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Predicting Early Onset of Intoxication versus Drinking - A Population-based Prospective Study of Norwegian Adolescents

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RUNNING TITLE: Predicting Early Onset of Intoxication

Abstract

Aims: Recent research suggests that early onset of intoxication (EOI) may be of greater importance for a wide range of subsequent adverse outcomes than early drinking experiences without intoxication. However, research on antecedents of EOI is scarce. The present study identifies predictors of EOI and whether they differ from those of early onset of drinking (EOD). Methods: Data was drawn from the prospective Tracking Opportunities and Problems (TOPP) study of Norwegian families ($n=382$), which followed up mothers and their children with six data collections from childhood (age 1.5) to adolescence (age 14.5). Self-reports from the adolescents (parenting practices, adolescent's conduct problems and friends' deviant behaviour) and their mothers (adolescent temperament, socio-economic factors and household alcohol problems) were used to identify predictors of EOI and EOD. Findings: A variety of temperamental, socio-economic, and family factors predicted EOI, whereas EOD was predicted of substantially fewer variables. Particularly, when controlling for relevant covariates, low levels of shyness, own conduct problems and having friends with deviant behaviour prospectively predicted EOI, but not EOD. Conclusions: Future research and prevention efforts should take into consideration that EOI and EOD without getting drunk appear to be predicted by different risk factors in childhood and adolescence.

Keywords: adolescents, alcohol, intoxication, drinking, onset, predictors.

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Introduction

A key focus in research on adolescent drinking behaviour has been early onset of drinking (EOD), not least because researchers have repeatedly observed associations between EOD and subsequent high levels of alcohol consumption (Fergusson et al., 1994; Pitkanen et al., 2005), alcohol related problems (Hingson et al., 2001; Hingson et al., 2000), and alcohol misuse and dependence (DeWit et al., 2000; Hawkins et al., 1997). In order to better prevent this negative development, research on predictors of EOD has long been prioritized, and findings have been essential in shaping alcohol prevention programs (Lemstra et al., 2010). However, in the last two decades, we have witnessed a shift in focus, suggesting that greater attention should be paid to early onset of intoxication (EOI), as it seems to play a more important role in the course of negative development than EOD (Adam et al., 2011; Kuntsche et al., 2013; Warner & White, 2003). Still, little is known about predictors of EOI. Knowledge on precursors of EOI and how they differ from EOD is important in order to better inform prevention policies and to nuance the picture of early drinking experiences in adolescence. This is the focus of the present paper.

Increasingly, longitudinal studies on consequences of early drinking behaviour have highlighted the experience of early drunkenness as an important variable. Warner and White (Warner & White, 2003; Warner et al., 2007) suggest that not only the timing of drinking (i.e. early onset of drinking) but also the experience (i.e. feeling drunk at initiation) is a key element in understanding the transition from early drinking experiences to detrimental drinking outcomes. Studies of early intoxication experience versus later intoxication also

support this pattern, where intoxication episodes before the age of 14 represent an increased risk of heavy alcohol use, alcohol-related consequences and alcohol dependency compared to intoxication onset after the age of 14 (Henry et al., 2011). In a similar vein, a short time interval between onset of drinking and onset of drinking to intoxication has been identified as a unique factor in predicting the development of heavy drinking frequency and other alcohol-related problems (e.g., work/school impairment, blackouts, and vomiting) (Morean et al., 2012). Thus, several studies point at EOI rather than, or in addition to, EOD as the important factor in predicting later alcohol-related problem development. Moreover, research indicates that the context of drinking smaller amounts in early life versus intoxication differs considerably: while drinking smaller amounts of alcohol, such as sipping and tasting, typically occurs in family settings (Donovan & Molina, 2008), more excessive drinking typically occurs in the presence of peers (Treno et al., 2000). Thus, EOI may not just be a distinct predictor of later alcohol-related problems, but may also be influenced by factors other than EOD, since the settings for drinking small amounts of alcohol versus intoxication may differ. However, few studies have so far investigated possible predictors of EOI, and yet fewer have examined whether such predictors differ from those of EOD.

