https://doi.org/10.24095/hpcdp.40.5/6.09

Original quantitative research

Autonomy, competence and relatedness and cannabis and alcohol use among youth in Canada: a cross-sectional analysis

Aganeta Enns, MSc (1,2); Heather Orpana, PhD (1,3)

This article has been peer reviewed.

Abstract

Introduction: There has been increasing attention on preventing problematic youth substance use in light of concerns about rates of use and policy changes in Canada. Strengths-based approaches that emphasize protective factors, including positive mental health, are at the forefront of current prevention recommendations. However, there is a dearth of research on the association between positive mental health and substance use among youth. This study examines the associations between cannabis and alcohol use among youth and positive mental health as measured through the lens of self-determination theory.

Methods: Secondary analyses of the 2014/2015 Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) were conducted. Participating Grade 7 to 12 students residing in Canada completed the Children's Intrinsic Needs Satisfaction Scale (CINSS), which measures autonomy, competence and relatedness, and answered questions that measure past 30-day and more frequent cannabis use, alcohol use and binge-drinking. The associations between autonomy, competence and relatedness and substance use, stratified by sex, were examined using logistic regression.

Results: Fully adjusted models revealed that relatedness and competence were associated with lower odds of 30-day and more frequent cannabis use, alcohol use and binge-drinking. Higher autonomy was associated with higher odds of these behaviours. All associations were significant with the exception of competence and more frequent cannabis use among boys, and autonomy and more frequent alcohol use among girls.

Conclusion: The findings offer new evidence on the associations between positive mental health and substance use among youth, specifically how autonomy, competence and relatedness are associated with cannabis use, alcohol use and binge-drinking. This evidence can be used to inform health promotion and substance use prevention programs.

Keywords: *adolescents, positive mental health, substance use, cannabis, alcohol*

Highlights

- In multivariate models, youth with higher levels of relatedness and competence had lower odds of 30-day and more frequent cannabis use, alcohol use and binge-drinking (except for more frequent cannabis use and relatedness among boys).
- In contrast, in fully adjusted models, youth with higher levels of autonomy had higher odds of the substance use outcomes examined (except for more frequent alcohol use and autonomy among girls).
- Higher relatedness was associated with lower odds of substance use for both girls and boys, although there was a significant interaction between a number of positive mental health concepts and substance use behaviours. This highlights the need to examine these associations separately by sex.

Introduction

Alcohol and substance use are most commonly initiated during adolescence.[1] In 2016–2017, almost half (44%) of students in Grades 7 to 12 consumed alcohol in the past year, and one-quarter of students reported drinking five or more drinks on one occasion.[2] Just under one in five students (17%) reported cannabis use in the past year.[2] Adolescence is a critical period of cognitive and psychosocial development, and substance use may be associated with disrupted patterns of behaviours and longer-term risks such as problematic substance use later in life.[3] Alcohol and cannabis use in adolescence has been associated with increased likelihood of injury, impaired driving and negative social, psychological and legal consequences.[4,5]

Changes in alcohol and drug policies in Canada, and concerns about rates of youth substance use[2] have highlighted the need to understand and prevent problematic substance use among young people. Recent changes in policies in some

Author references:

1. Public Health Agency of Canada, Ottawa, Ontario, Canada
2. School of Psychology, University of Ottawa, Ottawa, Ontario, Canada
3. School of Epidemiology and Public Health, University of Ottawa, Ottawa, Ontario, Canada

Correspondence: Aganeta Enns, 136 Jean-Jacques-Lussier Pvt, Ottawa, ON K1N 6N5; Tel: 613-562-5800 ext. 4639; Email: aenns022@uottawa.ca

jurisdictions, for example, the expansion of the sale of some forms of alcohol into grocery stores and the reduction of the minimum price of beer in Ontario, have changed the availability of alcohol.[6,7] Such policy changes increase exposure to alcohol marketing in stores, which may increase the odds of adolescent alcohol consumption.[8]

Preventing the sale and promotion of cannabis to youth was among the public health objectives of the recent legalization of cannabis in Canada.[9] While the *Cannabis Act* is the "legal framework for controlling the production, distribution, sale and possession of cannabis across Canada," provinces and territories determine how, where and by whom cannabis can be sold. After the legalization of nonmedical cannabis use in the state of Washington, the perceived harmfulness of cannabis use decreased and cannabis use increased among youth.[10] Further evidence is needed to understand youth substance use and inform prevention in the current Canadian context.

Current recommendations highlight strengths-based approaches to preventing problematic substance use among youth.[11,12] Strengths-based approaches include programs such as school-based prevention and comprehensive well-being initiatives. Rather than focussing on deficits, strengths-based approaches draw on protective factors, such as individual capabilities and aspects of positive development, which may include positive mental health.[11,12]

The Public Health Agency of Canada defines positive mental health as "the capacity of each and all of us to feel, think, act in ways that enhance our ability to enjoy life and deal with the challenges we face. It is a positive sense of emotional and spiritual well-being that respects the importance of culture, equity, social justice, interconnections and personal dignity."[13]

The potential role of positive mental health as a protective factor for youth substance use has been inadequately studied. Furthering our knowledge of this association will help inform strengths-based prevention programs that focus on supporting positive mental health.

