Competing Measurement Models for the Measurement of Cannabis Protective Behavioral Strategies

Kaelyn G. Gieske, Joey C. Mok, Matthew R. Pearson, Addictions Research Team
Center on Alcohol, Substance use, And Addictions, University of New Mexico

CENTER ON ALCOHOL, SUBSTANCE USE & ADDICTIONS

INTRODUCTION

- Cannabis **protective behavioral strategies (PBS)** are a strong protective factor linked to reduced cannabis use, fewer negative cannabis-related consequences, and fewer **cannabis use disorder (CUD)** symptoms (Richards et al., 2022)
- The **Protective Behavioral Strategies for Marijuana (PBSM**; Pedersen et al., 2016) scale is the most used measure of cannabis PBS (55 of 59 articles)
- Early research suggested the PBSM scale had a one-factor (unidimensional) structure (Pedersen et al., 2017), with more recent psychometric studies proposing a two-factor structure that includes a Quantity (strategies that limit how much cannabis is used) and Context (strategies that reduce social or situational problems related to use) factor (Mian et al., 2021)
- However, studies using standard continuous estimators have found only marginal model fit for the two-factor structure (Mian et al., 2021)
- The present study sought to examine the factor structure of the PBSM across three datasets of college student cannabis users
- We expected that the marginal fit found in previous research may be due to PBSM items being non-normally distributed and skewed, which likely warrants treating as categorical rather than continuous variables

METHOD

PARTICIPANTS

- College students were recruited from one of 10 universities across three consecutive years of data collection by the Addictions Research Team
- Our analytic samples were restricted to past 30-day cannabis users (**ART2** N = 1,200; **ART3** N = 1,308; **ART4** N = 607)

MEASURES

- Cannabis PBS were assessed using the 17-item version of the Protective Behavioral Strategies for Marijuana scale (PBSM; Pedersen et al., 2017)
- Cannabis use frequency was assessed with a single item of number of days used in the past 30 days
- Negative cannabis-related consequences were assessed using the brief 21-item version of the Marijuana Consequences Questionnaire (MACQ; Simons et al., 2012)
- CUD symptoms were assessed using the 8-item Cannabis Use Disorder Identification Test-Revised (CUDIT-R; Adamson et al., 2010)

ANALYSIS PLAN

- We compared one-factor and two-factor models of the PBSM using two estimation methods: 1) Maximum Likelihood with Robust standard errors (MLR) treating items as continuous, and 2) Weighted Least Squares Mean and Variance adjusted (WLSMV) treating items as categorical
- Analyses were conducted separately across the three samples

RESULTS

Table 1. CFA Fit Statistics			
1-Factor	CFI	RMSEA	SRMR
ML estimator	.838	.080	.058
WLSMV estimator	.885	.134	.052
2-Factor	CFI	RMSEA	SRMR
ML estimator	.891	.071	.050
WLSMV estimator	**.937**	**.111**	**.041**
1-Factor	CFI	RMSEA	SRMR
ML estimator	.839	.078	.053
WLSMV estimator	.883	.111	.052
2-Factor	CFI	RMSEA	SRMR
ML estimator	.897	.067	.045
WLSMV estimator	**.936**	**.088**	**.042**
1-Factor	CFI	RMSEA	SRMR
ML estimator	.837	.075	.056
WLSMV estimator	.917	.098	.055
2-Factor	CFI	RMSEA	SRMR
ML estimator	.898	.061	.048
WLSMV estimator	**.952**	**.077**	**.044**

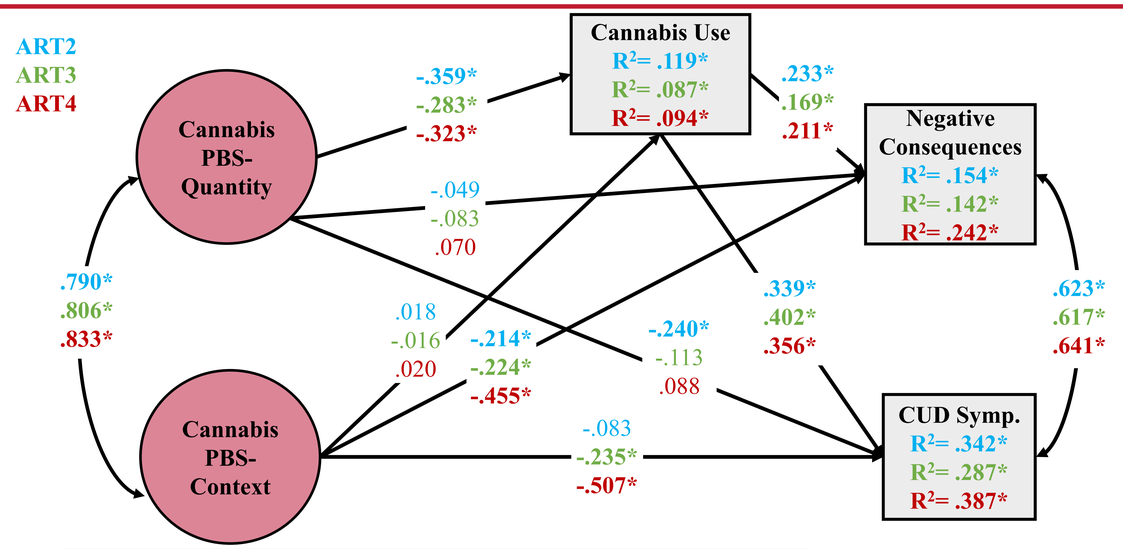

Figure 1. SEM of Cannabis PBS Predicting Cannabis-Related Outcomes **BOLD*= Significant**