We were able to identify only one longitudinal study focusing explicitly on whether potential risk factors predicted different early drinking behaviours differently (onset drinking, onset drunk and onset binge drinking) (Jester et al., 2015). This study reported that higher expectancies for positive effects of consuming alcohol predicted earlier onset of drunkenness and binge drinking, but not onset of drinking. The study, however, was based on a high-risk community sample and cannot necessarily be generalized to the general population. In addition, the authors only sought to shed light on the relationship between alcohol expectancies and drinking onsets, and not a broader set of variables. Some cross-sectional studies have been conducted in population-based samples, comparing correlates with EOD

and EOI. Here, both types of drinking behaviour, by and large, correlated with the same set of variables: family factors and participation in organized sports (Bu et al., 2002) and family and peer factors, conduct problems, socioeconomic factors and living area (Monshouwer et al., 2003). These studies, however, were based on retrospective reports of drinking and EOI and thus recall bias cannot be ruled out. Moreover, the studies include only a limited set of possible confounders in their analyses. Consequently, little is known about the prospective associations between different factors in childhood and early adolescence and EOI and how they differ from associations with EOD.

One way to expand knowledge of predictors of EOI is to examine whether factors previously identified as key predictors of EOD also predict EOI. Such factors have been identified within different domains of influence. One class of predictors are temperamental characteristics. For example, empirical studies have shown that inadequate emotional and behavioral self-control is related to early onset of alcohol use (Wills et al., 2001; Zucker et al., 2008), whereas a shy and inhibited temperament may be a protective factor (Kerr et al., 1997). Within the family domain, lower parental monitoring and an adverse home environment are found to be important predictors of initiation (Donovan & Molina, 2011; Rose et al., 2001). Likewise, parental drinking behaviour and approval of adolescent drinking are consistent predictors of early onset. Within the adolescents' and peers' behavioural domain, a large number of variables are repeatedly identified as predictors, including adolescents' lifestyle factors (e.g. smoking) and the characteristics of friends, such as deviancy and alcohol use (Donovan, 2004; Donovan & Molina, 2011; Scholes-Balog et al., 2013; Trucco et al., 2011). Moreover, a great range of behavioural problems (e.g. externalizing disorders and aggression) have been identified as antecedent predictors of early alcohol use initiation (McGue et al., 2001; Rose et al., 2001). Finally, there is some evidence

that socioeconomic status influences the timing of alcohol initiation, although the findings are inconclusive (see e.g., Donovan, 2004; Melotti et al., 2013).

Research thus shows that the development of early drinking behaviour is associated with a range of early life factors – some inherent and some embedded in the family and broader social environment. Thus, in order to identify robust risk factors or predictors of EOI, it is important to include a wide range of possible predictors within different domains of influence. Several longitudinal studies of predictors of EOD have applied such a design, but no one has so far applied a prospective design to address predictors of EOI, which will be done in the present study. More importantly, previous studies of predictors of EOD fail to separate individuals who have only had small amounts of alcohol and those who have also been drunk one or more times. Consequently, some of the results may in fact reflect associations to EOI. Thus, in order to get a better understanding of predictors of EOD and EOI, separating these drinking behaviours and comparing them to each other in the analyses is required. To our knowledge, the current study is one of a kind in this respect.

The cultural context may also be of importance as patterns of alcohol use and norms regarding “drunken comportment” vary between different cultures (MacAndrew & Edgerton, 1969). The majorities of studies on EOD are carried out in the US. Thus, there is a need to examine whether the risk profiles for both EOD and EOI identified in the literature also hold in different cultural contexts with varying alcohol-related drinking patterns and norms. The current study is set in the Norwegian cultural context, which is characterized by a strict alcohol regulation policy, influenced historically by a strong temperance movement, and somewhat paradoxically, a drinking culture characterized by excessive drinking at weekends.

The primary aim of this study is to examine predictors of EOI in the age span from early childhood (1.5 years) to middle adolescence (14.5 years) using multi-informant information. We will also examine whether such predictors differ from those for EOD without

EOI. The models include a wide range of prospective parent and adolescent self-reported risk factors (i.e., temperament, socio-economic factors, household alcohol problems, parenting practices, adolescent smoking, drinking and conduct problems and friends deviant behaviour) that have previously been associated with EOD, simultaneously in models predicting EOD and EOI relative to abstainers and relative to each other.