The present study measures positive mental health through the lens of the self-determination theory. This theory proposes that there are three basic psychological needs that contribute to overall well-being: competence, autonomy and relatedness.[14] Competence refers to a sense of self-efficacy or mastery to act in one's environment. Autonomy refers to the perceived choice and control over the activities one completes. Relatedness involves a sense of closeness and belonging with others. Positive mental health, as conceptualized through the self-determination theory as these three needs, maps onto the psychological (i.e. autonomy and competence) and social (i.e. relatedness) well-being outcomes defined in the Positive Mental Health Surveillance Indicator Framework.[15]

There is a dearth of research on how these three positive mental health needs impact behaviour, including substance use behaviours, in youth. However, some aspects of psychological well-being that overlap conceptually with the definition of positive mental health provided above, such as life satisfaction, locus of control (i.e. autonomy), resilience and positive affect, have been associated with drug and alcohol use among adolescents.[16-18] Two studies examined flourishing, which is a measure of overall positive mental health, among Grade 9 to 12 students in British Columbia and Ontario. These studies found that flourishing was associated with a lower likelihood of cannabis use but was not significantly associated with binge-drinking.[19,20]

Overall, there has been little investigation of positive mental health and substance use, with most previous studies focussing on adults and postsecondary students.[21,22] The purpose of this study was to examine the associations between the positive mental health concepts, as conceptualized through the self-determination theory, of competence, relatedness and autonomy and substance use, including alcohol use, binge-drinking and cannabis use, among youth. Based on the authors' knowledge, the associations between competence, relatedness and autonomy and substance use in youth across Canada have not previously been investigated; thus, this study will contribute to addressing this knowledge gap.

Methods

We analyzed data from the 2014/2015 Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS) public use microdata file.[23] CSTADS is a national, biennial survey on tobacco, alcohol and drug use among Canadian youth. This school-based survey is administered to a sample of students in Grades 6 to 12 (Grades 6 to secondary V in Quebec). In 2014/2015, a provincially generalizable sample was achieved in all provinces except New Brunswick.[23] The population consisted of students attending private or public schools. Schools in the Canadian territories, special schools (e.g. virtual schools, schools on military bases, schools on First Nations reserves or schools for students with visual or hearing impairment or special needs) and schools with fewer than 20 students enrolled in at least one eligible grade were excluded. Schools were selected using a stratified single-stage cluster design based on health-region smoking rate and type of schools (elementary or secondary). Random sampling within each stratum was used to select schools. All eligible students in the selected school were invited to participate.[23,24]

A total of 336 schools and 42 094 students participated in the CSTADS, representing 47% and 66% participation rates, respectively. Data collection was completed between October 2014 and May 2015.[23,24] Participants completed a paper-and-pencil questionnaire during class-time. Students could decline participating in the survey at the time of data collection. The survey took approximately 30 minutes to complete. Teachers provided instructions on how to complete the survey, but did not circulate the room during the administration to protect confidentiality.

Questions about alcohol and cannabis use were only asked of students in Grades 7 to 12,[23,24] and Grade 6 students were excluded from the analyses. The resulting sample size was 36 665.

Health Canada Research Ethics Board, the University of Waterloo and the ethics review boards of the participating school boards provided ethics approval.

Measures

Alcohol use

Alcohol use in the past 30 days was measured with two questions in a skip pattern, beginning with the following yes/no item: "Have you ever had a drink of alcohol that was more than just a sip?"

Respondents who indicated "yes" were then asked: "In the last 30 days, how often did you have a drink of alcohol that was more than just a sip?" Response options included: "I did not drink alcohol in the last 30 days (coded as no)"; "Once or twice," "Once or twice a week," "3–4 times a week," "5–6 times a week," "Every day (all coded as yes)"; and "I don't know." "I don't know" responses for all substance use questions were treated as "not stated" based on guidance in the CSTADS users' guide,[24] and excluded from analyses. A second variable representing more frequent alcohol use was created. Those who responded that they drank once or twice a week or less often were coded as less frequent use; those responding 3–4 times a week or more were coded as more frequent use. The CSTADS defined a drink of alcohol as "1 regular sized bottle, can, or draft of beer; 1 glass of wine; 1 bottle of cooler; 1 shot of liquor (rum, whisky, Baileys®, etc.); or 1 mixed drink (1 shot of liquor with pop, juice, energy drink, etc.)."

Binge-drinking

Binge-drinking in the past 30 days was measured with the following item: "In the last 30-days, how often did you have 5 or more drinks of alcohol on one occasion?" Participants chose one of the following responses: "I have never done this" or "I did not have 5 or more drinks on one occasion in the last 30 days" (coded as no); "once," "2 times," "3 times," "4 times" or "5 times or more" (all coded as yes); or "I don't know" (excluded from analysis). A second variable representing more frequent binge-drinking was also created. Those responding that they did not drink to those binge-drinking once or twice in the past 30 days were coded as less frequent; those responding 3 times or more were coded as more frequent.

Cannabis use

Two questions measured cannabis use in past 30 days. First, respondents were asked: "Have you ever used or tried marijuana or cannabis (a joint, pot, weed, hash, or hash oil)?" Possible responses were either "yes" or "no." Students who responded "yes" were then asked: "In the last 30 days, how often did you use marijuana or cannabis?" Response categories included: "I did not use marijuana in the last 30 days" (coded as no); "Once or twice," "Once or twice a week," "3–4 times a week," "5–6 times a week" or "Every day" (all coded as yes); or "I don't know" (excluded from analysis). A second variable representing frequent cannabis use was also created. Those responding that they did not use cannabis to those responding once or twice a week were coded as less frequent; those responding 3–4 times a week or more were coded as more frequent.

Children's Intrinsic Needs Satisfaction Scale

The Children's Intrinsic Needs Satisfaction Scale (CINSS)[25] is an 18-item scale that consists of three subscales (the need for autonomy, competence and relatedness), which each contain six items. The CINSS includes questions to assess the satisfaction with each need in three different contexts (with peers, at home and at school). These result in 2 items per context/concept pair. Example items include: "I feel I do things well at home" (competence/at home) and "I feel free to express myself at school" (autonomy/at school). Response categories for each statement include "really false for me," "sort of false for me," "sort of true for me" or "really true for me." The CINSS has been validated in a sample of Canadian students, demonstrating good internal consistency and criterion-related and factorial validity.[26]

Scores on each of the three subscales were summed and transformed to create continuous total scores for competence, relatedness and autonomy that range between 10 and 40. Higher scores indicate greater satisfaction with the measured need. Variables for high and low autonomy, competence and relatedness were created by ascribing a high value to those with a mean score of 3 or above on the six items in each scale and a low value to those with a mean score of 0 to less than 3.[27] The continuous scores are used throughout the analyses, except for the initial descriptive analyses of the prevalence of substance use behaviours by high versus low autonomy, competence and relatedness.

