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# Perceived Exposure to Substance Use and Risk-taking Behavior in Early Adolescence: Cross-sectional Study

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**Aim** To examine the relation between perceived exposure to parents, siblings, and peers' substance use and self-reported substance consumption among early adolescents in Primorsko-goranska county, Croatia, and between perceived exposure to substance use and risk-taking behaviors such as going out late at night, gathering at secluded places, skipping school, and gambling.

**Method** A self-reported cross-sectional survey was conducted in 2007 among 2219 eight-grade (14-year old) pupils in elementary schools in Primorsko-goranska county. Exposure to substance use in their immediate social environment, self-reported consumption of cigarettes, alcohol, inhalants, and marijuana, ways of spending free time, and family and peer relationships were assessed.

**Results** There was a significant association between perceived exposure to substance use and self-reported consumption of cigarettes, alcohol, inhalants, and marijuana in both sexes ( $P < 0.001$ ). Pupils whose parents, siblings, and peers used substances significantly more often developed the same behavioral patterns. Level of exposure to substance use in the immediate social environment had the strongest effect on experimenting with smoking among girls (from 26.6% in low exposure to 76.2% in high exposure group) and among boys (from 15.8% in low exposure to 69.4% in high exposure); on regular everyday smoking among girls (from 4.4% in low exposure to 45% in high exposure group) and among boys (from 2.7% in low exposure to 36.7% in high exposure group); on hard liquor consumption among girls (from 25.1% in low exposure to 79.5% in high exposure group) and among boys (from 28.1% in low exposure to 78.4% in high exposure group), as well as on binge drinking among girls (from 10.9% in low exposure to 56.6% in high exposure group) and among boys (from 15.5% in low exposure to 62.4% in high exposure group). Girls and boys exposed to substance use engaged more often in risk-taking and potentially delinquent behaviors ( $F_{(2, 1180)} = 166.502$ ;  $P < 0.001$ , two-way ANOVA).

**Conclusion** High exposure to substance use in immediate social environment and its great impact on substance use among early adolescents indicate that there is a need for the introduction of preventive programs that would reduce inappropriate behavior among adolescents' social models.

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Substance use among children and adolescents is a substantial problem throughout the world. Smoking and alcohol consumption initiation occurs mainly during early adolescence (1). Many studies have reported an upward trend in the use of tobacco and illicit drugs and a significant proportion of children who begin to smoke before their 12th birthday (2-9). Health consequences of smoking and alcohol consumption among adolescents are well documented (10) and an early initiation is associated with an increased risk of developing addiction and adulthood dependence.

Researchers have tried to understand why some adolescents experiment with substances while others do not. According to Hawkins et al (11), there are numerous reasons of drug consumption: laws and norms favorable toward drug use; availability of drugs; extreme economic deprivation; neighborhood disorganization; personal psychological characteristics; early and persistent behavior problems including aggressive behavior in males, other conduct problems, and hyperactivity in childhood and adolescence; a family history of alcoholism and parental use of drugs; poor family management practices; family conflict; low bonding to family; academic failure; lack of commitment to school; early peer rejection; social influences to use drugs; alienation and rebelliousness; attitudes favorable to drug use; and early initiation of drug use. With so many potential causes, it is difficult to form a complete picture of experimental substance use. Among numerous theories that attempted this, one of the most influential is the social learning theory (12). This theory states that individuals learn new behaviors from observation, modeling, and imitation of significant others. Adolescents acquire their beliefs about experimental substance use from their role models, especially their friends, siblings, and parents. The development of substance use in adolescents has 3 phases: 1) observation and imitation of substance-specific behaviors; 2) social reinforcement (ie, encouragement and support) for experimental substance use; and 3) adolescents' expectation of positive social and physiological consequences from future substance use. An adolescent who expects substances to produce more personal benefits than costs will be at risk for experimental substance use (13). According to social learning theory, youngsters who are under implicit or explicit pressure of peers to start smoking are more prone to actually do it.

Behavioral and cognitive variables specified in the social learning process account for significant portions of the variations in adolescent substance use and mediate

substantial effects of sex, socio-economic status, age, family structure, and community size on substance abuse (14).

