



Shifting patterns of variance in adolescent alcohol use: Testing consumption as a developing trait-state



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HIGHLIGHTS

- Adolescent alcohol use is both a state (fluctuating) and a trait (stable over time).
- Alcohol use becomes more stable over time, particularly for alcohol quantity.
- Trait-like stability increases over development for both males and females.
- The increased stability of use has important implications for prevention.

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ABSTRACT

While average rates of change in adolescent alcohol consumption are frequently studied, variability arising from situational and dispositional influences on alcohol use has been comparatively neglected. We used variance decomposition to test differences in variability resulting from year-to-year fluctuations in use (i.e., state-like) and from stable individual differences (i.e., trait-like) using data from the Project on Adolescent Trajectories and Health (PATH), a cohort-sequential study spanning grades 7 to 11 using three cohorts starting in grades seven, eight, and nine, respectively. We tested variance components for alcohol volume, frequency, and quantity in the overall sample, and changes in components over time within each cohort. Sex differences were tested. Most variability in alcohol use reflected state-like variation (47–76%), with a relatively smaller proportion of trait-like variation (19–36%). These proportions shifted across cohorts as youth got older, with increases in trait-like variance from early adolescence (14–30%) to later adolescence (30–50%). Trends were similar for males and females, although females showed higher trait-like variance in alcohol frequency than males throughout development (26–43% vs. 11–25%). For alcohol volume and frequency, males showed the greatest increase in trait-like variance earlier in development (i.e., grades 8–10) compared to females (i.e., grades 9–11). The relative strength of situational and dispositional influences on adolescent alcohol use has important implications for preventative interventions. Interventions should ideally target problematic alcohol use before it becomes more ingrained and trait-like.

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1. Introduction

Adolescence is a period of rapid change, with marked increases in alcohol use during this critical developmental period. Data from the Cross-Canada Report on Student Alcohol and Drug Use indicated marked increases in alcohol use from grades 7 to 12, with the prevalence of heavy episodic use (i.e., >5 drinks on one occasion) within the past month rising from under 5% in grade 7 to over 50% in grade

12 (Young et al., 2011). Similar data from the United States indicate 71% of adolescents consumed alcohol on at least one occasion by grade 12, with 23% reporting heavy episodic use within the past two weeks (Johnston, O'Malley, Bachman, & Schulenberg, 2011). Measures of alcohol consumption (e.g., frequency of drinking occasions; quantity of alcohol consumed per occasion) increase during adolescence and peak around age 21 (Chen & Jacobson, 2012; Thompson, Stockwell, Leadbeater, & Homel, 2014). Early alcohol use predicts heavy or problematic use (Heron et al., 2012; Irons, Iacono, & McGue, 2015; Liang & Chikritzhs, 2015), antisocial or risky behavior (Duncan, Alpert, Duncan, & Hops, 1997; Stueve & O'Donnell, 2005), long-term changes in neurocognitive functioning (Hanson, Medina, Padula, Tapert, &

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Brown, 2011; Koskinen et al., 2011), and other adverse social and health consequences (Thompson et al., 2014). Given the myriad negative consequences of adolescent alcohol use, understanding the developmental course of this behavior is clearly important.

Most research uses descriptive approaches (e.g., Leatherdale & Burkhalter, 2012) or complex statistical models (e.g., latent growth-curves; Duncan, Duncan, & Strycker, 2006) to describe the average trajectories of alcohol use during adolescence, but not every adolescent follows these average trajectories. The average trajectory of drinking varies between adolescents and within a single adolescent over time. Research has shown variation in individual (e.g., personality) and contextual risk factors (e.g., social and environmental influences) plays an important role in the development of alcohol use. However, it is unclear *how much* variance in adolescent alcohol trajectories results from stable trait-like variation due to individual differences in drinking patterns, versus state-like variation due to changing contexts and environmental influences over development. Given the rapid changes in alcohol use during adolescence, it is conceivable that contextual factors predominate during this early period, but that more stable individual patterns of use are emerging. This has not been tested, however.

Research with emerging adults suggests alcohol consumption is a trait-state, meaning alcohol use has a trait-like component (i.e., stable individual differences) and a state-like component (i.e., state-dependent fluctuation) when measured over time (Mushquash, Sherry, Mackinnon, Mushquash, & Stewart, 2014). Using variance decomposition, Mushquash et al. showed slightly more variance attributable to trait-like stability than state-dependent factors (57% vs. 43%) in heavy episodic use among university students, suggesting alcohol consumption is best accounted for by both the dispositional stability and situational fluctuation of use over time. Equivalent research with adolescents is lacking, indicating a gap in current knowledge about the transition from fluctuating, context-dependent initial use to more stable trait-like use as adolescents move toward adulthood.

