Initial validation of a brief assessment of cannabis demand among young adult college students

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1. INTRODUCTION

- Individual differences in cannabis's reinforcing value (i.e., demand) are associated with risky behaviors and cannabis use disorder (CUD) symptomatology

- The Marijuana Purchase Task (MPT) quantifies demand by assessing hypothetical cannabis consumption across escalating price points. Indices derived from MPT performance include:
  - Intensity: Number of hits consumed at $0
  - O_{max}: Maximum expenditure
  - P_{max}: Price at maximum expenditure
  - Breakpoint: Price at which consumption drops to 0
  - Elasticity: Rate at which consumption decreases with increasing price

- Most research has examined substance demand between-subjects, yet demand is sensitive to internal and external contexts and can fluctuate at the daily level

- The length of traditional purchase tasks (e.g., MPT) makes repeated assessment challenging thus limiting clinical utility

- Brief measures of alcohol and cigarette demand exist that assess intensity, O_{max}, and breakpoint

- The aim of the current study was to develop and validate a brief assessment of cannabis demand

2. METHOD

Participants & Procedures: Young adult college students ages 18-25 completed an online survey (*N*=211). In the past 30 days, participants consumed cannabis at least 3 times

Measures:
- *Socio-demographics* included age, sex, race/ethnicity and past month discretionary income (in USD).
- *Cannabis Use:* Single-item measure assessing cannabis use frequency in the prior 30 days.
- *Cannabis Use Disorder* (CUD; First et al., 2015): Online CUD assessment using adapted version of DSM-5 SCID including 11 CUD symptoms in the past year with binary yes/no response options.
- *Marijuana Problems Index* (MPI; White et al., 2015): 25-item self-report measure of past 30-day cannabis-related negative consequences on a 5-point rating scale ranging from "*never*" to "*more than 10 times*". The total score was used in all analyses.
- *Cannabis Craving:* Single-item where participants rated their "current level of desire for marijuana" on an 11-point scale ranging from "*no desire*" to "*greatest possible desire*".
- *Marijuana Purchase Task* (MPT; Aston et al., 2015): Self-report measure assessing cannabis demand whereby participants indicate how many hits of a joint they would purchase across 22 escalating prices ranging from $0 - $10 under uniform, pre-specified conditions. Performance on the MPT yields five indices: Intensity, breakpoint, O_{max}, P_{max}, and elasticity.
- *Brief Assessment of Marijuana Demand* (BAMD). 3-item self-report measure assessing how many hits of cannabis participants would take if they were free (i.e., intensity), the total amount they would spend on cannabis (i.e., O_{max}), and the maximum amount they would pay for a single hit of cannabis (i.e., breakpoint).

Data analyses: Variables of interest with outliers and distributional abnormalities were winsorized and transformed (e.g., log), respectively, which brought skew to acceptable levels. Bivariate correlations tested relations of demand indices on the BAMD, MPT, and cannabis outcome measures. Independent samples t-tests tested whether BAMD demand indices differed based on binary CUD status. One-way between-subjects ANOVAs with planned comparisons tested effects of CUD severity (mild/moderate/severe) on BAMD demand indices.