Parental use of tobacco, alcohol, and other drugs increases the likelihood that children will also engage in substance use (11,15). Parents who espouse norms favorable to substance use and who model such behavior, encourage imitation by children. Although parental use is a strong risk factor for children's use, substance use by peers may be even more influential. The psychological peer cluster theory views the peer group as critical in adolescent substance use (16,17). Imitation of deviant behavior is most likely to occur when role-models are very salient and peers are the most important role models in adolescents' lives. Reviews on the development of substance abuse all report that substance use by peers and friends is a major risk factor for adolescent drug use (11,18). Siblings may also act as powerful role models, particularly given that their influence extends from the family to the peer domain (19,20).

The aim of this study was to examine the relationship of exposure to substance use by parents, siblings, and peers to experimenting with substance use in early adolescence in eight-graders from a Croatian county and investigate the association of exposure to substance use and other forms of risk-taking behaviors.

## PARTICIPANTS AND METHODS

### Participants

The survey was conducted during November and December 2007 in all elementary schools in Primorsko-goranska County, except schools for children with special needs and the elementary school on the island of Rab. Out of a total of 2597 eight-grade pupils in the county, 2219 who were at school on the day of the assessment were included in the study (85.4% response rate) (Table 1). There were 51.4% of girls and the average age of the participants was  $14.3 \pm 0.44$  years.

### Measures

We applied a self-reporting questionnaire addressing important aspects of adolescents' life: free-time, relationship with peers, family, school life, self-concept, life satisfaction, risk-taking behaviors, and demographic variables (21). The questionnaire we used is an adaptation of a standardized questionnaire (21), used in a longitudinal study of pupils' risk-taking behaviors in Primorsko-goranska county. It was

**TABLE 1.** General demographic characteristics of the pupils (n = 2219)

Parameter	No (%) of pupils
<b>Sex:</b>	
girls	1141 (51.4)
boys	1078 (48.6)
<b>Living with:</b>	
both parents	1906 (85.9)
with mother only	251 (11.3)
with father only	40 (1.8)
not living with parents	22 (1.0)
<b>Number of household members (including the pupil):</b>	
2	62 (2.8)
3	348 (15.7)
4	1105 (49.8)
5	406 (18.3)
6	182 (8.2)
7 and more	115 (5.2)

validated on large samples of adolescents and showed satisfactory metric characteristics. For this study, we used two subscales of the questionnaire – “Exposure to substance use” and “Pupils’ risk-taking behavior” scale.

“Exposure to substance use” scale consists of the following 7 items: “My friends smoke;” “My parents smoke;” “My older siblings smoke;” “My friends drink alcohol;” “My parents drink alcohol;” “My older siblings drink alcohol;” and “I hang out at the places frequented by drug users.” Answers for each item were given on a 4-point scale, ranging from never to very often, and all 7 items were summed up to obtain a total exposure to substance usage index. Higher scores indicated higher level of exposure. Internal consistency coefficient (Cronbach  $\alpha$ ) for this measure in this sample was 0.73. The average correlation among items was  $r=0.29$  (ranging from  $r=0.13$  to  $r=0.68$ ), that confirmed satisfactory range of correlations.

“Pupils’ risk-taking behavior” scale consisted of 6 items assessing the frequency of behaviors potentially linked to substance abuse: “I go out at night (cafes, clubs, parties);” “I hang out at secluded places with my friends;” “I gamble (betting, slot machines);” “I skip school when I feel like it;” “Whenever possible I avoid lessons;” and “I drink alcohol in school or around the school.” Answers for each item were given on a 4-point scale, ranging from never to very often, and all 6 were summed up to obtain a reliable measure of pupils’ risk-taking behavior. Higher scores indicated more frequent involvement in potentially risk-taking behav-

ior. Internal consistency coefficient (Cronbach  $\alpha$ ) for this measure in this sample was 0.78. The average correlation among items was  $r=0.37$  (from  $r=0.23$  to  $r=0.60$ ), which confirmed satisfactory range of correlations.

