
Proportion of Hard Tasks Selected by Trial Type for Cannabis Users



Covariates appearing in the model are evaluated at the following values: log transform of TLFB alcohol total = .5561, Log transform of BDI total score = .6698
Error bars: 95% CI

Significant within-subjects effect of probability ($F(2,112) = 11.93, p < 0.001$) and reward magnitude ($F(2.83,158.6) = 11.89, p < 0.001$) indicates that all participants increased hard task selection as probability of winning and reward magnitude increased

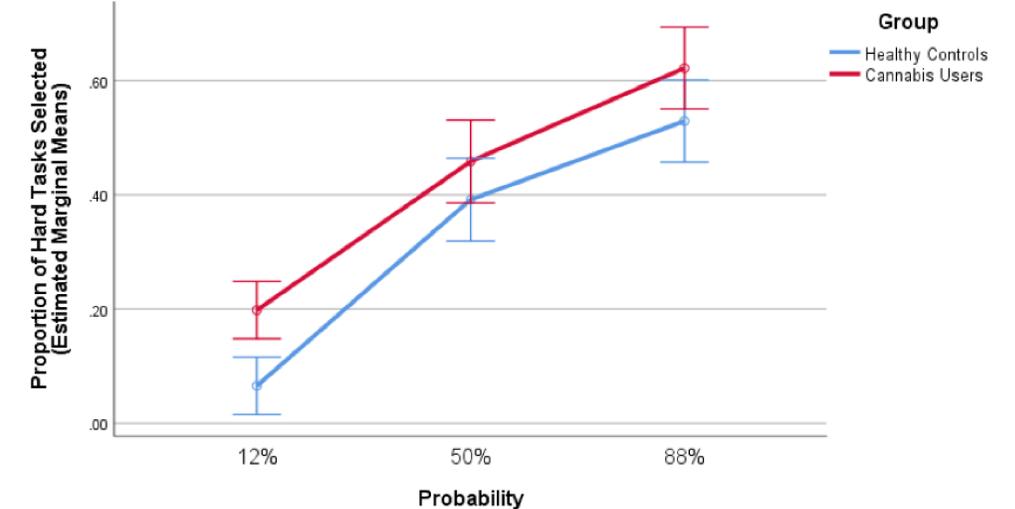
Proportion of Hard Tasks Selected by Reward Magnitude



Covariates appearing in the model are evaluated at the following values: log transform of TLFB alcohol total = .5561, Log transform of BDI total score = .6698

Significant between-subjects effect of Group ($F(1,56) = 6.486, p = 0.014$) suggests that overall cannabis users were more likely to choose hard tasks relative to controls

Proportion of Hard Tasks Selected by Probability



Covariates appearing in the model are evaluated at the following values: log transform of TLFB alcohol total = .5561, Log transform of BDI total score = .6698

Summary and Discussion

- Findings do not support amotivational syndrome
- Cannabis users consistently selected high-effort trials across all trial types
- Results suggest cannabis users may have difficulty integrating decision making information or exhibit atypical reward processing
- Self-reported apathy was no longer significantly different between groups p after controlling for depressive symptoms and alcohol use, nor was it related to task performance