Demographics

Demographic content included current grade (Grades 6–12; Quebec secondary I, II, III, IV and V were coded as Grades 7–11, respectively) and sex (male, female). Socioeconomic status was defined by the median household income for each participating school's region. This variable was obtained using the Canadian 2011 census data on household income by the first three digits of each school's postal code (forward sortation area). Urban/rural region was categorized based on whether a participant's school was located in an urban or rural region.[23]

Analysis

We generated descriptive statistics to describe the study sample and prevalence of cannabis use, alcohol use and binge-drinking for the whole sample, by grade and by sex. The prevalence of substance use by high versus low autonomy, competence and relatedness was examined. We used chi-square tests to determine differences in substance use by sex, and the Cochran–Armitage test for trend to test whether substance use systematically increased with grade level. Bonferroni corrections were applied.

We conducted a series of logistic regressions to test the associations between autonomy, competence and relatedness and substance use variables. The first regression model included continuous CINSS subscale scores as predictor variables and past month alcohol use as the outcome variable. We then repeated the regression model for each of the remaining outcome variables: past month cannabis use; past month binge-drinking and more frequent alcohol use; cannabis use; and binge-drinking in the past month. This series of regressions were then repeated with grade, urban versus rural location and area-based household income included as control variables. We also conducted a sensitivity analysis to test for provincial status as a control; no changes in the data were found.

To identify differences between boys and girls in the associations between autonomy, competence and relatedness and substance use, interaction terms by sex were first examined in the logistic regression models. When interactions terms were significant, models were stratified by sex. Interaction terms were not interpreted; however, coefficients are presented in Table 3 to justify sex-stratified analyses.

Analyses were conducted in statistical package SAS Enterprise Guide 7.1 (SAS Institute Inc., Cary, NC, USA), using the PROC SURVEY suite of commands. Bootstrapping and survey weights were applied to account for the complex sample design of the CSTADS.[23] Complete case analysis was conducted to exclude cases with missing data on the study variables.

Results

Prevalence of cannabis and alcohol use and binge-drinking

Based on the 2014/2015 CSTADS data, 10.8% of students in Canada between Grades 7 and 12 reported using cannabis at least once in the past 30 days (Table 1). The prevalence of alcohol use within the past month was 27.0%, and 16.0% of Grade 7–12 students reported binge-drinking in the same period. Cochran–Armitage tests for trend revealed significant associations (all $p < .001$) between increasing substance use and grade, with the highest prevalence of cannabis use (21.3%), alcohol use in the past month (47.3%) and binge-drinking in the past month (32.6%) observed among Grade 12 students.

The prevalence of more frequent use was lower than that of any 30-day use, at 3.7%, 1.9% and 4.9% for more frequent cannabis use, alcohol use and binge-drinking, respectively. Consistent with past 30-day use, the highest prevalence of more frequent use was among Grade 12 students, at 8.1%, 3.9% and 12.4% for cannabis use, alcohol use and binge-drinking, respectively.

In all cases, the prevalences of past 30-day and more frequent cannabis use, alcohol use and binge-drinking were higher among those with low levels of autonomy ($p < .001$), relatedness ($p < .001$) and competence ($p < .001$) than among those with high levels (Table 2). However, the magnitude of these differences varied by substance and by measured need. For example, the prevalence of more frequent binge-drinking was almost twice as high among those with low competence (7.9%) than those with high competence (4.1%), while the difference was smaller between the prevalence of more frequent cannabis use among those with low versus high autonomy (3.4% and 3.0%, respectively).

Results of logistic regression models

In models of autonomy, competence and relatedness and substance use that included sex as an interaction term, many associations demonstrated a significant interaction with sex. Interactions between sex and competence, as well as between sex and relatedness, for all three 30-day substance use behaviours were significant. (See Table 3 for unexponentiated estimates and their standard errors.) The interaction between sex and autonomy was also significant for 30-day binge-drinking. Interactions between sex and competence were significant for all more frequent substance use behaviours. In addition, the interaction between sex and autonomy was significant for more frequent cannabis use. No interactions between sex and relatedness were significant for more frequent substance use variables. All subsequent models are stratified by sex.

In unadjusted models that examined autonomy, competence and relatedness separately with 30-day cannabis use, alcohol use and binge-drinking, all odds ratios were significant for both girls and boys; higher scores were associated with lower odds of each of these behaviours (Table 4). The same pattern was observed for more frequent cannabis use, alcohol use and binge-drinking (Table 5).

After adjusting for grade, income and urban versus rural school location and including continuous scores of autonomy, competence and relatedness in the model simultaneously, higher competence and relatedness continued to be associated with a significantly lower odds of 30-day substance use, while autonomy was

TABLE 1
Prevalence of any 30-day and more frequent cannabis and alcohol use behaviours by sex, grade and urban/rural status, CSTADS, 2014–2015 (*n* = 36 665)