**Procedure**

After having obtained an approval from the school authorities (Educational and Teacher Training Agency) and school founders (City of Rijeka and Primorsko-goranska County) to conduct the study, schools were informed about the procedure and they organized the administration of the questionnaire. A trained research team of psychology students administered the questionnaire, and teachers and school administrators were not in the room during the completion. Pupils completed the survey material in groups (up to 25 students) in their school setting and the survey took about 45-50 minutes to complete. Participation was voluntary and anonymous.

**Statistical analysis**

Descriptive statistics is presented using percentages and frequencies. Normality of results distributions was tested by Kolmogorov-Smirnov test.  $\chi^2$  and  $t$  test were used to test the sex differences of exposure level and substance use. Correlation between exposure to substance use and pupils risk behavior was calculated with the Pearson correlation coefficient. Two-way analysis of variance was used to test the effect of sex and levels of exposure to substance use on risk-taking behaviors of pupils. All statistical analyses were performed with the Statistica 7.1 statistical package (StatSoft Inc., Tulsa, OK, USA).

**RESULTS**

**Exposure to substance use**

Almost 3 quarters of elementary school pupils in Primorsko-goranska county were exposed to their friends’ smoking (74.1% – sum of frequencies in “rarely;” “often;” and “very often” categories) (Table 2). Also, more than half of the parents smoked (55.9%). Alcohol was also frequently consumed both by peers (67.8%) and parents (61.2%). Girls and boys were equally exposed to substance use ( $t$  value = 0.095,  $P=0.924$ ). The distribution of results on cumulative scale was asymmetric, showing that a smaller number of pupils reported higher level of exposure to substance use (Kolmogorov-Smirnov  $Z=4.41$ ;  $P<0.001$ ).

**TABLE 2.** Exposure to substance use items – frequencies of responses within response categories

Items	No (%) of examinees who answered*			
	never	rarely	often	very often
My friends smoke	517 (25.9)	570 (28.6)	435 (21.8)	473 (23.7)
My parents smoke	908 (44.1)	378 (18.4)	379 (18.4)	394 (19.1)
My older siblings smoke	1481 (76.1)	171 (8.8)	134 (6.9)	161 (8.3)
My friends drink alcohol	642 (32.2)	647 (32.4)	383 (19.2)	324 (16.2)
My parents drink alcohol	790 (38.8)	108 (49.5)	174 (8.5)	64 (3.1)
My older siblings drink alcohol	1258 (65.6)	427 (22.3)	136 (7.1)	98 (5.1)
I hang out at places frequented by drug users	1661 (82.6)	219 (10.9)	66 (3.3)	64 (3.2)

\*Percentages were calculated using the number of valid answers. The percentages of missing data for the whole sample varied between 7.0% for "My parents smoke" and 13.4% for "My older siblings drink alcohol."

### Self-reported substance consumption

Self-reported substance consumption and sex differences in substance use are presented in Table 3. Pupils mostly experimented with alcohol (Table 3). More than 70% of eight-graders consumed beer and wine and more than half of them consumed hard liquor. There were 50.9% of girls and 44.4% of boys who experimented with smoking cigarettes. Almost 40% of boys and more than 30% of girls had episodes of binge drinking.

Girls and boys smoked cigarettes, drank wine, and used inhalants at about the same rate. Significantly more girls experimented with smoking cigarettes ( $P=0.004$ ), while more boys experimented with drinking beer ( $P=0.016$ ) and hard liquor ( $P=0.024$ ), had episodes of binge drinking ( $P<0.001$ ), and used marihuana ( $P=0.02$ ).

### Relationship between exposure to substance use and self-reported substance consumption

For further analysis, participants were divided into low, medium, and high level exposure groups according to their results on "Exposure to substance use" scale. Tobacco, alco-

hol, inhalants, and marihuana usage was analyzed regarding to sex and exposure to substance use level (Table 4). There was a significant relation between the level of perceived exposure to substance use and reported usage for all substances ( $P<0.001$ ). Pupils whose friends, older siblings, and parents smoked and drank alcohol more often developed the same behavioral pattern. Greater exposure to substance use increased the probability of incidence.

