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Substance Use and Sexual Intercourse Onsets in Adolescence: A Genetically Informative Discordant Twin Design

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A B S T R A C T

Purpose: Using a genetically informed, discordant twin analysis, the objective of this study was to examine whether earlier onset of drinking and smoking behaviors predicted early sexual intercourse onset.
Methods: Over 3,400 adult same-sex twins from the Australian Twin Registry completed a structured interview that included retrospective reports on onsets of smoking, drinking, intoxication, and sexual intercourse and conduct disorder symptoms. A two-level frailty model estimated within-twin-pair and between-twin-pair comparisons. Onsets of smoking, drinking, drunkenness, and conduct disorder symptoms were estimated as sexual intercourse onset predictors.
Results: After controlling for conduct disorder, smoking and drinking onset did not predict sexual intercourse onset for either within-twin-pair or between-twin-pair comparisons. Drunkenness onset had a significant effect on sexual intercourse onset, such that twins who first experienced alcohol intoxication at a younger age than their co-twins were also more likely to have sex earlier than their co-twins.
Conclusions: Relationships between substance use and sexual intercourse onsets may be due mostly to shared underlying factors; there was only a small relation between intoxication onset and sexual intercourse onset, and no direct relation between smoking and drinking onset and sexual intercourse onset.

IMPLICATIONS AND CONTRIBUTION

After controlling for genetics, shared environment, and antisocial behavior, early drunkenness onset weakly predicts earlier intercourse onset, indicating it may be a potential causal mechanism. Early smoking and drinking onset do not predict earlier intercourse onset. Relationships between early substance use and sexual intercourse onsets may have been previously overstated.

Early substance use is commonly found as being closely related to earlier sexual intercourse (see [1] for review). However, the nature of the relation between these behaviors is still unclear. Although some research documents there may be no direct relation between early substance use and subsequent intercourse above and beyond risk factors shared by both behaviors (e.g., parental monitoring, deviant peers, trauma/abuse, personality, genetic vulnerability) [2,3], other studies indicate such common causes cannot fully account for this relation [4]. Genetically informative research designs such as discordant twin studies allow for more precise examination of closely related behaviors. Discordant twin analyses can test whether a twin with an earlier substance use onset, compared with his or her co-twin, has a subsequent earlier intercourse onset, controlling for shared

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Table 1
Descriptive statistics for onset variables

	Sexual onset	Smoking onset	Drinking onset	Drunkenness onset	Conduct disorder
Sexual onset	–				
Smoking onset	.17**	–			
Drinking onset	.23**	.28**	–		
Drunkenness onset	.35**	.29**	.61**	–	
Conduct disorder	−.23**	−.24**	−.25**	−.26**	–
Mean (SD)	18.24 (2.94)	14.01 (2.02)	15.91 (2.60)	17.26 (2.67)	.36 (.53)
Discordance (in years/symptoms)	2.02 (2.01)	2.57 (2.49)	1.89 (2.33)	1.77 (1.98)	.35 (.45)

** $p < .01$.

environment and genetic vulnerability. The unique experience of the predictor can then be inferred as a causal variable [5]. Multilevel modeling for discordant twin studies allows for estimation of within-twin-pair effects in which predictors indicate unique environment effects, and between-twin-pair effects in which predictors indicate familial context effects (shared environment and genetics). To date, there is little research examining relations between onsets of substance use and intercourse using a genetically informative design [6–8].

This study's purpose was to examine early substance use as an antecedent to earlier sexual intercourse using a discordant twin design. Age of onset of cigarettes and alcohol were chosen. Drinking was assessed as onset of first drink and onset of the first time getting drunk. We hypothesized that within a twin pair, twins who smoked, drank, or got drunk earlier than their co-twins would also have earlier intercourse. We also hypothesized that twins who on average had earlier smoking, drinking, and drunkenness onsets would have earlier intercourse onsets.

Method

Participants

The sample consisted of 3,424 same-sex monozygotic (MZ) and dizygotic (DZ) adult twins (1,826 MZ; 1,598 DZ) born 1964–1971 drawn from the Australian Twin Registry (see [9] for information on interview procedures and participant demographics), with a mean age of 29.86 years (range 24–36 years). All study procedures were approved by all relevant institutional review boards.

Measures

All measures were assessed via structured telephone interview. Age of (consensual) intercourse onset was measured as a continuous variable. Age-related bias (correlation between onset variable and age at interview) of .08 suggested potential for slight bias. Ages of substance use onsets were measured by asking how old participants were the first time they engaged in smoking, drinking (more than a sip), and getting drunk. There was minimal age-related bias for the predictors ($r = -.01, .03$, and .06 respectively). Conduct disorder (CD) was evaluated using a 15-item symptom count based on DSM-IV diagnostic criteria (symptoms before age 18 years). Internal consistency reliability was $\alpha = .63$. There was minimal age-related bias ($r = -.02$).

