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The role of parental alcohol use, parental discipline and antisocial behaviour on adolescent drinking trajectories

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Backgrounds: Parental drinking, harsh parental discipline and adolescent antisocial behaviour have been independently implicated in adolescent alcohol use. Robust prospective studies are required to examine developmental relationships between these factors and their effect on trajectories of alcohol use across adolescence.

Methods: Data were ascertained at three consecutive adolescent waves (13.5, 15.5 and 17.5 years) from the Australian Temperament Project, a 15-wave (30 year) general population birth cohort in Victoria, Australia. Adolescent alcohol trajectories, adjusted for time-varying measures of parenting and antisocial behaviour, were regressed on time-stable measures of parental alcohol use. The full case analysis comprised 751 individuals with complete data.

Results: Two distinct alcohol trajectories were identified across the three adolescent waves after adjusting for time-varying factors: a higher and lower drinking group. Both trajectories increased linearly over the study period. Antisocial behaviour was positively associated with both trajectories while harsh parental discipline was positively associated with alcohol use in the lower-use group only. Increased maternal and paternal drinking at 13.5 years placed teenagers at a greater risk of being included in the high-risk trajectory.

Conclusion: Parental drinking was the strongest predictor of different drinking trajectories in adolescence. This finding underscores the importance of comprehensive public health approaches that target both parental and adolescent drinking attitudes and behaviour.

1. Introduction

Alcohol consumption is involved with 1 in every 26 deaths worldwide, mostly resulting from injury, cancer, cardiovascular disease and liver cirrhosis (Rehm et al., 2009). Reducing this avoidable disease burden is an international priority. Early adolescence is the key period for the initiation of alcohol consumption, with 83% of adolescents aged between 12 and 15 reporting having consumed alcohol in Australia (Kelly et al., 2011). A recent UK study identified the majority of adult heavy drinkers were consuming alcohol weekly by 15 years of age, and that almost a third of the sample were consuming at levels considered harmful to adults by age 16 (Heron et al., 2012). Not only do high levels of early drinking place teenagers at a greater risk of unsafe sexual behaviour, physical violence, affective disorders, accidents and other health problems (Danielsson et al., 2012, 2010), they are also a key predictor of adult alcohol use disorders (Englund et al., 2008; Pitkanen et al., 2008). Studies that have applied longitudinal mixture modelling have increased in prevalence and suggest both an insidious onset and broad aetiology of alcohol use disorders (Casswell et al., 2002; Colder et al., 2002; Danielsson et al., 2010; Vermeulen-Smit et al., 2012). These studies have implicated parenting, family environment, peer groups and psychological/behavioural problems during adolescence as important predictors of alcohol misuse (Ryan et al., 2010; Zucker, 2008).

The influence of parental alcohol use on adolescent drinking patterns is well documented (Latendresse et al., 2008; Mares et al., 2012, 2011; Ryan et al., 2010; Seljamo et al., 2006; Vermeulen-Smit et al., 2012). Alati et al. (2005) found that even moderate maternal alcohol use during the offspring's adolescence was the strongest predictor of developing alcohol disorders in early adulthood, accounting for over one-fifth of the alcohol use disorder risk in males (Alati et al., 2005). An Australian systematic review concluded that lower levels of parental alcohol consumption were protective of lower levels and later onset of teen drinking (Ryan et al., 2010). More recently, heavy parental episodic drinking (but not frequency of drinking) has been identified as a key marker of early alcohol initiation and an increased heavy drinking trajectory in 12–15 year olds (Vermeulen-Smit et al., 2012). Investigations into the impact of parental alcohol use on the longitudinal development of alcohol use in their adolescent offspring should account for longitudinal factors known to develop alongside alcohol use in a way that accounts for the complex interrelationships among these factors.

Evidence points to the importance of parenting skills and adolescent-parent communication in the relationship between early initiation and progression to heavy alcohol use (Latendresse et al., 2008; Luyckx et al., 2011; Mares et al., 2011). In general studies show that positive parenting has an important independent effect on teen drinking (Koning et al., 2012; Mares et al., 2012; Ryan et al., 2010), and there is evidence that early parental control at five years may reduce later problematic patterns of drinking (Alati et al., 2010). In contrast, harsh and inconsistent parenting, lax parental monitoring, and parent-child conflict has been linked to increased use of alcohol use in two longitudinal studies (Brody and Ge, 2001; Duncan et al., 1998). Longitudinal studies have confirmed that youth drinking trajectories during later childhood (Mayzer et al., 2009) and adolescence (Young et al., 2008) are associated with antisocial behaviour. Furthermore, epidemiological studies report that DSM-IV adult antisocial personality disorder is highly associated with chronic alcohol

dependence (AOR 3.51; Hasin et al., 2011), and that adolescent antisocial behaviour is associated with earlier drinking onset (Strat et al., 2010) and accelerated risky drinking (Buchmann et al., 2009). Thus it is important to understand how harsh parenting and child/adolescent antisocial behaviour in addition to adolescent alcohol use develop together over time.

