A Latent Growth Curve Analysis: Approximating Spill-over Effects of an Alcohol-focused Brief Intervention on Marijuana Use

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Introduction

Alcohol consumption is the third leading cause of preventable death in the United States.[12] Additionally, marijuana is the most frequently reported illicit drug in developed countries[2] and is found in approximately one third of drug-related emergency department admissions.[15] When used concurrently, alcohol and marijuana use is frequently found to be associated with impaired driving,[10] injury,[14] and other negative consequences,[18] as well as increased binge alcohol use.[17] Researchers have found that conjoint alcohol and marijuana use increases the likelihood of alcohol abuse, with odds increasing as levels of marijuana use increase.[3]

Emergency department (ED) patients who admit to using both alcohol and marijuana have reported increased negative consequences. While evidence indicates conjoint use of alcohol and marijuana lead to related problems, researchers have also found these users to report high levels of motivation to change.[17] Despite this, few clinical intervention trials have investigated addressing this concurrent use and how it may guide interventions. Fewer studies have explored parallel change in both alcohol and marijuana after intervention efforts use across time.

Brief motivational intervention (BMI) has demonstrated positive outcomes for both alcohol and marijuana among ED patients.[13,16] While some researchers have demonstrated reductions in both alcohol and marijuana use after a multi-targeted intervention (i.e. an intervention that addresses multisubstance use),[7, 8, 16] other evidence has indicated only short-term changes in alcohol but no changes in marijuana use following a similar, multi-targeted BMI.[1, 6]

The present study is particularly interested in the secondary effects of a BMI that targets alcohol use on marijuana use, (i.e., spill-over effect). The behavioral spill-over effect framework[4] postulates the following :

1. Behaviors 1 and 2 are linked by underlying mutual motives, motives which drive future behavior.
2. Behavior 1 is targeted by an intervention, and we are curious as to what happens to Behavior 2 as a result of this intervention

Therefore, given the associations between alcohol and marijuana use and related problems, consideration of secondary effects of alcohol interventions other substance use is important. Research has previously supported secondary effects of an alcohol intervention on marijuana use.[11] However, other research found increased use of marijuana and decreased use of alcohol following an alcohol-focused intervention among college students.[7] Given the limited and mixed results in the literature regarding the behavioral intervention spill-over literature on alcohol and marijuana use, further attention to such effects is needed.

Study Aims

The purpose of this study was to explore and approximate the presence of a spill-over intervention effect of an alcohol-focused BMI on marijuana use by estimating parallel change in both alcohol and marijuana use over time.

Methods

Participants and Procedure

596 patients were recruited from 3 urban level I trauma centers: Baylor University Medical Center (Dallas, TX; 52.5%), Methodist (Dallas, TX; 6.6%), and University Medical center Brackenridge (Austin, TX; 40.9%). Eligible participants were consented, screened for heavy drinking, and randomly assigned to either brief advice (BA; n = 200), brief motivational intervention (BMI; n = 203), or BMI + booster with personalized feedback (BMI+B; n = 193). Participants were compensated for their participation at baseline and throughout the 3-, 6-, and 12-month telephone follow-ups.

Measures

Although this study reports results on several alcohol outcome variables, all assessments also included patient reports of history of injury and related risk behavior, social support, health outcomes, physical functioning, and legal problems.

Marijuana Use.

At baseline, 3-, 6-, and 12- month follow-up, participants were asked to report how many days of the past 90 they had used marijuana, hashish, or other forms of THC.

Primary Drinking Variables.

Using self-reported data, the timeline follow back method was used to assess drinking outcomes during the past 3 months for baseline, 3- and 6-month follow up, and during the past 6 months for 12 month follow up. Drinking outcome variables calculated were the average number of standard drinks consumed per week, percent days of heavy drinking, maximum number of standard drinks consumed on one occasion, and average number of standard drinks consumed per drinking day.

Interventions.

BA presented minimal information regarding alcohol screening results, general recommendations to quit/cut down, and identification of community services. The average BA session lasted ≈ 4.7 minutes (SD = 2.2).

