



Full length article

## Adolescents, alcohol, and marijuana: Context characteristics and problems associated with simultaneous use



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### ABSTRACT

We investigated contexts of simultaneous use of alcohol and marijuana and the impact of simultaneous use on problems among adolescents. Ecological momentary assessment data were obtained over two weekends from 150 adolescents in California (47% female, *M* age = 16.36 years), using smartphone surveys administered early and late in the evening and again the following morning. We assessed whether, in what context, and with whom adolescents drank alcohol and used other substances over 3 evening hours. We assessed problems they experienced each evening on the following morning. Results showed that greater adult supervision in every context was associated with a 55% lower risk of simultaneous use ( $RRR = 0.45, p \leq .05$ ). Contexts with no other underage drinkers were associated with 99% lower risk of simultaneous use ( $RRR = 0.01, p \leq .005$ ). Each occasion of simultaneous use was related to 110% increase in the number of problems ( $IRR = 2.10, p \leq .005$ ), with 83%, 221% and 311% greater odds of violence ( $OR = 1.83, p \leq .05$ ), driving under the influence or riding with a drunk driver ( $OR = 3.21, p \leq .05$ ), or being drunk ( $OR = 4.11, p \leq .005$ ). Additional analyses showed that these problems may be attributed largely to the alcohol consumed in each context. Results demonstrate that it is essential to consider situational and social characteristics of substance use contexts to better understand adolescent simultaneous use of alcohol and drugs and problems.

### 1. Introduction

Alcohol and marijuana are the most commonly used drugs by adolescents in the U.S. (Miech et al., 2016). Although simultaneous use (i.e., use of more than one substance within a few hours) is common among young substance users (Pape et al., 2009; Schepis et al., 2016; Subbaraman and Kerr, 2015), we know very little about contexts and risks associated with simultaneous use of alcohol and marijuana. We know that risks for underage drinking vary from one context to another and that drinking contexts, independently of how much a person drinks, are related to specific problems (Bersamin et al., 2016; Lipperman-Kreda et al., 2015; Mair et al., 2015), but we do not know if contexts of simultaneous alcohol and marijuana use are unique or whether simultaneous use leads to greater problems.

A small but growing body of research has investigated risks associated with concurrent substance use (i.e., use of multiple substances but not necessarily at the same time). Concurrent substance use appears to be associated with more frequent use (Conway et al., 2013; Dierker et al., 2007), dependence (Moss et al., 2014), mental and physical health problems (Brooks-Russell et al., 2015), sexual risk taking (Connell et al., 2009), violence (Parker and Bradshaw, 2015), and high

school non-completion (D'Amico et al., 2016). The small literature that has addressed adolescent simultaneous use suggests that simultaneous use of alcohol and marijuana is associated with unsafe driving (Terry-McElrath et al., 2014) and other substance-related problems (e.g., legal, academic, relational; Briere et al., 2011). However, this limited cross-sectional research has relied on retrospective data and has not compared impacts of simultaneous use with alcohol use only and marijuana use only to gain an understanding of how problems are uniquely related to these specific substance use patterns.

Furthermore, no studies have investigated contexts of adolescents' simultaneous substance use. Substance use context is defined as the location, and situational and social characteristics of a specific substance use event (Freisthler et al., 2014). Limited research has found that situational (e.g., lack of adult supervision, alcohol availability, and lack of enforcement) and social (e.g., group size) context characteristics contribute to increased adolescent alcohol use (Bersamin et al., 2016; Grune et al., 2017; Jackson et al., 2016; Lipperman-Kreda et al., 2015). Characteristics of drinking or substance use contexts may influence alcohol or substance use and problems through increased access and opportunities to engage in risky behaviors (Flewelling et al., 2013; Ryan et al., 2010) or through social modeling, social pressure, or social norms

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(Chan et al., 2017; Handren et al., 2016). If we understand the situational and social contexts in which young people are likely to use substances simultaneously and experience problems, we can develop interventions that target use and risks within these contexts.

To address these gaps in the existing research literature, the current study investigates situational and social contexts of simultaneous use of alcohol and marijuana and subsequent risks for problems among adolescents. We used longitudinal Ecological Momentary Assessment (EMA) data collected from adolescents over two weekends assessing alcohol and marijuana use within a few hours of one another, situational and social characteristics of simultaneous use events, and subsequent problems. We compared context characteristics and problems associated with simultaneous use with those for alcohol use only, marijuana use only, and no substance use in order to gain an understanding of how contexts and problems are uniquely related to different substance use patterns. We tested the following hypotheses:

- (1) Situational characteristics including lack adult supervision, less perceived enforcement, and greater perceived availability of alcohol will be positively related to adolescents' simultaneous use of alcohol and marijuana.
- (2) Social characteristics including greater number of people, having a party, and presence of other underage drinkers will be positively related to adolescents' simultaneous use of alcohol and marijuana.
- (3) Simultaneous use of alcohol and marijuana will have a greater impact on the number of problems as well as the risks for specific problems than the use of either of these substances alone.