Importantly, most studies which have investigated these interrelationships do not include parental alcohol use, which is likely to be a decisive factor (Latendresse et al., 2008; Mares et al., 2012, 2011; Ryan et al., 2010; Seljamo et al., 2006; Vermeulen-Smit et al., 2012). It follows that large scale prospective studies attempting to gauge the impact of parental drinking on adolescent alcohol use are needed which disentangle the dynamic and longitudinal relationships among the factors outlined above (Jones et al., 2001a). Finally, there is little research on the influence of familial stress on the development of adolescent drinking. Family stress has been found to relate to parent-child relationship and to predict alcohol use (Baer et al., 1987), and is therefore likely an important factor in the development of alcohol use. In this study we take a new approach to more effectively account for this multifaceted relationship. Specifically, our aims are to (1) use time varying factors (e.g., parenting, family stress and adolescent antisocial behaviour) to inform the development of adolescent drinking trajectories and predict variation within trajectories, thereby accounting for the complexity of the relationships, and (2) examine associations between parental drinking and adolescent drinking trajectories.

2. Methods

2.1. Sample

The sample was drawn from three consecutive adolescent waves of the Australian Temperament Project (ATP), a longitudinal, general population study beginning in 1983. At baseline, 2,443 4–8 month olds and their parents were recruited during a two week period from infant health centres across Victoria.

2.2. Adolescent measures

Adolescent alcohol use was assessed over the last 30 days with the questions; (1) on how many days did you drink an alcoholic beverage?; and (2) on how many days did you have enough alcohol to get drunk? From these a composite, five level ordinal alcohol use variable was created which included; (1) no use, (2) <30 day use, (3) <weekly use, (4) <weekly use + intoxicated, (5) weekly use + intoxicated.

Adolescent antisocial behaviour in the past 12 months was measured using a short form of the Self Report Delinquency Scale which has been shown to have good validity and reliability (Moffitt and Silva, 1988). The scale contained items aimed to assess number and severity of adolescent delinquent behaviours, ranging from having 'stolen something', 'carried a weapon'; 'been charged by police', 'been suspended or expelled from school'; through to having 'attacked someone with the idea of seriously hurting him/her', 'been convicted of a criminal offence' At all ages antisocial behaviour was coded as a three level ordinal variable (0/1/≥2 reported antisocial behaviours).

2.3. Parental measures

Maternal and paternal alcohol use (reported by the mother) was ascertained at all three follow-ups using an ATP devised measure that asked the mother to classify her and her partner's alcohol use habits as 1 = non-drinker, 2 = ex drinker, 3 = occasional drinker, 4 = moderate drinker, 5 = heavy drinker. Because we wished to use parental drinking to predict the probability of belonging to each drinking trajectory, we used baseline drinking as a time-stable risk factor. Parental drinking exhibited little variation over the three measurement periods supporting its use as a time-stable risk.

Parenting style and family stress were assessed at all time points by the mother. Parenting style was assessed using an ATP devised measure of parenting practices and attitudes, with questions including 'physical punishment is often necessary to control the child at this age' and 'I use threats of physical punishment to control my child'. Principal component analysis with varimax rotation identified four components of parenting which were subsequently labelled reasoning, punishment, warmth and use of power, described in detail elsewhere (Prior et al., 1999). In this study we used the punishment variable as a time-varying risk, with increasing scores reflecting harsher parenting, ranging from 0 to 4.33.

Family stress was assessed using an adapted version of the Life Events Questionnaire (Smith and Prior, 1995) which covered the experience and impact of financial problems, life changes and losses and marital, family and illness-related events. The total number of negative life events, from a possible total of five, which respondents indicated had occurred and had had a serious or worrying impact on the family was used as the measure of family stress. Parental education (an 8-point scale ranging from postgraduate degree to elementary school) and occupation level were collected at each time point (an 8-point scale ranging from professional to unskilled). Parental socioeconomic status (SES) was calculated as the mean of both parents' education and occupation, ranging from 1 to 8 with higher values representing greater disadvantage.