The effect was strongest on experimenting with smoking among girls (from 26.6% in low exposure to 76.2% in high exposure group) and among boys (from 15.8% in low exposure to 69.4% in high exposure group); on regular everyday smoking among girls (from 4.4% in low exposure to 45% in high exposure group) and among boys (from 2.7% in low exposure to 36.7% in high exposure group); on hard liquor consumption among girls (from 25.1% in low exposure to 79.5% in high exposure group) and among boys (from 28.1% in low exposure to 78.4% in high exposure group), as well as on binge drinking among girls (from 10.9% in low exposure to 56.6% in high exposure group) and among boys (from 15.5% in low exposure to 62.4% in high exposure group). All differences were statistically significant ( $P<0.001$ ; Table 4).

**TABLE 3.** Prevalence and sex differences of substance use among eight graders

Type of behavior	No. (%)* of examinees		$\chi^2$	P
	girls	boys		
Consumption of beer	752 (72.2)	729 (76.8)	5.633	0.018
Consumption of wine	719 (69.7)	686 (72.4)	1.750	0.186
Consumption of hard liquor	536 (51.8)	535 (56.9)	5.114	0.024
Consumption of cigarettes	537 (50.9)	420 (44.4)	8.206	0.004
Participation in binge drinking	311 (30.4)	371 (39.6)	18.373	<0.001
Daily cigarette smoking	197 (18.9)	162 (17.3)	0.910	0.340
Consumption of inhalants, glue	94 (9.0)	102 (10.9)	1.898	0.168
Consumption of marihuana	50 (4.8)	68 (7.3)	5.444	0.020

\*Percentages were calculated using the number of valid answers.

**TABLE 4.** Substance usage in relation to exposure to substance use level and sex

Substance	Exposure level	Girls		Boys	
		No. (%)*	$\chi^2$	No. (%)*	$\chi^2$
Cigarette smoking at least once	low	67 (26.6)	126.715 <sup>†</sup>	36 (15.8)	137.982 <sup>†</sup>
	medium	76 (52.8)		52 (43.7)	
	high	199 (76.2)		170 (69.4)	
Daily cigarette smoking	low	11 (4.4)	134.432 <sup>†</sup>	6 (2.7)	89.271 <sup>†</sup>
	medium	16 (11.3)		18 (15.1)	
	high	117 (45.0)		90 (36.7)	
Consumption of beer	low	136 (54.4)	55.132 <sup>†</sup>	128 (56.4)	72.287 <sup>†</sup>
	medium	106 (73.6)		92 (78.0)	
	high	215 (84.3)		225 (90.7)	
Consumption of wine	low	123 (50.0)	77.738 <sup>†</sup>	114 (50.0)	85.182 <sup>†</sup>
	medium	105 (73.4)		86 (72.7)	
	high	220 (85.9)		220 (88.7)	
Consumption of hard liquor	low	62 (25.1)	149.986 <sup>†</sup>	64 (28.1)	121.824 <sup>†</sup>
	medium	78 (54.9)		70 (59.3)	
	high	205 (79.5)		192 (78.4)	
Binge drinking	low	27 (10.9)	122.936 <sup>†</sup>	35 (15.5)	107.470 <sup>†</sup>
	medium	36 (26.3)		46 (39.3)	
	high	146 (56.6)		151 (62.4)	
Consumption of inhalants	low	69 (2.8)	21.923 <sup>†</sup>	13 (5.8)	27.558 <sup>†</sup>
	medium	9 (6.4)		8 (6.8)	
	high	37 (14.0)		50 (20.4)	
Consumption of marihuana	low	0 (0.0)	39.605 <sup>†</sup>	2 (0.9)	49.385 <sup>†</sup>
	medium	2 (1.4)		3 (2.5)	
	high	29 (11.2)		42 (17.4)	

\*Percentages were calculated using the number of valid answers. The percentages of missing data for the whole sample varied between 8.0% for smoking cigarettes at least once and 9.2% for drinking hard liquor.

†Significant,  $P < 0.001$ ,  $\chi^2$  test.