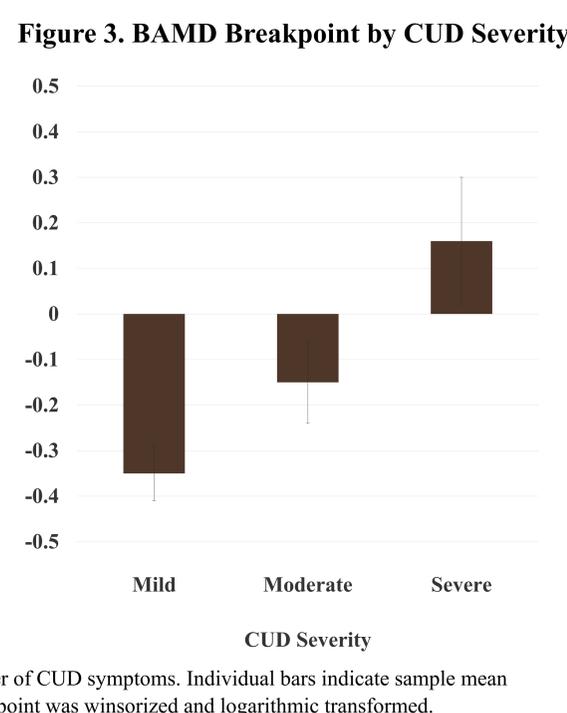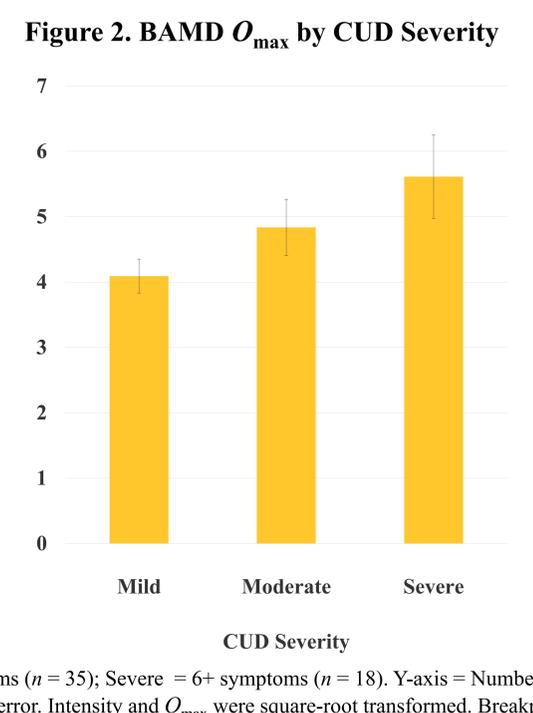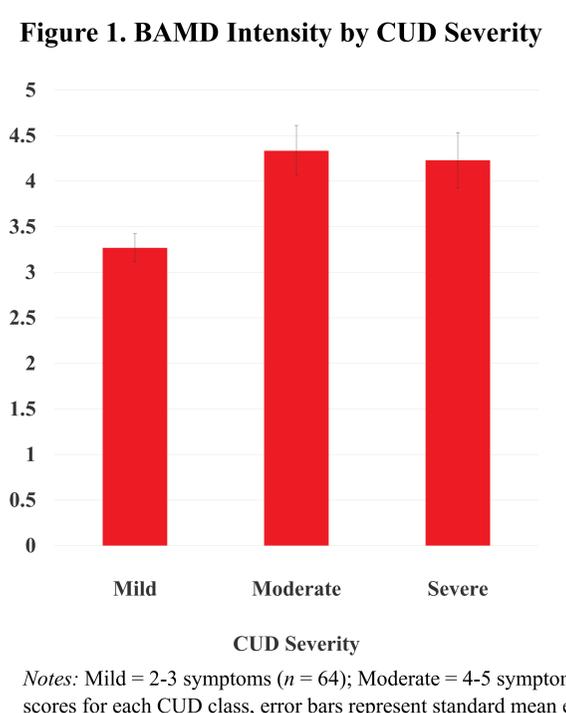### Table 1. Sample Descriptive Statistics

N = 211	M (SD), range	%
Age (in years)	19.91 (1.44), 18 – 25	-
Sex (% Male)	-	37
Race (% Non-Hispanic Caucasian)	-	56.4
Discretionary spending (USD)[a]	187.8 (187.5), 0 – 1001	-
Cannabis-related variables		
Past-month cannabis use days	10.62 (8.06), 3 – 31	-
Cannabis craving	3.69 (2.79), 0 – 10	-
Age of cannabis initiations (years)	16.43 (1.79), 12 – 21	-
CUD symptom count	2.39 (2.35), 0 – 11	-
Marijuana Problem Index[b]	10.37 (10.9), 0 – 51	-
Cannabis demand indices[c]		
BAMD: Intensity	12.69 (11.04), 0 – 51	-
MPT: Intensity	13.06 (10.30), 0.9 – 41	-
BAMD: O_{max}	21.88 (22.37), 0 – 101	-
MPT: O_{max}	6.09 (7.45), 0 – 32.25	-
BAMD: Breakpoint	1.07 (1.72), 0 – 50	-
MPT: Breakpoint	2.16 (2.27), .25 – 9.25	-