Analytic plan

A multilevel frailty model was estimated using Cox proportional hazards regression with a twin-pair random intercept. Moderation by zygosity and gender were tested for all level-1 onset predictors; the only moderation effect was between drunkenness and zygosity, which was included in the final model. Model 1 included level-1 and level-2 indicators of smoking and drinking onsets, gender, zygosity, and age. Individual within-twin-pair variables of onset predictors were group-mean centered in order to assess the "pure" within-twin-pair effect [10]. Model 2 added

Table 2
Frailty models predicting sexual intercourse onset

Variable	Model 1		Model 2[a]		Model 3	
	Hazard ratio	95% CI	Hazard ratio	95% CI	Hazard ratio	95% CI
Zygosity	1.09	.99–1.18	1.08	.99–1.18	1.08	.99–1.16
Age	.98**	.96–.99	.98**	.96–.99	.98**	.96–.99
Gender	1.03	.94–1.12	.94	.85–1.03	.93	.85–1.03
Level-1 smoking onset	1	.97–1.02	1	.97–1.02	1	.97–1.02
Level-2 smoking onset	.98**	.96–.99	.99	.97–1	.99	.97–1
Level-1 drinking onset	.98	.95–1.02	.99	.95–1.02	.98	.95–1.02
Level-2 drinking onset	1.01	.98–1.04	1.02	.99–1.05	1.02	.99–1.05
Level-1 drunkenness onset	.96*	.92–1	.96*	92.–1	1	.95–1.05
Level-2 drunkenness onset	.87**	.84–.89	.88**	.85–.90	.88**	.85–.90
Level-1 conduct disorder	–	–	1.07	.92–1.24	1.06	.92–1.23
Level-2 conduct disorder	–	–	1.38**	1.23–1.54	1.39**	1.25–1.54
Level-1 drunkenness onset x zygosity	–	–	–	–	.92**	.86–.98

* $p < .05$.
** $p < .01$.
[a] When Model 2 is re-run using grand-mean centered level-2 predictors, results indicated that when controlling for level-1 effects and conduct disorder symptoms, average age of smoking (HR = 1, $p = .67$), drinking (HR = .99, $p = .49$), and conduct disorder (HR = 1.19, $p = .06$) were not significant contextual effects. Average age of drunkenness (HR = .91, $p < .001$) was a significant contextual effect, indicating that this effect was significantly stronger than the respective level-1 variable.

the effect of CD symptoms to control for risk-taking predisposition. Model 2 was then re-run with grand-mean centered level-1 variables in order to assess contextual twin-average effects [10]. Model 3 included the zygosity and level-1 drunkenness onset interaction.

Results

Table 1 displays correlations and average onsets of drinking, smoking, and sexual intercourse, along with discordance between twins. Most adolescents engaged in smoking, drinking, or getting drunk prior to having sexual intercourse or in the same year as sexual intercourse (75%, 78%, and 60% respectively). Table 2 displays hazard ratios for the frailty models. Only drunkenness onset was a significant predictor after controlling for CD, at both within-twin and between-twin levels, although this effect was small. As indicated by the hazard ratios, Twin 1 was more likely to have an early sexual onset compared with Twin 2 if Twin 1 first became drunk earlier than his or her co-twin. The between-twin-pair effect was significantly stronger than the within-twin-pair effect, as indicated by the grand-mean centered model level-2 estimates. Within-twin and between-twin effects of drinking and smoking onsets were not significant after controlling for CD, indicating there was no increased likelihood of Twin 1 having an earlier sexual onset if Twin 1 engaged in smoking or drinking earlier than his or her co-twin. Finally, the within-twin-pair effect for age of first drunkenness was stronger for MZ twins compared with DZ twins. There were no interactions between any variable and the log of intercourse onset, indicating no violation of the proportional hazard assumption.

Discussion

The purpose of this study was to examine the age of substance use onset as an antecedent to intercourse onset using a genetically informed discordant twin design. As hypothesized, when controlling for CD and familial context (shared environment and genetics), twins who first became drunk earlier than their co-twins had a slightly higher probability of having sex earlier. Between-twin-pair onset of drunkenness was also a significant predictor, indicating that twin pairs who have an earlier average age of drunkenness onset have a higher likelihood of also engaging in early intercourse. This effect was significantly stronger than the within-twin-pair effect. Contrary to the hypothesis, there was no relation between smoking or drinking onset after accounting for shared environment, genetics, and CD.

Limitations include the retrospective nature of the data. These results may not generalize to other countries or age groups. Although sexual onset reports displayed minor age-related bias, we minimized this by controlling for age at interview. This model also does not account for individuals who engaged in sex prior to engaging in drinking or smoking or both behaviors jointly, and future research should examine causal influence regarding temporal ordering of either onset behavior. Another limitation is the assumption of equivalence of similarity in age of behavioral onsets within and between twin pairs.

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Errata

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