Description	Any 30-day use			More frequent use		
	Cannabis use	Alcohol use	Binge-drinking	Cannabis use	Alcohol use	Binge-drinking
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
All	10.8 (10.6–11.1)	27.0 (26.5–27.6)	16.0 (15.7–16.4)	3.7 (3.5–3.9)	1.9 (1.8–2.0)	4.9 (4.8–5.1)
Sex						
Female	10.2 (9.8–10.5)	27.4 (26.8–27.9)	15.7 (15.3–16.1)	2.9 (2.7–3.2)	1.5 (1.4–1.6)	4.7 (4.5–4.9)
Male	11.5 (11.1–11.9)*	26.7 (26.1–27.3)*	16.4 (15.9–16.8)*	4.5 (4.3–4.7)*	2.4 (2.2–2.5)*	5.2 (4.9–5.4)*
Grade						
7	0.9 (0.8–1.1)	5.8 (5.3–6.3)	1.4 (1.2–1.6)	0.2 (0.1–0.2)	0.2 (0.1–0.2)	0.2 (0.2–0.2)
8	3.4 (3.0–3.7)	11.3 (10.6–12.0)	4.4 (4.0–4.8)	1.1 (0.9–1.2)	0.8 (0.1–0.9)	1.1 (0.9–1.3)
9	7.4 (6.8–8.0)	21.3 (20.1–22.4)	10.3 (9.7–10.9)	2.4 (2.0–2.8)	1.2 (1.1–1.3)	2.7 (2.5–2.9)
10	12.4 (11.8–13.0)	33.1 (32.4–33.9)	19.1 (18.4–19.9)	4.5 (4.2–4.8)	2.0 (1.8–2.2)	4.4 (4.1–4.7)
11	18.9 (18.4–19.4)	41.5 (40.4–42.7)	28.0 (27.1–28.9)	5.8 (5.5–6.1)	3.3 (3.0–3.6)	8.8 (8.2–9.4)
12	21.3 (20.3–22.4)**	47.3 (46.0–48.7)**	32.6 (31.5–33.6)**	8.1 (7.6–8.6)**	3.9 (3.3–4.5)**	12.4 (11.7–13.1)**
Urban/rural status[a]						
Urban	10.4 (10.1–10.8)	24.1 (23.2–24.9)	14.1 (13.5–14.6)	3.6 (3.4–3.8)	1.7 (1.6–1.9)	4.2 (4.0–4.4)
Rural	12.4 (11.7–13.1)*	38.4 (37.0–40.0)*	23.8 (22.7–25.0)*	4.1 (3.6–4.6)*	2.6 (2.4–2.8)*	8.0 (7.5–8.5)*

Abbreviations: CI, confidence interval; CSTADS, Canadian Student Tobacco, Alcohol and Drugs Survey.

Note: Prevalences based on weighted data.

[a] The urban/rural status is assigned based on the location of the school.

* Chi square, $p < .05$.

** Cochran–Armitage test for trend < 0.001.

TABLE 2
Prevalence[a] of any 30-day and more frequent cannabis use, alcohol use and binge-drinking by low versus high autonomy, competence and relatedness, CSTADS, 2014–2015 (*n* = 36 665)

	Any 30-day use			More frequent use		
	Cannabis use	Alcohol use	Binge-drinking	Cannabis use	Alcohol use	Binge-drinking
	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)	% (95% CI)
Autonomy						
Low[b]	14.1 (13.7–14.5)	29.9 (29.3–30.5)	18.0 (17.5–18.6)	3.4 (3.1–3.7)	5.1 (4.9–5.4)	6.2 (5.8–6.6)
High[b]	9.3 (9.0–9.6)*	25.9 (25.2–26.5)*	15.2 (14.8–15.6)*	3.0 (2.8–3.2)*	1.4 (1.3–1.5)*	4.4 (4.3–4.6)*
Competence						
Low[b]	18.5 (17.8–19.2)	35.3 (34.7–36.0)	22.0 (21.7–22.7)	6.6 (6.2–7.0)	3.9 (3.7–4.2)	7.9 (7.5–8.3)
High[b]	8.7 (8.5–9.0)*	24.8 (24.2–25.5)*	14.5 (14.0–14.9)*	2.7 (2.6–2.9)*	1.4 (1.3–1.5)*	4.1 (4.0–4.3)*
Relatedness						
Low[b]	19.0 (18.4–19.7)	36.2 (35.5–36.8)	23.3 (22.8–23.8)	7.6 (7.2–8.0)	4.2 (3.9–4.5)	7.9 (7.5–8.4)
High[b]	8.7 (8.5–9.0)*	25.0 (24.4–25.6)*	14.4 (14.0–14.8)*	2.6 (2.5–2.8)*	1.4 (1.3–1.5)*	4.3 (4.1–4.4)*

Abbreviations: CI, confidence interval; CSTADS, Canadian Student Tobacco, Alcohol and Drugs Survey.

[a] Prevalences based on weighted data.

[b] Variables for high and low autonomy, competence and relatedness were created by ascribing a high value to those with a mean score of 3 or above on the six items in each scale and a low value to those with a mean score of 0 to less than 3.

* Chi square, $p < .05$.

associated with a significantly higher odds, for both boys and girls (Table 4). For each unit increase in relatedness, the odds of cannabis use, alcohol use and binge-drinking decreased by 8%, 5% and 4% for girls and 2%, 3% and 2% for boys, respectively. For each unit increase in competence, the odds of cannabis use, alcohol use and binge-drinking decreased by 7%, 4% and 4% for girls and 9%, 5% and 7% for boys, respectively. In contrast, for each unit increase in autonomy, the odds of cannabis use, alcohol use and binge-drinking increased by 6%, 4% and 4% for girls and 5%, 4% and 6% for boys, respectively (Table 4).

Results of models of more frequent cannabis use, alcohol use and binge-drinking were similar to those for 30-day substance use (Table 5). Again, higher levels of competence and relatedness were associated with significantly lower odds of more frequent cannabis use, more frequent alcohol use and more frequent binge-drinking, for both girls and boys. The only exception was for the association between competence and more frequent cannabis use, which was not significant for boys (Table 5). Higher levels of autonomy were associated with significantly higher odds of more frequent cannabis use, more frequent alcohol use and more frequent binge-drinking for boys and girls. The exception was more frequent alcohol use among girls, where the association was not significant.