Methods

Participants and procedure

The sample was drawn from the Norwegian population-based prospective study Tracking Opportunities and Problems (TOPP) where mothers and their children are followed over an 18-year span. Originally 1,081 families from 19 geographical health care districts in eastern Norway (28 % living in large cities, 55 % in densely populated areas and 17% in rural areas), were invited to the study. They were recruited when the families attended their toddlers' 18 month vaccination in 1993 at the child health clinics. Details of the study are described elsewhere (Mathiesen et al., 1999). The participants have been followed up over eight data collections from when the children were 1.5 years (T1) to 18.5 years (T8). Questionnaires were handed out and returned at the clinic in the three first waves. The remaining surveys were conducted by mail. From age 12.5 (T5) and thereafter, the adolescents replied to their own questionnaire. At T1, 85 % (n=913) of the invited mothers participated. Background data from the child health clinics at 1.5 years showed that non-respondent mothers did not differ significantly from responding mothers in age, education, employment status, or marital status (Mathiesen & Tambs, 1999). Attrition over time was predicted by lower educational level at baseline (Gustavson et al., 2012). The current sample (n=382) comprises self-report data from the mothers of children aged 1.5 to 14.5 (response rate: 51.9 %, calculated on the basis of participation at T1), and adolescents at 12.5 (T5, response rate: 61.9 %) and 14.5 years (T6,

response rate: 50,2 %) The participants gave their informed consent and the study was approved by the Regional Committees for Medical and Health Research Ethics.

Measures

Alcohol use

At 12.5 and 14.5 years alcohol use and intoxication were measured by adolescent self-report on two items: “Have you ever tasted more than a few sips of alcohol?” and “During the past 12 months, have you had so much to drink that you felt clearly intoxicated?” with five response categories (Never, Once, 2-5 times, 6-10 times and More than 10 times). These items were categorized into three groups at 14.5 years; 1) Abstinent (never tasted, never been drunk), 2) EOD (tasted one or more times, but never been drunk) and 3) EOI (tasted one or more times and been drunk one or more times).

Temperament

Adolescent temperament was assessed at 12.5 by maternal report on the EAS Temperament Survey for Children; Parental ratings (Buss & Plomin, 1984). The scale assesses the adolescents' degree of emotionality (the tendency to become aroused easily and intensely, 12 items), activity (preferred levels of activity and speed of action, 4 items), sociability (the tendency to prefer the presence of others to being alone, 4 items) and shyness (the tendency to be inhibited and wary in new social situations, 4 items). Responses were rated on a 5-point scale ranging from 1 (Not typical) to 5 (Very typical). Mean scores were computed and Cronbach's alpha at 12.5 for the four temperamental subscales were .81 (Emotionality), .82 (Activity), .63 (Sociability) and .77 (Shyness).

Socio-economic factors

Family status was reported by the adolescents at 12.5 and recoded into a dummy variable where those living with both biological parents (value 1) were contrasted with all other living arrangements (value 2). Maternal education was assessed by asking the mothers to report their highest level of education on a scale from 1 (9 years primary school or less) to 5 (more than 4 years at university or university college). Employment measures the mothers' workforce participation in terms of percentage of paid work (1=No paid work, 2=less than 50%, 3=50-80% and 4=80-100%). Household economy was measured by asking the mothers "How do you/your family cope with your current financial situation?" with five response categories ranging from 1 "We cope very poorly" to 5 "We cope very well".

Family factors

Alcohol problems in the household were defined to have occurred if the mothers reported having experienced "alcohol problems in the household" one or more times during the past 12 months with children aged between 1.5 and 12.5 (0=No, 1=Yes). Parenting practices at 12.5 were measured by the Alabama Parenting Questionnaire (Shelton et al., 1996), which measures positive involvement with children (Cronbach's alpha .76), use of positive discipline techniques (Cronbach's alpha .70), consistency in the use of such discipline (Cronbach's alpha .67) and other disciplinary practices (Cronbach's alpha .65). Items were rated on a 5-point Likert scale from 1 (Never) to 5 (Always) and mean scores were computed. We also included a 10-item revised subscale on parental strictness and supervision from the Lamborn Parenting Scales (Lamborn et al., 1991) at 12.5, with response categories recoded into "Low" (coded 1) to "High" (coded 3) levels of strictness/supervision. Mean scores were computed and Cronbach alpha was .75.