**Other forms of risk-taking behavior**

Exposure to substance use was further explored in relation to other potentially risk-taking behaviors of early adolescents. Going out at night and spending time in cafés, clubs, or at parties was common among pupils (Table 5). Around 44% of girls and boys rarely went out at night and around 30% did it often or very often. Another potentially risk-taking type of behavior was hanging out at secluded places, which was often or very often practiced by more than one fifth of 14-year-old pupils. There were no differences according to sex in the two types of behavior. Boys were significantly more often involved in betting and gambling – around 48% of boys and 18% of girls spent money on slot machines or betting. More than 33% of boys and around 25% of girls skipped school and intentionally avoided lessons. The difference between the

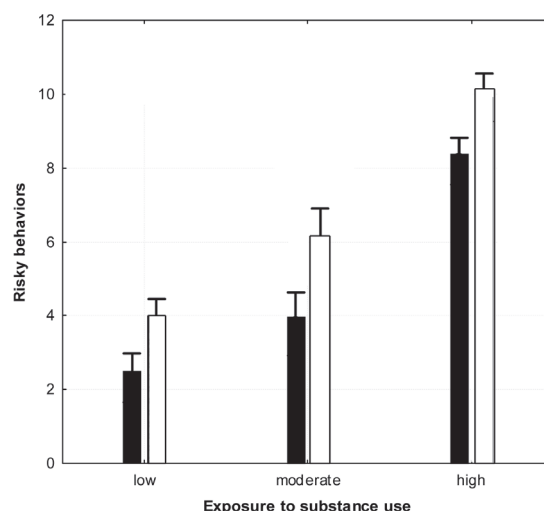
sexes in skipping school was significant ( $P < 0.001$ ), as well as the difference in drinking alcohol in school surroundings ( $P = 0.05$ ).

Results on aggregated “Pupils’ risk-taking behavior” scale showed that boys engaged in risk-taking behaviors significantly more often than girls (t value = 7.15;  $P < 0.001$ ). Both girls’ and boys’ results showed a significant deviation from normal distribution (Kolmogorov-Smirnov  $Z = 8.55$ ;  $P < 0.001$ ). A smaller number of boys and girls engaged in risk-taking behaviors frequently.

**Relationship between exposure to substance use and risk-taking behavior**

The Pearson correlation coefficient between the “cumulative exposure to substance use” scale and “pupils’ risk-taking behavior” scale was 0.612 ( $P < 0.001$ ) in girls and 0.534 ( $P < 0.001$ ) in boys. The effect of sex and exposure to substance use on risk-taking behaviors was also tested by two-way (sex vs exposure to substance use) analysis of variance (Figure 1). Analysis showed the significant effect of sex ( $F_{(1, 1180)} = 33.253$ ,  $P < 0.001$ ) and exposure to substance use ( $F_{(2, 1180)} = 166.502$ ,  $P < 0.001$ ) on risk-taking behaviors of girls and boys. Interactional effect was not significant ( $F_{(2, 1180)} = 0.398$ ,  $P = 0.672$ ). Boys tended to more often engage in risk-taking behaviors, regardless of the level of exposure.

Figure 1.



Exposure to substance (mean) use in relation to pupils’ risk-taking behavior and sex. Open bars – boys, closed bars – girls, vertical bars denote 0.95 confidence intervals.

TABLE 5. Sex differences in potentially risk-taking behaviors – frequencies of responses within response categories