Discussion

This study provides national estimates of past 30-day and more frequent cannabis use, alcohol use and binge-drinking use in relation to levels of autonomy, competence and relatedness among youth. Higher levels of competence, a sense of self-efficacy or mastery to act in one's environment, was associated with a lower odds of each of three 30-day substance use behaviours and a lower odds of all but one more frequent substance use behaviours.

These results align with those of studies that have suggested an association between greater self-efficacy and lower

TABLE 3
Unexponentiated estimates, standard errors and *p* values for logistic regression interaction terms between sex and autonomy, competence and relatedness for 30-day and more frequent cannabis use, alcohol use and binge-drinking, CSTADS, 2014–2015 (*n* = 36 665)

	Cannabis			Alcohol			Binge-drinking		
	Estimate	SE	*p* value	Estimate	SE	*p* value	Estimate	SE	*p* value
Any 30-day use									
Autonomy	0.002	0.003	.38	0.000	0.002	.94	−0.009	0.003	< .001
Competence	−0.030	0.002	< .0001	−0.014	0.002	< .0001	−0.021	0.003	< .0001
Relatedness	0.009	0.003	.01	0.006	0.002	.01	0.015	0.003	< .0001
More frequent use									
Autonomy	0.016	0.004	< .0001	0.007	0.008	.36	0.002	0.004	.65
Competence	−0.042	0.006	< .0001	0.008	0.009	< .0001	−0.010	0.003	.01
Relatedness	0.009	0.005	.07	−0.031	0.007	.36	−0.005	0.004	.24

Abbreviations: CSTADS, Canadian Student Tobacco, Alcohol and Drugs Survey; SE, standard error.

TABLE 4
Unadjusted and fully adjusted odds ratios of any 30-day cannabis use, alcohol use and binge-drinking by autonomy, competence and relatedness, stratified by sex, CSTADS, 2014–2015 (*n* = 36 665)

		30-day cannabis use		30-day alcohol use		30-day binge-drinking	
		OR (95% CI) *		OR (95% CI) *		OR (95% CI) *	
Unadjusted odds ratios							
Girls	Autonomy	0.95	(0.94–0.95)	0.97	(0.97–0.98)	0.97	(0.96–0.97)
	Competence	0.91	(0.91–0.92)	0.95	(0.94–0.95)	0.94	(0.94–0.95)
	Relatedness	0.91	(0.90–0.91)	0.94	(0.94–0.94)	0.94	(0.93–0.94)
Boys	Autonomy	0.97	(0.97–0.98)	0.98	(0.98–0.99)	0.99	(0.99–0.99)
	Competence	0.94	(0.94–0.95)	0.95	(0.95–0.96)	0.96	(0.96–0.96)
	Relatedness	0.93	(0.93–0.94)	0.95	(0.94–0.95)	0.95	(0.95–0.96)
Fully adjusted odds ratios							
Girls	Autonomy	1.06	(1.05–1.06)	1.04	(1.03–1.05)	1.04	(1.03–1.04)
	Competence	0.92	(0.91–0.93)	0.95	(0.94–0.95)	0.94	(0.94–0.95)
	Relatedness	0.93	(0.92–0.94)	0.96	(0.95–0.97)	0.96	(0.95–0.97)
Boys	Autonomy	1.05	(1.04–1.06)	1.04	(1.03–1.05)	1.06	(1.05–1.06)
	Competence	0.98	(0.97–0.99)	0.97	(0.97–0.98)	0.98	(0.97–0.99)
	Relatedness	0.91	(0.90–0.92)	0.95	(0.94–0.95)	0.93	(0.93–0.94)

Abbreviations: CI, confidence interval; CSTADS, Canadian Student Tobacco, Alcohol and Drugs Survey; OR, odds ratio.
Note: Fully adjusted for grade, urban/rural location of school and median household income of school area.
* $p < .05$.

levels of substance use among adolescents.[28,29] Our finding that relatedness, a greater sense of closeness and belonging with others, was associated with lower odds of all 30-day and more frequent substance use behaviours is consistent with previous research that has noted the importance of social relationships with peers and family in preventing youth substance use.[30,31] The findings for relatedness and competence are consistent with studies demonstrating a link between higher overall scores of positive mental health, such as flourishing, and lower levels of substance use.[19,21,22]

TABLE 5
Unadjusted and fully adjusted odds ratios of more frequent cannabis, alcohol use and binge-drinking by autonomy, competence and relatedness, stratified by sex, CSTADS, 2014–2015 (*n* = 36 665)

		More frequent cannabis use		More frequent alcohol use		More frequent binge-drinking	
		OR (95% CI)		OR (95% CI)		OR (95% CI)	
Unadjusted odds ratios							
Girls	Autonomy	0.94	(0.93–0.94)	0.92	(0.91–0.93)	0.96	(0.95–0.97)
	Competence	0.91	(0.90–0.91)	0.90	(0.89–0.91)	0.93	(0.93–0.94)
	Relatedness	0.90	(0.89–0.90)	0.89	(0.88–0.90)	0.93	(0.92–0.93)
Boys	Autonomy	0.96	(0.95–0.96)	0.94	(0.93–0.95)	0.97	(0.97–0.98)
	Competence	0.94	(0.93–0.94)	0.92	(0.92–0.93)	0.95	(0.94–0.95)
	Relatedness	0.92	(0.92–0.93)	0.91	(0.91–0.92)	0.95	(0.94–0.95)
Fully adjusted odds ratios							
Girls	Autonomy	1.07	(1.05–1.08)	1.03	(1.00–1.07)**	1.04	(1.03–1.06)
	Competence	0.93	(0.92–0.94)	0.92	(0.90–0.94)	0.93	(0.93–0.94)
	Relatedness	0.91	(0.90–0.92)	0.94	(0.91–0.96)	0.95	(0.94–0.96)
Boys	Autonomy	1.03	(1.02–1.05)	1.02	(1.00–1.03)	1.04	(1.03–1.05)
	Competence	1.01	(0.99–1.03)**	0.98	(0.96–1.00)	0.95	(0.94–0.96)
	Relatedness	0.89	(0.88–0.90)	0.92	(0.91–0.94)	0.96	(0.95–0.98)

Abbreviations: CI, confidence interval; CSTADS, Canadian Student Tobacco, Alcohol and Drugs Survey; OR, odds ratio.
Note: Fully adjusted for grade, urban/rural location of school and median household income of school area.
** All $p < .05$, unless noted by **.

