

Predictors and Consequences of Simultaneous Alcohol and Cannabis Use in Adolescents

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Abstract

Background/Aims: The simultaneous use of alcohol and cannabis is common among adolescents, but has been little studied. In this study, we examine predictors and consequences of this behavior in a population-based sample of high school students.

Method: Self-reports were obtained from students in Quebec (Canada) followed throughout high school (N = 6 589). Logistic regressions were used to test the association between individual, family, and peer-related predictors in grades 7-8 and simultaneous alcohol and cannabis use in grade 10, as well as between simultaneous alcohol and cannabis use in grade 10 and substance-related problems of various types (legal, physical, etc. in grade 11).

Results: Most predictors in grades 7-8 were associated with simultaneous alcohol and cannabis use in grade 10. Only variables reflecting early-onset substance use involvement - binge drinking, cannabis use, and drug use by close friend(s) – remained predictive in a multivariate model. Simultaneous alcohol and cannabis use was associated with increased substance-related problems in grade 11, above and beyond baseline problems in grade 10 and the concurrent use of the two substances in separate episodes.

Conclusions: Simultaneous alcohol and cannabis use 1) is anticipated by multiple psychosocial risk factors which come together with individual and peer substance use in early high school and 2) is independently predictive of subsequent substance-related problems. Providing adolescents with adequate information regarding the potential harm of simultaneous use is imperative.

Keywords: Polysubstance Use, Simultaneous Use, Alcohol use, Cannabis, Adolescence, Predictors.

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1. Introduction

Polysubstance use is common in adolescence. Prevalence is estimated at 37% among grade 12 teenagers in the United States (Collins, Ellickson, & Bell, 1998) and at 46.5% among grade 11 students in Quebec, Canada (Cazale, Fournier, & Dubé, 2009). Many polysubstance users report using multiple substances at the same time, i.e., simultaneous polysubstance use (Collins et al., 1998). Alcohol is by far the most common substance involved in simultaneous polysubstance use patterns, most of the time together with cannabis (Collins et al., 1998; Earleywine & Newcomb, 1997; Midanik, Tam, & Weisner, 2007). In fact, most cannabis users consume the drug simultaneously with alcohol (Andersson et al., 2007; Pape, Rossow, & Storvoll, 2009). Substance mixing is considered to be a particular risk for the safety and well-being of youngsters (Schensul, Convey, & Burkholder, 2005), notably because of its additive or interactive effects which can be unpredictable (Norton & Colliver, 1988; Starmer & Bird, 1984).

Despite these concerns, little data is available regarding the risk factors and outcomes of simultaneous alcohol and cannabis use in general populations of adolescents. Cross-sectional studies with adults associated simultaneous use with being young, Caucasian, and male (McCabe, Cranford, Morales, & Young, 2006; Midanik et al., 2007), being a frequent alcohol and cannabis user (McCabe et al., 2006; Midanik et al., 2007), and experiencing multiple substance-related consequences such as legal issues, health and work problems, and accidents (Midanik et al., 2007). The only prospective study with adolescents to date identified multiple risks in grade 10 of simultaneous

alcohol-cannabis use in grade 12 including drug availability, pro-drug beliefs, drug-use intentions, deviant behavior, and family disruption (Collins et al., 1998).

In the present study, we extend the investigation of simultaneous alcohol and cannabis use using a population-based sample of adolescents who were followed prospectively throughout high school. Our aims are:

- (1) to identify specific psychosocial risk factors in grades 7 and 8 of simultaneous alcohol and cannabis use in grade 10;
- (2) to determine how simultaneous alcohol and cannabis use in grade 10 relates to substance-related problems in grade 11.

2. Methods

2.1 Sample

Participants were high school students from disadvantaged areas of Quebec (Canada) followed from grades 7 to 11 in the context of the New Approaches New Solutions (NANS) program. Self-reported questionnaires were administered to students annually (2004-2008). The sample included 6589 participants with a mean age of 12.8 ($SD = 0.6$) in grade 7, who were mostly Caucasian (87.4%), and equally represented by gender (52.5% females).