## 2. Materials and methods

### 2.1. Sample

#### 2.1.1. Sample of cities and adolescents

Data for the current study were collected from adolescents in 12 midsized California cities that were randomly assigned to control condition for a randomized trial, conducted in 24 midsized California cities, to evaluate effects of environmental strategies to reduce community alcohol problems. A total of 1217 adolescents (15–18 years old) participated in a baseline survey and the estimated response rate was 42%. The selection of cities and sample recruitment have been described elsewhere (Bersamin et al., 2016).

#### 2.1.2. Recruitment of EMA sample

Using the baseline data, we created a list of 252 potential participants in the 12 control sites for the EMA study. Specifically, we considered all participants who self-reported past month drinking ( $N = 126$ ) and matched them with non-past month drinking participants by age, gender, race (non-White versus White) and ethnicity (non-Hispanic versus Hispanic). Potential participants were invited to take part in a study about alcohol and young people using personal smartphones. They were told that the study involved 12 brief text prompted online surveys across two weekends and that they could receive up to \$80 for participating. An invitation postcard was mailed to households, followed by a telephone contact to obtain parental consent and youth assent. Institutional review board approval was obtained prior to implementation of the study.

#### 2.1.3. EMA sample

We recruited 154 adolescents (51% past month drinkers) to participate in the EMA study (61% cooperation rate). Participants represented all 12 control sites and the number of participants per community ranged from 5 to 19. The EMA sample included 46% ( $N = 71$ ) females, 17% ( $N = 26$ ) Hispanics and 77% ( $N = 119$ ) Whites. The average age at baseline was 16.4 years ( $SD = .92$ ).

### 2.2. EMA methods

#### 2.2.1. Timing of EMA surveys

We restricted EMA data collection to the weekends to minimize respondent burden, but capture the maximum number of drinking events, which typically occur on weekends (Kauer et al., 2009). Surveys were conducted Friday evening through Sunday morning over two weekends. Participants received text messages with links to the surveys each day at 8pm, 11pm, and the next morning at 11am for a total of 6 surveys per weekend. Participants received two reminders to complete the surveys and responses were only accepted within a 6-h window. On average, participants completed the surveys within 35 min after receiving the first reminder. Each survey took approximately five minutes to complete. EMA data collection continued for 10 months with 7–8 adolescents participating every 2 weekends.

#### 2.2.2. Incentives

Participants received a visa card, which initially had no value. Incentives were electronically wired to the participants' cards on the Monday morning after each weekend. Participants received \$5 for each completed survey and a \$10 bonus if all 6 surveys were completed each weekend. On average, participants responded to 9.94 of the 12 assessments (83%). The number of completed surveys per participant ranged from 2 to 12, providing a total of 1531 data points.

### 2.3. Outcome measures

#### 2.3.1. Alcohol and marijuana use

In each survey we asked adolescents whether they drank alcohol or used other substances over the past 3 h (i.e., an occasion). The time-frame for each survey was specified (e.g., between 8 and 11 pm), and response options were yes or no. Other substances included (a) cigarettes or other tobacco products, (b) marijuana, and (c) other drugs. Of a total of 1531 data points, 33 (2.1%) involved use of various other drugs (e.g., Cocaine, Ecstasy, Xanax) and 15 (1%) had missing data for these items. In addition, 26 (1.7%) involved tobacco use only, 14 (1%) use of alcohol and tobacco, 16 (1%) use of tobacco and marijuana, and 21 (1.4%) use of alcohol, tobacco and marijuana. We excluded these 125 assessments for the current study and focused on use of alcohol and marijuana. This resulted in the elimination of 4 respondents, leaving us with a sample of 150 adolescents and 1406 assessments for the current investigation. For the analyses, we used a multinomial outcome measure with no substance use as the reference category (0), alcohol use only (1), marijuana use only (2), and simultaneous use of alcohol and marijuana (3).

#### 2.3.2. Problems

In the morning surveys we asked adolescents whether any of the following happened to them the previous night: (a) getting into a verbal argument or a physical fight, (b) getting hurt or injured, (c) getting into trouble with the police, (d) getting into trouble with parents or other adults, (e) having unprotected vaginal sex (e.g., sex without a condom), (f) having vaginal sex or oral sex with someone they had met yesterday, (g) driving after drinking alcohol, (h) riding with a driver who had been drinking alcohol, and (i) getting drunk. Similar questions were asked about problems that happened to other people who were with them that night. Response options for all these items were yes or no. We created the following problem measures by summing the reports of own and other's problems: (a) total number of problems that night, (b) verbal argument, physical fight or injury (i.e., any violence), (c) trouble with police, parents or other adults (i.e., any trouble), (d) risky sex, (e) driving under the influence of alcohol or riding with a drunk driver (i.e., any DUI/RDD), and (f) being drunk.

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