2.4. Statistical analysis

Developmental trajectories of adolescent drinking over T1–T3 were estimated by maximum likelihood using the TRAJ procedure for SAS (Jones et al., 2001b). In this procedure, subjects with some missing longitudinal data on time varying covariates are included while those with any missing time stable risk factors are excluded. When assessing the development of behaviour across time, the Bayesian Information Criterion (BIC) was used to decide how many trajectories or classes best describe the unobserved heterogeneity in the data and whether the increase across time in the resulting classes was linear or quadratic, with the model attaining the largest BIC indicating superior fit (Jones et al., 2001a,b). While the bootstrap likelihood ratio test (BLRT) is a good indicator of model fit across a variety of models, it is computationally burdensome and is not traditionally employed in mixture modelling research (Nylund et al., 2007). We tested a total of 199 models, with 1 to 7 classes, increasing as a constant, linear or quadratic term across time. Subsequently, models incorporating time varying covariates (harsh parenting, family stress, adolescent anti-social behaviour) and time stable risks (parental education, parental alcohol use, child gender) were employed to assess relationships of covariates with groups and to produce adjusted trajectories.

It is common in the behaviour development literature to fix the unadjusted class membership probabilities for individuals and then regress the covariates and risks on these to produce risk

estimates via multinomial logistic regression. However, in this analysis we employed a one-step approach by which the all time-varying and time-stable variables were included directly into the modelling procedure. This method conferred a number of advantages: (1) This allowed the time-varying covariates to determine the behaviour trajectories, acknowledging that the number and shape of the trajectories depends on the data and important covariates, not simply time. (2) This, in turn, led to the identification of the most parsimonious mixtures within the data, as the covariates explained some of the variability in teen drinking, thus reducing the number of trajectories needed to summarise teen drinking. (3) In addition, this method accounts for the uncertainty in group assignment by using risk factors to predict individuals posterior probabilities rather than their group membership (Jones et al., 2001a,b). Finally we carried out an attrition analysis which compared descriptive statistics for T1 measures of the time-dependent covariates and time-independent risks used in the model between those who only had measurements at T1 and those who had measurements at both T1 and T3. This was done to assess how loss to follow-up may have biased our sample.

Table 1 includes all participants with measures at T1 and presents the characteristics tabulated by adolescent drinking scores at T1. Males were drinking at higher levels at age 13.5. Harsh parental discipline and adolescent antisocial behaviour were positively associated with adolescent drinking level, and interestingly adolescent drinking was unrelated to father's occupation but related to mother's employment. Table 2 reveals that adolescent drinking was related to mothers' but not fathers' drinking, such that the proportion of mothers drinking at mild levels increased as adolescent drinking increased.

Before the addition of covariables, a four-class model was found to be the best fit to the data. Fig. 1 shows the four unadjusted trajectories of adolescent drinking, which consisted of non-drinkers at all time-points (4.4% of the sample), light drinkers who were not drinking at T1 and who mainly increased drinking between T2 and T3 (23.8%), moderate drinkers (59.6%), and heavy drinkers who started drinking early and were drinking at the highest measured levels by T3 (12.2%). Moderate drinkers increased linearly, while light and high drinkers had quadratic increases. Fig. 2 shows that after the addition of both time-dependent and time-independent covariates a two class solution was the best fit, revealing a high (75.8%) and a low drinking (24.2%) trajectory, both of which increased linearly over T1 to T3.

The time-dependent covariates of antisocial behaviour, SES and harsh parental discipline were related to the trajectories. Adolescent antisocial behaviour was positively associated with increasing drinking levels in both the high and low drinking classes. Harsh parental discipline predicted an increase in adolescent alcohol consumption in the low drinking group only. Lower SES was associated with increasing alcohol use in both groups, but the relationship was stronger in the low drinking group (estimates for the time-dependent effects are available from the corresponding author).

Time-independent risk factors were also related to the trajectories. Table 3 shows that paternal and maternal drinking levels at T1 predicted trajectory membership, with a unit increase in fathers' and mothers' drinking associated with an increase of 1.40 ($p = <0.001$) and 2.77 ($p = 0.029$) of being in the high drinking group compared with the low drinking group respectively.

Table 4 presents the adjusted predicted probabilities of belonging to the high drinking group, with probabilities separated by gender and parental drinking at T1. Due to low numbers in the heavy drinking category, this category was combined with the moderate drinking group for this analysis. For both males and females the probability of being included in the high drinking group (group one) strongly increased by parents' drinking. Table 5 presents an attrition analysis, comparing descriptive statistics for variables measured at T1 between individuals with data at T1 only and individuals with data at T3. It shows that most of the covariates and risk factors were subject to minor differential attrition. Regarding the variables which were predictive of teen drinking in the main model, those who did not have measurements at T3 had higher antisocial behaviour scores, harsh discipline and SES, and higher levels of maternal drinking.