Adolescents' and friends' behaviour

Adolescent smoking was assessed by one item with responses ranging from 1 (“Have never smoked”) to 4 (“Smoke daily”) at 12.5. Adolescent conduct problems were assessed by 22 items with response options ranging from 1 “Never happened” to 5 “Happened more than 10 times”. The scale is based on three different Scandinavian scales of antisocial behaviour and is described in more detail elsewhere (Kjeldsen et al., 2014). Deviant behaviour of friends was assessed by four items asking about number of close friends who smoke regularly, use alcohol approximately once a week, have tried cannabis, or have been in contact with the police for illegal activities. The response categories were 1 (none), 2 (one friend) and 3 (several friends). Mean scores were computed for both scales.

Covariates

Gender, age and alcohol use before 12.5 were used as covariates in most analyses.

Statistical analyses

Predictors of EOI and EOD at 14.5 were examined by means of multinomial logistic regression analyses. The variables in the models were categorized under four domains: temperament, socio-economic factors, family factors and adolescents’ and friends’ behaviour. Firstly, all variables were evaluated one by one in a series of multinomial logistic regression analyses, with control for age, gender and alcohol use before age 12.5. Being abstinent was chosen as the comparison group; thus each analysis produced two comparisons: the odds of EOI and EOD compared to abstinent. In order to identify predictors that differentiate between EOI and EOD, we conducted additional analyses using EOD as comparison group. Secondly, we entered all significant predictors from these analyses simultaneously into multiple multinomial regression analyses. All models were adjusted for age, gender and alcohol use before 12.5. Participants with intoxication experiences before the age of 12.5 were excluded

from the analysis in order to predict EOD and EOI by age 14.5 without including respondents who had been drunk before this age.

Results

Prevalence of alcohol use is provided in Table 1. Adolescents reporting alcohol use increased from 16.4 % to 38.9 % from age 12.5 to 14.5, with the majority (82.6 % and 61.3 %) being abstinent in both age groups. Four participants (1.0 %) reported having been drunk before age 12.5. Moreover, 105 (27.5 %) respondents reported EOD (without having been intoxicated) at 14.5 years.

Table 1 about here

Results from multinomial logistic regression analyses examining the relationship between each predictor of EOI and EOD separately, with control for age, gender and alcohol use before 12.5, are presented in Table 2. When comparing adolescents who reported EOI with those who had remained abstinent, significant relationships between predictors and outcome were revealed in all four domains. In the temperamental domain, low levels of shyness and high levels of sociability significantly predicted increased odds for EOI. Of socio-economic factors, only better household economy was related to a decreased risk of EOI. In the family factors domain, a parenting style characterized by greater involvement and higher levels of strictness and monitoring significantly reduced the odds of EOI compared to abstinent. Finally, all predictors concerning the respondents' and their friends' behaviour was significantly related to EOI, with high levels of problem behaviour and more deviant friends being associated with increasing risk of EOI.

When comparing EOD to abstinent, comparably fewer variables significantly predicted the outcome, as only high levels of emotionality, low household economy, alcohol use before age 12.5, and female gender were significantly related to increased risk for EOD at 14.5. None of the predictors within the family factors and adolescents' and friends' behaviour domain were significantly related to EOD.

Finally, when predicting EOI compared to EOD, adolescent showed a higher risk of EOI when reporting low levels of shyness, high levels of conduct problems, and having friends with deviant behaviour.

Table 2 about here

Next, multiple multinomial logistic regression analyses were conducted, where all significant predictors from previous analyses were included simultaneously in one model (see Table 3). When predicting EOI compared to abstinent, low levels of shyness and parental strictness and supervision remained significantly related to EOI. Likewise, conduct problems and deviant friends remained significant predictors, and female gender and alcohol use before age 12.5 significantly increased the odds of EOI.

When comparing EOD to abstinent, in addition to alcohol use before age 12.5, only emotionality remained significantly related to the outcome in the multiple analyses. Finally, deviant friends and low shyness increased the odds of EOI compared to EOD.

Table 3 about here

Discussion

The aim of the present study was to identify predictors of EOI among Norwegian adolescents and to examine whether these predictors differ from those of EOD. Results showed that EOI was predicted by a variety of temperamental, socio-economic, and family factors. Particularly strong and consistent findings were found in the domain of the adolescents' own and their friends' behaviour, where all included variables on norm-breaking behaviour were significantly related to EOI. None of these variables predicted EOD. Some of these variables lost statistical significance in the multivariate analyses. However, in both the separate and the multivariate analyses, low level of shyness and high friend deviancy differentiated between adolescents who had experienced EOI and those who just had EOD without experiencing intoxication. Thus, the results indicate that a temperament characterized by lower levels of shyness and high level of risk exposure in the friends' network may be important factors in the aetiology of EOI.