Given the large number of significant interactions between positive mental health concepts and sex for substance use behaviours, examining these differences is an important area of future research, as the small body of past research on this subject have not noted any sex/gender differences.[19,21,22]

Without accounting for grade, urban/rural location, income, competence and relatedness, higher autonomy was associated with a lower prevalence of substance use. However, after controlling for covariates, higher autonomy was significantly related with higher odds of all substance use behaviours except for more frequent alcohol use among girls.

The change in the association between higher autonomy and lower odds of substance use in the unadjusted findings to higher autonomy and higher odds of substance use in the adjusted model was unexpected. Conclusions are mixed on whether youth autonomy and substance use is significantly associated and whether higher autonomy is associated with higher or lower substance use.[32-34] Having a sense of choice and control is an aspect of positive mental health and fosters a healthy transition through adolescence to adulthood. The timing of adolescent autonomy may be pertinent, as one study suggested that early development is linked with increased substance use among youth.[34] However, autonomy may also be a factor that could be leveraged in substance use prevention.

Some prevention efforts have focussed on supporting youth autonomy in decision-making about substance use. A systematic review of mass media campaigns that aim to prevent substance use revealed four interventions that had some evidence of beneficial effects.[35] Two of these four interventions emphasized non-use of drugs as a means to support autonomy. The two interventions included the "Be Under Your Own Influence" and "Above the Influence" media campaigns in the United States, which have been associated with lower use of cannabis.[36] However, another media campaign that emphasized self-efficacy ("My Anti Drug"), which was included in the same systematic review by Allara et al., was among the interventions associated with harmful effects.[35] Overall, the evidence supporting the effectiveness of mass media campaigns to prevent drug use is weak.[35] The association between autonomy and youth substance use appears to be a nuanced one that may involve developmental and contextual factors and warrants further research.

The findings we present in this article provide new insight into the associations between autonomy, competence and relatedness and recent substance use among youth, based on analysis of a large, representative survey. This information is particularly relevant in the current context of changing alcohol and drug policies and trends in youth substance use.

The 2018 Chief Public Health Officer report highlighted the role of prevention, including the importance of promoting resilience and protective factors, in addressing problematic substance use among youth.[37] Strengths-based approaches to prevention have come to the forefront of many recommendations, emphasizing the need to better understand protective factors in relation to problematic substance use among youth in Canada.[12,38] The findings from the present study further support the potential roles of competence and relatedness as protective factors for substance use. They are consistent with, for example, the Ontario Ministry of Health and Long-Term Care guideline on substance use prevention and harm reduction, which gives examples of protective factors that may decrease the likelihood of substance use and related harms.[38] Examples include competence and factors that align with relatedness (i.e. positive parent relationships and positive teacher and social connectedness at school).[38]

A systematic literature review of strengths-based youth development programs that promote the positive development of "skills, attitudes, relationships and identities" and include factors that align with relatedness and competence was recently conducted. This review identified several mechanisms through which these programs may reduce substance use. These include enhancing protective factors in general to buffer against risk factors for substance use, enhancing a specific protective factor to reduce a specific risk behaviour and "piling up" multiple protective factors.[39] Whether relatedness and competence act through one or several of these mechanism warrants future research.

Strengths and limitations

There are limitations that should be considered when interpreting the results of this study.

The findings presented are observational, and further investigation is needed to draw conclusions on the causal role of autonomy, competence and relatedness in problematic substance use prevention. Each of the three subscales combined scores across three contexts (home, school and with peers) and the present study was limited to include scores combined across contexts. Further investigation into the associations between substance use and autonomy between contexts may be warranted.

The present study was limited to cannabis and alcohol use, including binge-drinking; other forms of substance use were not examined.

Complete case analysis, which confines analyses to cases with complete data, was used to handle missing data. This may have resulted in bias due to the loss of information.

The analyses were conducted with the 2014/2015 cycle of the CSTADS, rather than the 2016/2017 cycle, due to data availability at the time the project was initiated. However, these analyses examined associations, not prevalence; we would not expect notable changes in the associations between variables between data collection cycles. Future research may investigate if associations are moderated by time.

Items on substance use and positive mental health relied on self-report and may have been subject to social desirability bias. The active consent process may have introduced bias into the sample, or may have affected participants' responses.[40]

Less than half of schools participated, which may have also biased the sample. As this analysis was conducted with a cross-sectional survey, no inferences about causality can be made. However, to our knowledge, this is the first research using a large, representative sample of Canadian youth to examine the association between positive mental health and substance use, using a measure that has been validated in this age group.[26]

Conclusion

These findings provide evidence to further elucidate the associations between aspects of positive mental health and substance

use among youth in Canada. The results of this study provide contextual evidence that can be used to further our understanding of risk and protective factors associated with substance use, inform health promotion and substance use prevention programs and prevent or reduce problematic substance use among youth.

Acknowledgements

Data used for this research were taken from Health Canada's Canadian Student Tobacco, Alcohol and Drugs Survey (CSTADS), which was conducted for Health Canada by the Propel Centre for Population Health Impact at the University of Waterloo. Health Canada has not reviewed, approved nor endorsed this research. Any views expressed or conclusions drawn herein do not necessarily represent those of Health Canada or the Public Health Agency of Canada.