2.2 Measures

Simultaneous alcohol and cannabis use was self-reported in grade 10 (“have you used alcohol with cannabis at the same time in the past 12 months?”; yes/no). Participants also reported the frequency of their alcohol and of their cannabis use in grade 10 using the same 8-point Likert scale (ranging from “never” to “more than 100 times”).

Substance-related problems were measured in grades 10 and 11. Participants rated the

consequences of their drug and alcohol consumption in the past 12 months using 11 “yes/no” items based on an instrument frequently used for epidemiological purposes in Quebec (Germain et al., 2003) investigating various outcomes (legal, academic, relational, health problems, etc.; $\alpha = 0.88$). The scale was dichotomized as no/low problems (0 = 0-2 problems) and problems (1 = 3 problems or more).

Predictors were individual, familial, and peer-related characteristics measured in grades 7 and 8. Mean scores of both time points were used. Individual variables included *Gender*, *Grades* (average grade on language arts and mathematics), *Depressive Symptoms* (20-item Center for Epidemiologic Studies Depression Scale [CES-D], Radloff, 1977; alpha (α) = .90), *Delinquency* (20-item MASPAQ scale, LeBlanc, 1996; $\alpha = .94$), *Cannabis Use* (“did you take marijuana or hashish (a joint, pot)?”; yes/no), and *Binge Drinking* (“did you get drunk with beer, wine or spirits?”; yes/no) in the past 12 months. Family characteristics include three variables from the MASPAQ (LeBlanc, 1996): *Communication with Parents* (6-item scale, $\alpha = .88$), *Parental Rules* (7-item scale, $\alpha = .71$), and *Conflict with Parents* (3-item scale, $\alpha = .79$). Participants provided the following information the first time they answered questionnaires: *Intact Household* (0 = parents together; 1 = parents separated), *Maternal Education* (high school degree or higher = 0; no high school degree = 1) and *Parental Occupational Prestige* (mean score based on rating of father and mother occupation; Ganzeboom, de Graff, & Treiman, 1992). The peer domain included a measure of *Drug Use by Closest Friend(s)* (“do your best friend(s) use(s) drugs?”, yes/no).

2.3 Analyses

We used logistic regression to investigate the prospective relation between

individual, family, and peer predictors in grades 7-8 and simultaneous alcohol and cannabis use in grade 10 (objective 1), as well as the relation between simultaneous alcohol and cannabis use in grade 10 and subsequent substance-related problems in grade 11 (objective 2). In both cases, we tested an unadjusted model and a series of increasingly controlled models to secure independent associations. For objective 1, 6 513 participants with complete data in grade 7 and/or 8 and/or 10 were used. For objective 2, 4 415 participants with complete data on simultaneous use in grade 10 (2 649 had available data at follow-up) were used, in addition to 531 participants with available data only in grade 11, resulting in a final sample of 4 946. Multiple imputation with NORM (Schafer, 1997) was used to treat missing data (Graham, 2009). Twenty datasets were imputed and analyses fitted on all datasets using Mplus 5.1 (Muthén & Muthén, 1998-2007).

3. Results

3.1 Descriptive Statistics

Approximately a third (31.1%; males = 33.2%, females = 29.3%) of the sample reported at least one episode of simultaneous alcohol and cannabis use in grade 10. Simultaneous users reported an elevated frequency of past-year alcohol ($M = 29.0$, $SD = 31.3$) and cannabis use ($M = 30.3$, $SD = 37.1$) compared to non-simultaneous users of alcohol ($M = 12.2$, $SD = 18.6$) and cannabis ($M = 12.8$, $SD = 19.8$).

3.2 Predictors of Simultaneous Alcohol and Cannabis Use

The association between individual, family, and peer predictors in grades 7 and 8 and simultaneous alcohol and cannabis use in grade 10 are presented in Table 1. The unadjusted relation between each predictor and the outcome was estimated in model 1. With the exception of maternal education and parental occupational prestige, all predictors were significantly associated with subsequent simultaneous alcohol and cannabis use. Binge drinking and cannabis use were most strongly predictive of later simultaneous use, increasing the odds by 4 and 4.5 respectively.

In model 2, all of the predictors were included in a multivariate model to estimate independent and relative contributions of each variable. In this adjusted model, only binge drinking, cannabis use, conflict with parents, and peer substance use in early high school remained predictive of subsequent simultaneous use. The association of other predictors in the previous model was better accounted for by these four factors.