Shyness, as conceptualized in the present study, represents the tendency to be inhibited and wary in new social situations. Interestingly, this trait, even as observed by others, seems to play a role for EOI. Shy adolescents may avoid social situations, such as parties, where friends are consuming larger quantities of alcohol, and where they themselves would be at risk of getting drunk. Shyness may thus function as a protective factor for EOI as intoxication is typically related to social situations that socially inhibited persons may avoid. Moreover, it has been proposed that shyness is part of a broader temperamental category of behavioural inhibition to both non-social and social situations (Kagan, 2001). Shyness may thus be seen in contrast to personality traits such as sensation seeking (Zuckerman, 1971) and novelty seeking (Cloninger, 1987), which describe tendencies to seek stimulating experiences, willingness to take risk, and low levels of worry and rigidity in both social and non-social situations. Even when shy, adolescents will experience situations where they are offered large quantities of

alcohol, but may be less inclined to drink large amounts, as they may have lower degrees of sensation and novelty seeking, concepts that have consistently been related to drug use (for a review, see Hittner & Swickert, 2006).

Deviant friends and adolescents' own conduct problems were also related to EOI. In a culture such as the Norwegian, with very strict restriction of alcohol for the youth population, adolescents drinking large amounts of alcohol and being intoxicated can be considered a violation of societal and cultural norms. Intoxication experiences may therefore be related to a cluster of factors that are related to other behaviours deviant from culturally accepted norms. The correlation between young people's substance use and involvement in a wide range of other problem behaviours is well documented (Elliott et al., 2012; Farrell et al., 1992). This study adds to the literature by showing that these factors are in fact of particular importance for EOI, whereas they seem not to be related to EOD, which is in contrast to previous research. This finding supports the notion that EOD and EOI contain some unique elements and may be considered as two different phenomena.

Interestingly, neither shyness, nor adolescents' behavioural problems, nor having deviant friends were related to EOD. The marked differences in how these factors predicted EOI, but not EOD, can probably be understood in light of the context in which this drinking occurs. The first encounter with alcohol for many children is typically sipping and tasting at family dinners and celebrations (Donovan & Molina, 2008). In adolescence, many parents may support the idea of "supervised introduction" of alcohol, as a way of teaching adolescents healthy drinking habits (Livingston et al., 2010). One could imagine that EOD, as commonly defined as having more than a few sips, takes place in such a family context, and that there are strong norms regulating the amount that may be drunk as well as the acceptance of visible "drunken behaviour". Temperamental dimensions such as shyness and inhibition may be important to a lesser degree for EOD, as drinking will take place in a familiar setting and will

be experienced as having comparably little risk. Likewise, drinking small amounts in family settings will be perceived to a much lesser degree as breaking societal or cultural norms, compared to intoxication, and may therefore not fit into a cluster behaviour associated with conduct problems and deviant friends.

In our study, we identified lower levels of parental strictness and monitoring as a significant predictor increasing risk of EOI. This indicates that adolescents with parents who have greater knowledge of their whereabouts and who they are with, and stricter restrictions on staying out at night significantly decreased the risk of EOI. In contrast to former studies, none of the family factors related significantly to EOD. This also supports the notion that EOD and EOI might take place in different contexts. If EOD typically occurs in a family context, and is in fact encouraged by parents, we would not expect parenting practices reflecting different forms of control and discipline to have an effect. This implies that previously identified associations between family factors and EOD may be due to not distinguishing between the two types of drinking behaviour and that it is EOI and not EOD that can be predicted by family factors.

The present study was conducted in Norway, a country characterized by a strict alcohol regulation policy. The rates of alcohol use and drunkenness reported are consistent with national statistics and other studies on Norwegian adolescents (Bakken, 2014; Rossow & Kuntsche, 2013). Not surprisingly, however, such rates are lower than rates in other European countries with a more liberal alcohol policy and drinking culture, such as Eastern Europe countries and Denmark (Hibell et al., 2012)

Strengths and limitations

The comprehensive set of risk factors evaluated, the comparison of different types of early drinking behaviour, and using population-based, prospective design with multiple informants

make this study an important contribution to the literature on early onset. The results should however be interpreted in light of some limitations.