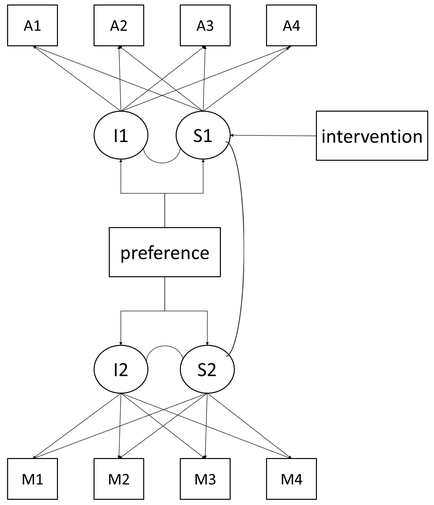
BMI follows the primary components of motivational interviewing, acknowledging patient autonomy, providing personalized feedback, assessing causal attribution, exploring pros and cons, assessing importance and confidence, and supporting patient self efficacy. The average BMI session lasted ≈ 22.5 minutes (SD = 10.4).

BMI+B received the BMI just described, with the addition of a telephone booster session 30 days later. The booster session comprised of personalized feedback from the baseline interview compared to sex-specific national norms, risk indicators, total AUDIT score, and reported alcohol-related consequences. The average BMI+B session lasted ≈ 28.0 minutes (SD = 10.4).

Approach to Analyses

Given the difficultly presented when attempting to observe behavior change directly, change in the slope of self-reported alcohol and marijuana use was assessed using a parallel latent growth curve analysis. A missing not-at-random multiple imputations were conducted using MPLUS.[5] Model fit was assessed using Hu & Bentler's (1999) suggested joint criteria for model fit: nonsignificant χ^2, $M_{RMSEA} \leq .06$, $M_{CFI} \geq .90$, $M_{SRMR} \leq .08$).

Parallel Growth Model:



Results

Participants were 77.5% male, 40% White, M_{age} = 34.5. Descriptive explorations of the data were used to check distributional assumptions and missing patterns. The exploration found average number of standard drinks, percent of days heavy drinking, and maximum number of drinks, to approximate missing not-at-random patterns with an average attrition rate of 250 participants. Therefore, the proposed model with either of the four outcome variables did not approximate the data.

Table 1: Descriptive Statistics

Variable	Baseline		3 months		6 months		12 months	
	μ	σ	μ	σ	μ	σ	μ	σ
Marijuana use (past 90 days)	14.54	28.55	8.96	23.53	7.89	22.47	14.73	41.85
Percent days of heavy drinking	23%	.275	10%	.218	14%	.259	17%	.286
Average number of standard drinks consumed per week	19.22	31.49	8.73	23.80	12.08	28.39	13.56	29.24
Total number of standard drinks consumed per drinking day	7.30	6.05	6.22	5.56	6.79	5.74	6.84	6.27
Maximum number of standard drinks on any one occasion	13.66	11.37	7.40	16.60	8.68	15.70	10.06	13.37

Table 2: Model Fit Indices

Outcome Variable	X^2, SD, df	RMSEA	CFI	SRMR
Percent days of heavy drinking	330.410, 8.814, 51	.102	.826	.073*
Average number of standard drinks consumed per week	247.368, 9.273, 51	.085	.849	.076*
Average number of standard drinks per drinking day	270.516, 13.784, 51	.09	.843	.074*
Maximum number of standard drinks on any one occasion	549.527, 18.037, 51	.136	.71	.163

Note: ** p< .01, *p < .05

Discussion

The results suggest that our models approximating the presence of a spill-over effect of a BMI targeting alcohol on marijuana use did not result in appropriate fit to these data. While attrition in this study was accounted for by the multiple imputation method, exploration of this type of growth model in other data sets should not be discounted.

The use of a latent growth model in this study to estimate changes in self-reported substance use presents a novel approach in assessing the aims of this study. Rather than assuming change in substance use by comparing average differences at different time points, a latent growth model allows for closer approximation of changes in self-reported user rates by examining the slope of change across time points.

Future research of spill-over effects could assess latent change in marijuana use independent of change in alcohol, investigating the possibility of an unparalleled relationship in change after a targeted BMI. Such findings might indicate the presence of BMI influence beyond the targeted scope of the intervention unrelated to target behavior change when substance use preference is indicated.

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