In order to isolate predictions that are specific to simultaneous alcohol and cannabis use as opposed to frequent alcohol and cannabis use in general, a control for the frequency of alcohol and cannabis use in grade 10 was added in model 3. Binge drinking,

cannabis use, and peer substance use in grades 7-8 remained associated with later simultaneous use in this model, independently of how frequently participants consumed alcohol and cannabis. Conflict with parents, on the other hand, became non significant, suggesting that this predictor may forecast frequent substance use generally rather than the simultaneous use of these substances specifically.

3.3 Consequences of Simultaneous Alcohol and Cannabis Use

Table 2 presents the associations between simultaneous alcohol and cannabis use and substance-related problems of various types (physical, psychological, relational, etc.) the following year. Without adjustment (model 1), simultaneous alcohol and cannabis use was associated with a four-fold increase in the odds of reporting three or more problems the following year. This prediction was reduced but remained statistically significant after controlling for baseline problems in grade 10 (model 2). To estimate whether consuming alcohol and cannabis simultaneously added to the risk of problems above and beyond the simple use of the two substances, we compared simultaneous with non-simultaneous users of alcohol and cannabis (model 3). Simultaneous use was associated with an increased risk of subsequent problems in this final model, indicating a unique effect of mixing alcohol and cannabis in the same episode as opposed to using the two in separate occurrences.

4. Discussion

As observed in other samples (Collins et al., 1998; Pape et al., 2009), a majority of users of alcohol and cannabis reported using the two substances simultaneously at least once during the past year in grade 10. Simultaneous users consumed alcohol and cannabis more frequently than individuals who used alcohol only, cannabis only, or the two substances non-simultaneously. This replicates previous results showing more frequent substance use among simultaneous alcohol and drug users (McCabe et al., 2006; Midanik et al., 2007). Simultaneous users were found to be at increased risk on a wide range of individual (male gender, depressive symptoms, low school grades, binge drinking, cannabis use, and delinquency), family (poor communication with parents, lack of parental rules, conflict with parents, having separated parents), and peer-related (drug use by closest friends) predictors at high school entry in grades 7 and 8. In multivariate models, most of these associations were better accounted for by three variables reflecting early-onset individual and peer substance use: cannabis use, binge drinking, and drug use by closest friends. Conflict with parents was the only predictor to remain predictive over these variables, but its association with the outcome disappeared after accounting for the frequency of alcohol and cannabis use in grade 10. Overall, this suggests that early individual and contextual predictors outside of substance-related behaviors are likely to relate to simultaneous usage via a contribution to more general aspects of substance use such as initiation and frequency. More proximal and context-dependent risk factors may be needed to independently predict a behavior as specific as simultaneous use (beyond prior use and general frequency of use). In terms of consequences, simultaneous alcohol and cannabis use was associated with an increased risk of later substance-related

problems (legal, academic, relational, health problems, etc.) beyond baseline problems in grade 10 and beyond the concurrent use of the two substances in separate episodes. This provides, to our knowledge, the first compelling evidence that simultaneous usage might constitute a hazardous behavior with potentially harmful consequences for adolescents in the general population.

The results of this study should be considered in light of a number of limitations. These include 1) the reliance on self-reports only; 2) the presence of missing data which can bias associations and reduce the representativeness of the sample, although multiple imputation should be helpful to reduce this bias; and 3) the difficulty to isolate simultaneous alcohol and cannabis use from other substance mixing behaviors (e.g. mixing alcohol or cannabis with other substances). These limitations notwithstanding, this study has important implications for prevention efforts with adolescents. First, simultaneous use was found in adolescents with various psychosocial risk factors who tended to already use substances and have drug-using friends in early high school. Prevention working upstream may represent a promising avenue. Efforts to reduce alcohol and cannabis involvement at the moment of entry into high school could buffer an escalating chain of riskier and more problematic substance use behaviors (such as simultaneous substance use) over time in early-onset users. Early conflict with parents emerges also as an important target, being associated with both frequent and simultaneous alcohol and cannabis use by the end high school independently from early-onset binge drinking and cannabis use. Second, from a harm reduction perspective, it is imperative to inform adolescents with regards to the risks of mixing alcohol and cannabis together. This behavior is widespread, if not typical among adolescents and may appear

normative and relatively innocuous to them in the absence of adequate warning. Future studies providing knowledge on the context in which simultaneous alcohol and drug use behaviors typically occur would be helpful as a next step to inform prevention.