Notes: [a]winsorized for outliers, n=208; [b]Marijuana Problem Index winsorized for outliers; [c]All demand indices winsorized for outliers but not transformed

Table 2. Bivariate Correlations among Study Variables

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. BAMD Intensity[a]	-										
2. BAMD O_{max}[a]	.44**	-									
3. BAMD Breakpoint[b]	.15*	.28**	-								
4. MPT Intensity	.79**	.28**	.02	-							
5. MPT O_{max}[a]	.41**	.34**	.55**	.35**	-						
6. MPT Breakpoint[b]	.16*	.30**	.62**	.06	.81**	-					
7. Discretionary income[a]	.03	.12	.08	.05	.11	.04	-				
8. Past-month cannabis use	.46**	.27**	.07	.48**	.20**	.04	.22**	-			
9. Cannabis Craving	.44**	.26**	.24**	.40**	.31**	.23**	.15*	.29**	-		
10. CUD (yes/no)	.37**	.23**	.04	.35**	.19**	.09	.04	.34**	.33**	-	
11. CUD Severity	.44**	.29**	.18*	.48**	.32**	.20**	.16*	.34**	.42**	.82**	-
12. MPI Total Score	.36**	.31**	.26**	.37**	.33**	.22**	.12	.33**	.34**	.43**	.67**

Notes: *$p < .05$; **$p < .01$; [a]Square-root transformed; [b]Logarithmic transformed

Figure 1. BAMD Intensity by CUD Severity

Figure 2. BAMD O_{max} by CUD Severity

Figure 3. BAMD Breakpoint by CUD Severity

Notes: Mild = 2-3 symptoms (*n* = 64); Moderate = 4-5 symptoms (*n* = 35); Severe = 6+ symptoms (*n* = 18). Y-axis = Number of CUD symptoms. Individual bars indicate sample mean scores for each CUD class, error bars represent standard mean error. Intensity and O_{max} were square-root transformed. Breakpoint was winsorized and logarithmic transformed.

3. RESULTS

- BAMD and MPT demand indices positively correlated. With few exceptions, intensity, O_{max}, and breakpoint related to cannabis outcomes (Table 2)

- CUD+ (vs CUD-) had significantly elevated intensity and O_{max}, but not breakpoint

Intensity	CUD+: M = 3.7, SD = 1.5	
	CUD-: M = 2.7, SD = 1.1	*t*(209) = 5.9, p = <.001
O_{max}	CUD+: M = 4.6, SD = 2.4	
	CUD-: M = 3.5, SD = 2.0	*t*(209) = 3.4, p = .001
Breakpoint	CUD+: M = -0.2, SD = 0.5	
	CUD-: M = -0.3, SD = 0.6	*t*(209) = 0.6, p = .525

- Significant main effect of CUD severity on:

Intensity: [F(2, 114) = 8.113, p = .001]; Mild < Moderate and Severe, p < .001; Moderate = Severe, p = .794 (Fig 1)

O_{max}: [F(2, 114) = 3.372, p = .038]; Mild < Moderate and Severe, p = .012; Moderate = Severe, p = .254 (Fig 2)

Breakpoint: [F(2, 114) = 7.286, p = .001]; Mild > Moderate and Severe, p < .001; Moderate < Severe, p = .042 (Fig 3)

4. DISCUSSION

- This is the first study to develop and validate a brief assessment of cannabis demand

- Consistent with prior brief demand assessments, cannabis demand indices were related across the MPT and BAMD

- Demand indices were positively associated with cannabis outcomes, with few exceptions (i.e., breakpoint and use)

- The BAMD espoused convergent validity with the MPT and divergent validity by differentiating individuals with and without a CUD and along the CUD severity continuum

- Limitations include an inability to evaluate elasticity on the BAMD and the use of "hits" as the unit of measurement. The current study also enrolled college students, thus further replication is needed among more diverse populations

- Given the rise in novel cannabis products with different modes of administration and varying potencies, future research should examine whether demand differs based on these factors

- To further determine the clinical utility of the BAMD, future research should examine its predictive utility with cannabis outcomes and treatment response within clinical settings and populations over time

Contact Information