If alcohol use is a trait-state by young adulthood, it is theoretically and clinically important to understand if alcohol use is less stable during adolescence and, if so, when it moves from a fluctuating, context-dependent phenomenon (state-like) to the more stable, enduring pattern of behavior (trait-like) observed in young adulthood. Given sex differences in adolescent alcohol consumption (Chen & Jacobson, 2012; Leatherdale & Burkhalter, 2012; Thompson et al., 2014), the shift from state-like to trait-like use may occur at different times or in different ways for males and females. Understanding if a shift occurs, when it occurs, and for whom, is important for the development and delivery of effective prevention programs that target problematic alcohol use before it becomes more ingrained and trait-like in nature.

1.1. Objectives and hypotheses

The purpose of this research was to test the overall pattern of state versus trait variance in alcohol use in this age group, change in state-like and trait-like variance over time during this developmental phase, and sex differences in how state-like and trait-like variance shift during adolescence. We used data from the Project on Adolescent Trajectories and Health (PATH), a cohort-sequential design spanning grades 7 to 11, and applied the variance decomposition approach described by Mushquash et al. (2014) to identify state and trait components of alcohol consumption.

Based on Mushquash et al. (2014) and research showing rapid changes in drinking during adolescence (Chen & Jacobson, 2012) we hypothesized adolescent alcohol consumption would have a larger proportion of state-like variation compared to trait-like variation. We hypothesized the state-like component of use would predominate early in development, but trait-like components would emerge and increase in magnitude across adolescence as alcohol use became more stable (Mushquash et al., 2014). Males tend to have a fluctuating and escalating pattern of use compared to females, who show more frequent,

Table 1
Sample demographics for each cohort.

	Cohort 1	Cohort 2	Cohort 3
Grades (years 1 to 3)	7 to 9	8 to 10	9 to 11
Initial sample (N)	444	456	403
% retained in year 2	89.9% (N = 399)	90.1% (N = 411)	82.4% (N = 332)
% retained in year 3	82.0% (N = 364)	78.9% (N = 360)	73.0% (N = 294)
Sex			
Male	46.2% (N = 205)	43.9% (N = 200)	44.2% (N = 178)
Female	53.8% (N = 239)	56.1% (N = 256)	55.8% (N = 225)
Ethnicity			
Aboriginal	4.1% (N = 18)	3.9% (N = 18)	4.7% (N = 19)
Non-aboriginal	95.9% (N = 426)	96.1% (N = 438)	95.0% (N = 383) ^a
Family income			
Well above average	8.3% (N = 35)	7.7% (N = 33)	8.6% (N = 34)
Above average	29.6% (N = 125)	38.2% (N = 164)	32.7% (N = 129)
Average	55.9% (N = 236)	47.3% (N = 203)	47.8% (N = 189)
Below average	5.0% (N = 21)	5.4% (N = 23)	9.4% (N = 37)
Well below average	1.2% (N = 5)	1.4% (N = 6)	1.5% (N = 6)
Not reported	5.0% (N = 22)	5.9% (N = 27)	2.0% (N = 8)

^a Data missing for 1 case.

stable patterns of use (Van Der Vorst, Vermulst, Meeus, Deković, & Engels, 2009). We hypothesized females would show stronger trait-like variance than males early in adolescence, but that males would develop trait-like use later in adolescence as their patterns of use started to stabilize.

2. Method

2.1. Participants

Our sample included three cohorts of students who participated in the PATH study, a three-year longitudinal study on adolescent risk behaviors spanning a five-year developmental period from grades 7–11. In the first year of data collection, the three cohorts included students from grade seven ($n = 444$), eight ($n = 456$), and nine ($n = 403$) enrolled in a large school district in western Canada. All students in the school district were invited to participate. Of the 1315 students who provided parental consent and student assent, 1303 completed at least 50% of study measures. Analyses indicate attrition of 21.9% by the third year of the study, with failure to complete predicted by aboriginal status, $\chi^2(1, N = 1302) = 9.02, p = .003$, and the absence of a father in the household, $\chi^2(1, N = 1303) = 24.04, p < .001$.¹ Table 1 shows demographic information for participants in each cohort. Detailed sample information for the PATH study is described elsewhere (e.g. Fulton, Krank, & Stewart, 2012; Krank et al., 2011).

2.2. Measures

Alcohol consumption was measured using alcohol frequency, quantity, and volume. Frequency of alcohol consumption was measured with the question “If you drank alcohol in the past 30 days, how many days did you drink alcohol?” and typical alcohol quantity was then measured with the question “Think of a typical drinking situation. How many drinks would you normally have?” Both questions used an open-ended numerical response format (i.e., number of days; number of drinks). These single-item measures of alcohol consumption are commonly used and have shown acceptable reliability and validity in previous research (Bloomfield, Hope, & Kraus, 2013; Chung et al., 2012). Alcohol quantity and alcohol frequency were positively correlated

¹ Analyses included sex, starting grade, aboriginal status, family income, foster care, mother’s and father’s education, presence of mother and father in the household, and presence of step-mother and step-father in the household. Bonferroni correction was used to control type 1 error ($\alpha = .05$) across these 11 comparisons.

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