Information about the adolescent drinking context was not available in this study. Another concern is the statistical power of the analyses, as only 43 adolescents reported EOI. However, in spite of the relatively low number of adolescents in this group, several significant associations between predictors and EOI were found, indicating that the effects that were obtained in the analyses were in fact of considerable size. The generalizability of these findings needs to be confirmed in other samples as our sample is based on adolescents in a Norwegian cultural context. Moreover, our sample is slightly overrepresented by adolescents whose mothers have higher levels of education. This represents a threat to the representativeness and findings are somewhat more uncertain in terms of people with low socio-economic status.

Implications and conclusion

In summary, EOI and EOD without getting drunk are related to different risk factors during childhood and adolescence. As most previous studies have not distinguished between EOD and EOI, the importance of temperament, family factors, conduct problems and friends' networks on adolescents' different types of early drinking experience has not been examined in detail. These findings need to be replicated using samples from different cultural contexts and the underlying mechanisms behind these associations need to be examined further. It is possible that some of the same underlying mechanisms that predispose adolescents to conduct problems, such as theft, vandalism, and involvement with anti-social peers could also make them prone to EOI. Some of this proneness might even have strong genetic components. There has been identified a genetic influence on EOI, and some of this genetic influence overlaps extensively with the genetic risk of alcohol use disorders (Ystrøm et al., 2014). More

studies are needed on the relative importance of EOD and EOI on the development of drinking patterns and alcohol-related problems in late adolescence and adulthood.

Because the nature of the relationship between EOI and later outcomes is still unclear, simply shifting focus from delaying EOD to a delay of EOI as a strategy to prevent alcohol related problems later in life has little evidence. However, preventing early drunkenness may be an important goal in itself, as immediate consequences of excessive alcohol uses, such as alcohol related accidents, can be avoided. The findings in the present study indicate, in accordance with other research (i.e. Cleveland et al., 2012; Rossow & Kuntsche, 2013; Scholes-Balog et al., 2013) that effective prevention strategies should target factors in multiple domains, including family and peers.

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Conflict of interest statement

None declared.

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Table 1. Prevalence (% , n) of Intoxication (T5), Early Onset of Intoxication (EOI, T6), Alcohol use (T5), Early Onset of Drinking (EOD,T6) and Abstinent (T5 and T6).

	T5 Age 12.5	T6 Age 14.5
Intoxication/EOI	1.0 % (4)*	11.3 % (43)
Alcohol use/EOD (without intoxication)	16.4 % (63)	27.5 % (105)
Abstinent	82.6 % (319)	61.3 % (234)
Total	100 % (386)	100 % (382)*

*The 4 respondents reporting having been intoxicated at 12.5 are excluded from all further analyses.

Table 2. Results of Multinomial Logistic Regression Predicting Early Onset of Intoxication (EOI) and Early Onset of Drinking (EOD). Predictors included one by one with control for age, gender, and alcohol use before age 12.5.