We appreciate the helpful comments provided by Dr. Katelyn Godin on an earlier draft of this article and the assistance of Adena Pinto and Matthew Hunt with tables and data verification.

Conflict of interest

The authors have no conflicts of interest to disclose.

Authors' contributions and statement

AE and HO conceived the project.

AE conducted the analysis.

AE and HO interpreted the results.

AE drafted the article and HO critically revised the article.

The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

References

1. Kosterman R, Hawkins JD, Guo J, Catalano RF, Abbott RD. The dynamics of alcohol and marijuana initiation: patterns and predictors of first use in adolescence. Am J Public Health. 2000;90(3):360-6. doi:10.2105/AJPH.90.3.360.

2. Health Canada. Summary of results for the Canadian Student Tobacco, Alcohol and Drugs Survey 2016-17 [Internet]. Ottawa (ON): Government of Canada; 2018 [cited 2019 Jun 12]. Available from: https://www.canada.ca/en/health-canada/services/canadian-student-tobacco-alcohol-drugs-survey/2016-2017-summary.html

3. Paglia-Boak A, Adlaf E. Substance abuse in Canada: youth in focus [Internet]. Ottawa (ON): Canadian Centre on Substance Abuse; 2007 Sep [cited 2019 May 2] Available from: https://www.ccsa.ca/sites/default/files/2019-04/ccsa-011521-2007-e.pdf

4. Bonomo Y, Coffey C, Wolfe R, Lynskey M, Bowes G, Patton G. Adverse outcomes of alcohol use in adolescents. Addiction. 2001;96(10):1485-96. doi:10.1046/j.1360-0443.2001.9610148512.x.

5. Degenhardt L, Hall W. Extent of illicit drug use and dependence, and their contribution to the global burden of disease. Lancet. 2012;379(9810):55-70. doi:10.1016/S0140-6736(11)61138-0.

6. Liem S. Alcohol policy review: opportunities for Ontario municipalities [Internet]. Toronto (ON): Ontario Public Health Association; 2018 [cited 2019 May 2]. Available from: https://opha.on.ca/getmedia/1190fb42-3dac-4e26-9e9f-1d1b5cec4cb9/Alcohol-Policy-Review-Full-Report-Final-corrected.pdf.aspx

7. CBC. Toronto: Ontario government vows to bring back buck a beer by Labour Day [Internet]. Toronto (ON): Canadian Broadcasting Corporation; 2018 Aug 3 [cited 2019 May 2]. Available from: https://www.cbc.ca/news/canada/toronto/buck-a-beer-doug-ford-ontario-1.4774034

8. Hurtz SQ, Henriksen L, Wang Y, Feighery EC, Fortmann SP. The relationship between exposure to alcohol and advertising in stores, owning alcohol promotional items, and adolescent alcohol use. Alcohol Alcohol. 2007;42(2):143-9. doi:10.1093/alcalc/agl119.

9. Cannabis Act (S.C. 2018, c. 16) [Internet]. Ottawa (ON): Government of Canada; 2019 [cited 2019 May 2]. Available from: https://laws-lois.justice.gc.ca/eng/acts/C-24.5/

10. Cerdá M, Wall M, Feng T, et al. Association of state recreational marijuana laws with adolescent marijuana use. JAMA Pediatr. 2017;171(2):142-9. doi:10.1001%2Fjamapediatrics.2016.3624.

11. Canadian Centre on Substance Abuse. Building on our strengths: Canadian standards for school-based youth substance abuse prevention (version 2.0). Ottawa (ON): Canadian Centre on Substance Abuse; 2010.

12. National Research Council and Institute of Medicine. Preventing mental, emotional, and behavioral disorders among young people: progress and possibilities. Washington (DC): The National Academies Press; 2009.

13. Public Health Agency of Canada. Mental health promotion [Internet]. Ottawa (ON): Government of Canada; 2014 [cited 2019 May 2]. Available from: https://www.canada.ca/en/public-health/services/health-promotion/mental-health/mental-health-promotion.html

14. Ryan RM, Deci EL. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. Am Psychol. 2000;55(1):68-78. doi:10.1037/0003-066X.55.1.68.

15. Orpana H, Vachon J, Dykxhoorn J, McRae L, Jayaraman G. Monitoring positive mental health and its determinants in Canada: the development of the Positive Mental Health Surveillance Indicator Framework. Health Promot Chronic Dis Prev Can. 2016;36(1):1-10. doi:10.24095/hpcdp.36.1.01.

16. Visser M, Routledge LA. substance abuse and psychological well-being of South African adolescents. S Afr J Psychol. 2007;37(3):595-615. doi:10.1177/008124630703700313.

17. Lew D, Xian H, Qian Z, Vaughn MG. Examining the relationships between life satisfaction and alcohol, tobacco and marijuana use among school-aged children. J Public Health (Oxf). 2019;41(2):346-53. doi:10.1093/pubmed/fdy074.

18. Fergus S, Zimmerman MA. Adolescent resilience: a framework for understanding healthy development in the face of risk. Annu Rev Public Health. 2005;26(1):399-419. doi:10.1146/annurev.publhealth.26.021304.144357.

19. Butler A, Patte KA, Ferro MA, Leatherdale ST. Interrelationships among depression, anxiety, flourishing, and cannabis use in youth. Addict Behav. 2019;89:206-15. doi:10.1016/j.addbeh.2018.10.007.

20. Butler A, Romano I, Patte KA, et al. Psychological correlates and binge drinking behaviours among Canadian youth: a cross-sectional analysis of the mental health pilot data from the COMPASS study. BMJ Open. 2019;9:e028558. doi:10.1136/bmjopen-2018-02855.