4. Discussion

The strength of this large scale, prospective study is its capacity to robustly and simultaneously examine the impact of paternal and maternal drinking, parenting and antisocial behaviour on adolescent trajectories of alcohol use prior to the legal age of drinking. Data for this study was drawn directly from family units, with information provided separately by parents or caregivers and offspring, an improvement over many previous studies which have used a

Our findings indicate that adolescent drinking development can be categorised in terms of a pattern of higher or lower level of alcohol consumption, when specification of the trajectories includes important time-dependent covariables. Interestingly, though both classes were qualitatively distinct, both showed meaningful increases in alcohol use over the course of adolescent development. This increase is likely to reflect the experimental use of alcohol during adolescence, with lower levels of experimentation less likely to lead to ongoing alcohol use problems after adolescence.

Our results are in line with earlier findings that parental alcohol use is predictive of both an earlier age of initiation and of a greater increase in alcohol use across adolescence (Vermeulen-Smit et al., 2012). These findings add to the existing evidence of a positive association between parental and teen drinking (MacPherson et al., 2010), confirming these associations hold after accounting for important covariates. It is now clear that parental drinking plays a central role in the development of a risky trajectory of adolescent alcohol use. We suggest that social cognitive/learning theory (Bandura, 1986) best conceptualises the processes by which paternal and maternal drinking increases adolescent drinking development. In many instances, expectations of the positive outcomes of alcohol use are transmitted (implicitly or explicitly) from parents to offspring even before initiation of alcohol use (Jones et al., 2001a,b). Periods of irregular and experimental alcohol use may follow, with role models contributing considerably to the maintenance of experimental use, or escalation to more regular use (Petraitis et al., 1995). These positive expectations are highly associated with increased drinking over time (MacPherson et al., 2010).

Importantly, within both trajectories, antisocial behaviour was positively associated with increasing alcohol consumption, consistent with previous studies (MacPherson et al., 2010). However, our results do not provide a clear explanation for the positive relationship between these two variables. Antisocial behaviour may be a proxy for a sensation seeking and risk taking propensity among adolescents (MacPherson et al., 2010). Also, antisocial behaviour is likely to occur in the company of

peers who display similar behaviour traits, perhaps providing adolescents with alcohol using role models.

With regard to the role of harsh parental discipline, our study provides new insight regarding early evidence suggesting that excessive discipline may actually increase adolescent alcohol intake (MacPherson et al., 2010). Among those in the high drinking trajectory, harsh discipline was not effective in reducing adolescent drinking levels, while among those in the lower drinking trajectory harsh discipline contributed to higher levels of drinking. Thus while strict rules and monitoring regarding alcohol, in addition to parent-adolescent communication against alcohol use, are consistently found to reduce teenage alcohol consumption (MacPherson et al., 2010), harsh parenting may be counter-productive in low-level adolescent drinkers. In other words, general attempts to restrain adolescent autonomy by harsh means may have the opposite to desired effect in relation to alcohol use among those drinking at lower levels. This is supported by studies showing that relatively moderate levels of parental control and supervision seem optimal and related to lower levels of heavy episodic drinking (Getz and Bray, 2005; Guilamo-Ramos et al., 2005). An alternative interpretation is that harsh/callous, unreasonable and inconsistent parenting may reflect higher levels of parental alcohol and/or substance use, which impedes responsible parenting and leads to poor adult-adolescent relationships (MacPherson et al., 2010). With this scenario, harsh parenting could increase teenage drinking by its association with greater levels of parental substance use, or because it is an indicator that the beneficial aspects of consistent parenting are absent. Future studies are needed to further understand the mechanisms behind this association.

This study had a number of limitations that should be considered when interpreting findings. Firstly, we were unable to adjust for other aspects of parenting including parental control, communication and monitoring of alcohol use. Secondly, although we controlled for a wide range of important confounders including parental education, SES and family stress, we were unable to adjust for peer drinking (MacPherson et al., 2010). Future studies should replicate our findings while adjusting for time-dependent measures of peer drinking. Thirdly, the available sample did not have enough power to assess the impact of parental drinking on male and female adolescents separately and our specification of parental alcohol use was limited to the measure at T1. Thus the contradiction

In conclusion, this study found that parental alcohol use and parenting style are most important in determining the development of alcohol trajectories in early adolescence. These findings highlight the important role of educating parents about the ways in which they model alcohol use to their offspring, and the importance of developing parenting strategies which are firm but supportive when guiding adolescent alcohol use. In addition, our findings warn that the use of harsh and excessive discipline is not only ineffective at reducing high levels of alcohol use among adolescents, but may actually increase alcohol use among teenagers who drink at lower levels. Future studies should replicate our findings and go further to see how the inclusion of further time-dependent predictors influences trajectory specification and to see how these trajectories evolve over the third decade of life.

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Neither we nor anyone else, has published, or is attempting to publish the article we have submitted to you in whole or in part.

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