RESULTS

- A 2-factor model of the PBSM fit substantially better than a 1-factor model, and treating indicators as categorical fit better than treating them as continuous (see Table 1 for fit statistics and Table 2 for factor loadings)
- The Quantity factor was strongly associated with less cannabis use, which was in turn related to lower negative consequences and CUD symptoms (see Figure 1)
- Reduced cannabis use mediated the relationship between the Quantity factor and fewer negative consequences and CUD symptoms
- The Context factor did not significantly predict cannabis use frequency, but showed a direct, significant association with fewer negative consequences and lower CUD symptoms.

Table 2. Factor Loadings for 2-Factor Model	ART2		ART3		ART4	
	Quantity	Context	Quantity	Context	Quantity	Context
Use marijuana only among trusted peers		.689		.490		.420
Avoid use while spending time with family		.663		.622		.576
Avoid using marijuana before work or school		.794		.762		.691
Avoid using marijuana to cope with emotions such as sadness or depression		.544		.530		.485
Only purchase marijuana from a trusted source		.634		.517		.443
Use a little and then wait to see how you feel before using more	.753		.689		.680	
Avoid mixing marijuana with other drugs		.712		.630		.572
Avoid using marijuana in public places		.695		.742		.684
Buy less marijuana at a time so you smoke less	.598		.616		.550	
Have a set amount of "times" you take a hit (e.g., passing on a shared joint if you have already hit that limit)	.685		.711		.692	
Avoid methods of using marijuana that can make you more intoxicated than you would like (e.g., using large bongs, volcano, 'edibles,' etc.).	.739		.702		.724	
Only use one time during a day/night	.816		.777		.760	
Limit the amount of marijuana you smoke in one sitting	.819		.836		.858	

DISCUSSION

- The findings suggest that the PBSM is a multi-faceted construct best modeled by treating its indicators as categorical rather than continuous
- From a clinical perspective, the results highlight the distinct utility of different types of strategies
- Quantity-based strategies appear especially important for reducing overall cannabis consumption
- Context-based strategies may function as a direct protective buffer against cannabis-related harms, independent of level of use
- Cannabis harm-reduction interventions should target these divergent pathways to optimize outcomes among student populations
- Our reliance on retrospective self-report of all constructs is a serious limitation, and ecological momentary assessment studies are needed to examine these relationships at the episode-level

CONTACT

Email:
kgieske@unm.edu
Website:
https://mateolab.yolasite.com/

We would like to acknowledge members of the Addictions Research Team (ART) who contributed to data collection.

ART 2:

Matthew R. Pearson, University of New Mexico (Coordinating PI); Adrian J. Bravo, William & Mary (site PI); Bradley T. Conner, Colorado State University – Fort Collins (site PI); Carrie Cuttler, Washington State University (site PI); Craig A. Field, University of Texas at El Paso (site PI); Vivian Gonzalez, University of Alaska - Anchorage (site PI); James M. Henson, Old Dominion University (site PI); Jon M. Houck, Mind Research Network; Kevin M. King, University of Washington (site PI); Benjamin O. Ladd, Washington State University (site PI); Kevin S. Montes, California State University – Dominguez Hills (site PI); Mark A. Prince, Colorado State University – Fort Collins (site PI); Maria M. Wong, Idaho State University (site PI).

ART 3:

Matthew R. Pearson, University of New Mexico (Coordinating PI); Adrian J. Bravo, William & Mary (site PI); Bradley T. Conner, Colorado State University – Fort Collins (site PI); Carrie Cuttler, Washington State University (site PI); Craig A. Field, University of Texas at El Paso (site PI); Vivian Gonzalez, University of Alaska - Anchorage (site PI); James M. Henson, Old Dominion University (site PI); Jon M. Houck, Mind Research Network; Kevin M. King, University of Washington (site PI); Benjamin O. Ladd, Washington State University (site PI); Kevin S. Montes, California State University – Dominguez Hills (site PI); Mark A. Prince, Colorado State University – Fort Collins (site PI); Maria M. Wong, Idaho State University (site PI).

ART 4:

Matthew R. Pearson, University of New Mexico (Coordinating PI); Adrian J. Bravo, William & Mary (site PI); Bradley T. Conner, Colorado State University – Fort Collins (site PI); Carrie Cuttler, Washington State University (site PI); Robert D. Dvorak, University of Central Florida (site PI); James M. Henson, Old Dominion University (site PI); Kevin M. King, University of Washington (site PI); Benjamin O. Ladd, Washington State University (site PI); Kevin S. Montes, California State University – Dominguez Hills (site PI); Dylan K. Richards, University of Georgia (site PI); Maria M. Wong, Idaho State University (site PI).