21. Schotanus-Dijkstra M, ten Have M, Lamers SM, de Graaf R, Bohlmeijer ET. The longitudinal relationship between flourishing mental health and incident mood, anxiety and substance use disorders. Eur J Public Health. 2017;27(3):563-8. doi:10.1093/eurpub/ckw202.

22. Low KG. Flourishing, substance use, and engagement in students entering college: a preliminary study. J Am Coll Health. 2011;59(6):555-61. doi:10.1080/07448481.2011.563432.

23. Burkhalter R, Cumming T, Rynard V, Schonlau M, Manske S. Research methods for the Canadian Student Tobacco, Alcohol and Drugs Survey, 2010-2015 [Internet]. Waterloo (ON): Propel Centre for Population Health Impact, University of Waterloo; 2018. Available from: https://uwaterloo.ca/canadian-student-tobacco-alcohol-drugs-survey/reports-and-results/reports-and-tables

24. Rynard V, Cumming T, Burkhalter R, Manske S. 2014/2015 Canadian Student, Tobacco, Alcohol and Drugs Survey microdata user guide. Waterloo (ON): Propel Centre for Population Health Impact, University of Waterloo; 2015. p. 1-47.

25. Véronneau M, Koestner RF, Abela JR. Intrinsic need satisfaction and well-being in children and adolescents: an application of the self-determination theory. J Soc Clin Psychol. 2005;24(2):280-92. doi:10.1521/jscp.24.2.280.62277.

26. Orpana H, Pearson C, Dopko RL, Kocum L. Validation of the Children's Intrinsic Needs Satisfaction Scale among Canadian youth: psychometric properties, criterion-related validity and multi-trait multi-method confirmatory factor analysis. Health Promot Chronic Dis Prev Can. 2019;39(1):25-32. doi:10.24095/hpcdp.39.1.03.

27. Centre for Chronic Disease Prevention. Positive Mental Health Surveillance Indicator Framework: quick stats, youth (12 to 17 years of age). Ottawa (ON): Public Health Agency of Canada; 2017. doi:10.24095/hpcdp.37.4.04.

28. Wheeler SB. Effects of self-esteem and academic performance on adolescent decision-making: an examination of early genderual intercourse and illegal substance use. J Adolesc Health. 2010;47(6):582-90. doi:10.1016/j.jadohealth.2010.04.009.

29. Chung H, Elias M. Patterns of adolescent involvement in problem behaviors: relationship to self-efficacy, social competence, and life events. Am J Community Psychol. 1996;24(6):771-84. doi:10.1007/BF02511034.

30. Sigfúsdóttir ID, Thorlindsson TH, Kristjánsson AL, Roe KM, Allegrante JP. Substance use prevention for adolescents: the Icelandic Model. Health Promot Int. 2009;24(1):16-25. doi:10.1093/heapro/dan038.

31. Balázs MÁ, Piko BF, Fitzpatrick KM. Youth problem drinking: the role of parental and familial relationships. Subst Use Misuse. 2017;52(12):1538-45. doi:10.1080/10826084.2017.1281311.

32. Adalbjarnardottir S, Rafnsson FD. Perceived control in adolescent substance use: concurrent and longitudinal analyses. Psychol Addict Behav. 2001;15(1):25-32. doi:10.1037/0893-164X.15.1.25.

33. Bearinger LH, Blum RW. The utility of locus of control for predicting adolescent substance use. Res Nurs Health. 1997;20(3):229-45. doi:10.1002/(SICI)1098-240X(199706)20:3%3C229::AID-NUR6%3E3.0.CO;2-K.

34. Dishion TJ, Nelson SE, Bullock BM. Premature adolescent autonomy: parent disengagement and deviant peer process in the amplification of problem behaviour. J Adolesc. 2004;27(5):515-30. doi:10.1016/j.adolescence.2004.06.005.

35. Allara E, Ferri M, Bo A, Gasparrini A, Faggiano F. Are mass-media campaigns effective in preventing drug use? A Cochrane systematic review and meta-analysis. BMJ Open. 2015;5(9):e007449. doi:10.1136/bmjopen-2014-007449.

36. Slater MD, Kelly KJ, Lawrence FR, Stanley LR, Comello ML. Assessing media campaigns linking marijuana non-use with autonomy and aspirations: "Be Under Your Own Influence" and ONDCP's "Above the Influence". Prev Sci. 2011;12(1):12-22. doi:10.1007/s11121-010-0194-1.

37. Public Health Agency of Canada. The Chief Public Health Officer's report on the state of public health in Canada 2018: preventing problematic substance use in youth [Internet]. Ottawa (ON): Public Health Agency of Canada; 2018 [cited 2019 May 2]. Available from: https://www.canada.ca/en/public-health/corporate/publications/chief-public-health-officer-reports-state-public-health-canada/2018-preventing-problematic-substance-use-youth.html

38. Ministry of Health and Long-term Care. Substance use prevention and harm reduction guideline [Internet]. Toronto (ON): Population and Public Health Division, Ministry of Health and Long-Term Care; 2018 Jan 1 [cited 2019 May 2]. Available from: http://www.health.gov.on.ca/en/pro/programs/publichealth/oph_standards/docs/protocols_guidelines/Substance_Use_Prevention_and_Harm_Reduction_Guideline_2018_en.pdf

39. Bonell C, Hinds K, Dickson K, et al. What is positive youth development and how might it reduce substance use and violence? A systematic review and synthesis of theoretical literature. BMC Public Health. 2015; 16(1):135. doi:10.1186/s12889-016-2817-3.

40. Liu C, Cox Jr RB, Washburn IJ, Croff JM, Crethar HC. The effects of requiring parental consent for research on adolescents' risk behaviors: a meta-analysis. J Adolesc Health. 2017;61(1): 45-52. doi:10.1016/j.jadohealth.2017.01.015.