	EOI compared to abstinent		EOD compared to abstinent		EOI compared to EOD	
	OR	95% CI	OR	95% CI	OR	95% CI
<i>Adolescent temperament</i>						
Shyness (m)	0.40**	(0.22-0.72)	0.95	(0.67-1.36)	0.42**	(0.23-0.79)
Activity (m)	1.25	(0.82-1.89)	1.20	(0.89-1.61)	1.04	(0.67-1.61)
Emotionality (m)	1.16	(0.60-2.26)	1.78*	(1.10-2.86)	0.66	(0.33-1.32)
Sociability (m)	2.10*	(1.12-3.89)	1.21	(0.81-1.80)	1.73	(0.91-3.31)
<i>Socio-economic factors</i>						
Family status (a)	1.09	(0.49-2.42)	1.56	(0.90-2.69)	0.70	(0.31-1.58)
Mother's education (m)	1.05	(0.79-1.40)	1.17	(0.95-1.44)	0.90	(0.66-1.22)
Household economy (m)	0.56**	(0.37-0.86)	0.70*	(0.51-0.96)	0.80	(0.52-1.24)
Mother's employment (m)	0.90	(0.67-1.21)	1.67	(0.92-1.49)	0.77	(0.55-1.07)
<i>Family factors</i>						
Alcohol problems in the household (m)	1.64	(0.50-5.32)	1.79	(0.78-4.15)	0.91	(0.27-3.07)
Parenting - Involvement (a)	0.36*	(0.15-0.87)	0.65	(0.35-1.23)	0.56	(0.22-1.40)
Parenting - Positive parenting (a)	0.66	(0.33-1.32)	0.94	(0.57-1.56)	0.70	(0.33-1.46)
Parenting - Inconsistent discipline (a)	1.54	(0.87-2.72)	1.38	(0.91-2.09)	1.11	(0.62-2.01)
Parenting - Other disciplinary practices (a)	1.08	(0.52-2.26)	1.21	(0.72-2.04)	0.89	(0.41-1.94)
Parenting - Strictness/supervision (a)	0.16**	(0.04-0.60)	0.38	(0.13-1.09)	0.42	(0.12-1.64)
<i>Adolescents' and friends' behaviour</i>						
Adolescent smoking (a)	5.92**	(1.99-17.60)	2.67	(0.99-7.22)	2.21	(0.82-6.02)
Adolescent conduct problems (a)	1.17***	(1.07-1.27)	1.07	(1.00-1.15)	1.09*	(1.00-1.82)
Deviant friends (a)	2.92***	(1.64-5.20)	1.35	(0.76-2.41)	2.16**	(1.26-3.70)
<i>Covariates</i>						
Gender (girl = 0, boy =1) (a)	0.49	(0.24-1.00)	0.56*	(0.34-0.93)	0.88	(0.41-1.19)
Age (m)	1.55	(0.59-4.08)	1.60	(0.79-3.26)	0.97	(0.36-2.62)

Alcohol use before age 12.5 (a) 4.34*** (2.46-7.65) 3.74*** (2.23-6.27) 1.16 (0.81-1.68)

***P< 0.001; ** P< 0.01; * P< 0.05. OR = odds ratio; CI = confidence interval for odds ratio.

EOI = Early onset of intoxication (< 14.5 years); EOD = Early onset of drinking (< 14.5 years); Abstinent (< 14.5 years).

(m) = mother's report; (a) = adolescent self-report.

Table 3. Results of Multiple Multinomial Logistic Regression Predicting Early Onset of Intoxication (EOI) and Early Onset of Drinking (EOD).

All predictors included simultaneously.

	EOI relative to abstinent		EOD relative to abstinent		EOI relative to EOD	
	OR	95% CI	OR	95 % CI	OR	95% CI
<i>Adolescent temperament</i>						
Shyness (m)	0.42*	(0.18-0.96)			0.40*	(0.22-0.84)
Sociability (m)	1.42	(0.63-3.27)				
Emotionality (m)			1.63*	(1.00-2.65)		
<i>Socio-economic factors</i>						
Household economy (m)	0.64	(0.38-1.07)	0.74	(0.54-1.02)		
<i>Family factors</i>						
Parenting – Involvement (a)	0.50	(0.16-1.52)				
Parenting – Strictness/supervision (a)	0.18*	(0.04-0.80)				
<i>Adolescents' and friends' behaviour</i>						
Adolescent smoking (a)	1.60	(0.40-6.40)				
Adolescent conduct problems (a)	1.12*	(1.01-1.22)			1.05	(0.96-1.15)
Deviant friends (a)	1.96*	(1.06-3.61)			1.96*	(1.14-3.35)
<i>Covariates</i>						
Gender (girl=0, boy=1) (a)	0.32**	(0.14-0.74)	0.61	(0.36-1.03)		
Age (m)	1.36	(0.44-4.20)	1.72	(0.84-3.54)		
Alcohol use before age 12.5 (a)	3.10***	(1.61-5.96)	3.65***	(2.15-6.21)		

***P< 0.001; ** P< 0.01; * P< 0.05. OR = odds ratio; CI = confidence interval for odds ratio.

EOI = Early onset of intoxication (< 14.5 years); EOD = Early onset of drinking (< 14.5 years); Abstinent (< 14.5 years).

(m) = mother's report; (a) = adolescent self-report.

Highlights

- Early onset of intoxication (EOI) and drinking (EOD) are predicted differently
- Parenting styles are associated with EOI, but not EOD
- Norm breaking behaviour predicts EOI, but not EOD
- Having friends with deviant behaviour prospectively predicts EOI, but not EOD
- Lower levels of shyness increase risk of EOI, but not EOD.

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