Potentially risk-taking behaviors	No. (%)* of examinees				$\chi^2$	P
	never	rarely	often	very often		
<b>I hang out at night (cafés, clubs, parties)</b>						
girls	276 (25.2)	483 (44.1)	217 (19.8)	118 (10.8)	0.247	0.970
boys	264 (25.5)	459 (44.3)	208 (20.1)	105 (10.1)		
<b>I hang out at secluded places with my friends</b>						
girls	491 (45.3)	354 (32.7)	155 (14.3)	83 (7.7)	1.828	0.609
boys	467 (44.7)	365 (35.0)	143 (13.7)	69 (6.6)		
<b>I gamble (betting, slot machines)</b>						
girls	904 (81.7)	165 (14.9)	23 (2.1)	14 (1.3)	251.494 <sup>†</sup>	<0.001
boys	542 (51.9)	281 (26.9)	130 (12.4)	92 (8.8)		
<b>I skip school when I feel like it</b>						
girls	762 (72.0)	219 (20.7)	34 (3.2)	43 (4.1)	30.320 <sup>†</sup>	<0.001
boys	633 (63.2)	229 (22.9)	74 (7.4)	66 (6.6)		
<b>Whenever possible I avoid lessons</b>						
girls	831 (76.9)	181 (16.7)	37 (3.4)	32 (3.0)	32.150 <sup>†</sup>	<0.001
boys	680 (67.3)	202 (20.0)	71 (7.0)	58 (5.7)		
<b>I drink alcohol in school or around school</b>						
girls	875 (82.1)	117 (11.0)	45 (4.2)	29 (2.7)	7.587	0.05
boys	778 (77.3)	146 (14.5)	49 (4.9)	33 (3.3)		

\*Percentages were calculated using the number of valid answers. The percentages of missing data for the whole sample varied between 1.0% for gambling and 5.2% for avoiding school.

## DISCUSSION

Our study found a moderately strong association between perceived exposure to substance use and reported smoking and alcohol, inhalants, and marijuana consumption in early adolescents. According to these findings, a higher level of exposure leads to more frequent consumption of cigarettes and hard liquor, and binge drinking, equally for girls and boys. These results are in line with previous findings (2-7,9,22). If adolescents' best friends smoked, adolescents were more likely to smoke themselves. Moreover, they were more likely to drink alcohol, suggesting that modeling any addictive behavior can lead to modeling other addictive behaviors as well (9,22). Peer influence or socialization has often been attributed to modeling peer behavior, as postulated by social learning theorists (14). The similarity between peers in substance use may be explained by the process of peer socialization (23). Besides peer socialization, positive perceptions about substance use among adolescents, may also play an important role. Nearly a quarter of boys think that boys who smoke have more friends and girls have the same attitude, regardless their smoking status (2). In addition, smokers find themselves more appealing than what their non-smoking peers perceive them to be. In addition to being related to friends'

smoking, adolescents' smoking onset is also related to parents' smoking (24).

There were significant correlations between the exposure to substance use and risk-taking behaviors in boys and girls. We found significantly higher proportion of everyday smokers among pupils who engaged in other risk-taking behaviors. The pupils who more often went out at night smoked cigarettes and drank alcohol more often. More than one third of pupils reported that they very often went out at night and more than one fifth of them reported hanging out at secluded places with their friends. The results suggest that adolescents whose parents, siblings, and peers indulged in risk-taking behaviors were more likely to indulge in other forms of risk-taking behavior themselves, confirming the crossover effect.

These findings are concordant with previous findings (9) and have important implications for the prevention and treatment of adolescent smoking and drinking. The influence of models of addictive behaviors may be stronger than was originally thought.

Although the results of this study provide a strong evidence for the social learning of substance use, there are

some limitations. First, data on substance use by significant others were based on self-reports. The validity of such data are open to question, since adolescents have consistently overestimated how similar they are to their friends in substance use (23). It is also possible that some adolescents overreport their substance use because they think it is "cool." Thus, if asked directly if and how much they smoke, drink alcoholic beverages, or use marijuana, adolescents may provide answers that are socially desirable but not completely true. We tried to address this problem by emphasizing that answers would be analyzed anonymously. The importance of assessing the prevalence of substance use or other health-risk behaviors as part of research activities involving children and adolescents often necessitates the use of self-report measures. However, these are often affected by cognitive and situational factors in varying degrees (25).

In conclusion, we confirmed that exposure to substance use can lead not only to adoption of similar behavior, but also to adoption of other forms of risk-taking, criminal, or delinquent behavior. Such findings have important implications for prevention programs aiming at reduction of substance use and other forms of risk-taking behavior. While current smoking and alcohol prevention programs focus on improving communication and interactions at schools, social learning theories suggest that prevention should be based on making substance-using role models less salient and substance-abstaining role models more salient. Therefore, there is a need to include parents, siblings, and peers in the prevention efforts, or at least address issues relating to close social relationships and influences as a part of these efforts.

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