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Table 1

Association Between Predictors in Grades 7-8 and Simultaneous Alcohol and Cannabis Use in Grade 10

	Simultaneous Alcohol and Cannabis Use, Odds Ratios (95% Confidence Intervals)		
	Model 1 ^a	Model 2 ^a	Model 3 ^a
Gender (Male = 1)	1.1 (1.01 – 1.3) ^c	1.1 (1.3 – 1.0)	0.9 (0.7 – 1.0)
Depressive Symptoms (1 = 1 SD increase)	1.3 (1.2 – 1.3) ^c	1.0 (0.9 – 1.1)	1.0 (0.9 – 1.1)
Grades (1 = 1 SD increase)	1.04 (1.03 – 1.05) ^c	1.0 (1.0 – 1.0)	1.0 (1.0 – 1.0)
Binge Drinking (Yes = 1)	3.9 (3.3 – 4.6) ^c	1.8 (1.4 – 2.2) ^c	1.5 (1.2 – 1.9) ^c
Cannabis Use (Yes = 1)	4.5 (3.8 – 5.3) ^c	2.3 (1.9 – 2.9) ^c	1.9 (1.5 – 2.4) ^c
Delinquency (1 = 1 SD increase)	1.4 (1.3 – 1.5) ^c	1.0 (0.9 – 1.1)	0.9 (0.8 – 1.1)
Communication with Parents (1 = 1 SD increase)	1.2 (1.07 – 1.2) ^c	1.0 (1.0 – 0.9)	1.0 (0.9 – 1.1)
Parental Rules (1 = 1 SD increase)	1.4 (1.3 – 1.5) ^c	1.1 (1.0 – 0.9)	1.0 (0.9 – 1.1)
Conflict with Parents (1 = 1 SD increase)	1.4 (1.3 – 1.5) ^c	1.1 (1.03 – 1.3) ^c	1.1 (1.0 – 1.2)
Drug Use by Closest Friend(s) (Yes = 1)	3.5 (3.0 – 4.1) ^c	1.5 (1.3 – 1.8) ^c	1.4 (1.2 – 1.8) ^c
Intact Household (No = 1)	1.4 (1.2 – 1.6) ^c	1.1 (0.9 – 1.3)	1.1 (0.9 – 1.3)
Maternal Education (No High School Degree = 1)	0.9 (0.7 – 1.1)	1.0 (0.8 – 1.4)	1.0 (0.8 – 1.4)
Parental Occupational Prestige (1 = 1 SD increase)	1.0 (1.0 – 1.1)	1.0 (0.9 – 1.1)	1.0 (0.9 – 1.1)
Frequency of Alcohol and Cannabis Use in Grade 10 (1 = 1 SD increase)			3.2 (2.9 – 3.7) ^c

Abbreviations: SD = Standard Deviation

^a All participants in grade 7 and/or 8; n = 6 513^b All participants who reported using both alcohol and cannabis in grade 10; n = 2 737^c Significant findings (p < .05)

Table 2

Association Between Simultaneous Alcohol-Cannabis Use in Grade 10 and Substance-Related Problems in Grade 11

	Substance-Related Problems (3 or more), Odds Ratios (95% Confidence Intervals)		
	Model 1 ^a (Univariate)	Model 2 ^a (Concurrent Problems)	Model 3 ^b (Alcohol and Cannabis Users Only)
Simultaneous Alcohol-Cannabis Use (Yes = 1)	3.7 (3.1 - 4.5) ^c	1.9 (1.6 - 2.4) ^c	1.5 (1.1 - 2.0) ^c
Problems in Grade 10		24.7 (16.1 - 38.1) ^c	18.2 (11.4 - 29.2) ^c

^a Participants who reported using alcohol and/or cannabis; n = 4 255

^b Participants who reported using both alcohol and cannabis; n = 1 942

^c Significant findings (p < .05)