

## Accepted Manuscript

Brief Report: The association of puberty and young adolescent alcohol use: do parents have a moderating role?

H. Karen Li, Adrian B. Kelly PhD, Gary C.K. Chan, John W. Toumbourou, George C. Patton, Joanne W. Williams

PII: S0306-4603(14)00155-5  
DOI: doi: [10.1016/j.addbeh.2014.05.006](https://doi.org/10.1016/j.addbeh.2014.05.006)  
Reference: AB 4246

To appear in: *Addictive Behaviors*

Received date: 29 January 2014  
Revised date: 8 May 2014  
Accepted date: 19 May 2014

Please cite this article as: Karen Li, H., Kelly, A.B., Chan, G.C.K., Toumbourou, J.W., Patton, G.C. & Williams, J.W., Brief Report: The association of puberty and young adolescent alcohol use: do parents have a moderating role?, *Addictive Behaviors* (2014), doi: [10.1016/j.addbeh.2014.05.006](https://doi.org/10.1016/j.addbeh.2014.05.006)

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.



**BRIEF REPORT:****The association of puberty and young adolescent alcohol use: Do parents have a moderating role?**

H. Karen Li BSc(Hons)<sup>a, b</sup>, Adrian B. Kelly PhD<sup>a</sup>, Gary C. K. Chan BSc(Hons)<sup>a</sup>, John W. Toumbourou PhD<sup>c, d, f</sup>, George C. Patton PhD<sup>c, d, e</sup>, & Joanne W. Williams PhD<sup>c, d, e</sup>

<sup>a</sup> Centre for Youth Substance Abuse Research, The University of Queensland, Brisbane, Australia.

<sup>b</sup> School of Psychology, The University of Queensland, Brisbane, Australia.

<sup>c</sup> Centre for Adolescent Health, Royal Children's Hospital, Melbourne, Australia.

<sup>d</sup> Murdoch Children's Research Institute, Royal Children's Hospital, Melbourne, Australia.

<sup>e</sup> Department of Paediatrics, University of Melbourne, Melbourne, Australia.

<sup>f</sup> School of Psychology and Centre for Mental Health and Wellbeing Research, Deakin University, Melbourne, Australia.

**CORRESPONDING AUTHOR:** H. Karen Li, Centre for Youth Substance Abuse Research, K Floor Mental Health Centre, Royal Brisbane and Women's Hospital, Herston, Brisbane QLD 4029 Australia. Tel: +61 7 3365 6230, Fax: +61 7 3365 4466, Email: [k.li@uq.edu.au](mailto:k.li@uq.edu.au).

**RUNNING HEAD:** Puberty, families, and adolescent alcohol use

**WORD COUNT:** 1990 **PAGE COUNT:** 7

**NUMBER OF TABLES:** 2

**ABSTRACT**

- Purpose** To explore the extent to which parent-adolescent emotional closeness, family conflict, and parental permissiveness moderates the association of puberty and alcohol use in adolescents (aged 10-14).
- Methods** Cross-sectional survey of 7631 adolescents from 231 Australian schools. Measures included pubertal status, recent (30 day) alcohol use, parent-adolescent emotional closeness, family conflict, parental permissiveness of alcohol use and peer alcohol use. The analysis was based on a two-level (individuals nested within schools) logistic regression model, with main effects entered first, and interaction terms added second.
- Results** The interaction of family factors and pubertal stage did not improve the fit of the model, so a main effects model of family factors and pubertal stage was adopted. There were significant main effects for pubertal stage with boys in middle puberty at increased odds of alcohol use, and girls in advanced puberty at increased odds of alcohol use.
- Conclusions** Puberty and family factors were strong predictors of adolescent alcohol use, but family factors did not account for variation in the association of pubertal stage and alcohol use.

**KEY WORDS:** adolescent, alcohol, puberty, family, parents, permissiveness, family relationships.

## 1.0 INTRODUCTION

Alcohol use and misuse increases during early adolescence (10-14 years of age) (Kelly et al., 2011b), and adolescents who are advanced in their pubertal development may be ill-prepared for contextual influences on alcohol use (Hummel, Shelton, Heron, Moore, & van den Bree, 2013). Early pubertal development predicts substance use (Kelly et al., 2012), and effects are independent of age (Kaltiala-Heino, Koivisto, Marttunen, & Fröjd, 2011). Relatively little research has focused on early adolescents, when alcohol use often emerges, and pubertal development begins.

Parents have an important protective role in reducing alcohol-related risks (Kelly, et al., 2011b). Key protective factors include communication of clear rules about alcohol non-use (Habib et al., 2010; Simons- Morton, 2004), providing a safe and secure emotional environment (Choquet, Hassler, Morin, Falissard, & Chau, 2008; Luyckx et al., 2011), and effectively managing family distress (Chan, Kelly, & Toumbourou, 2013; Kelly et al., 2011c). Based on Contextual Amplification Theory (Ge, Brody, Conger, Simons, & Murry, 2002) parenting may amplify existing risks of pubertal development on alcohol use.

Research on the interplay of parenting, pubertal development, and alcohol use is comparatively rare (Hummel, et al., 2013). Prior research has focused on negative family factors such as lax supervision, harsh/inconsistent parenting, family violence (Costello, Sung, Worthman, & Angold, 2007), and positive factors, such as warmth, love, and caring behaviors (Shelton & van den Bree, 2010). These studies indicate that when family relationship quality is low, the risk of alcohol use is elevated for early maturing girls but not boys (Costello, et al., 2007; Shelton & van den Bree, 2010). Other research shows that family factors may hasten pubertal development (Belsky et al., 2007; Ellis, 2004; Ellis &

Essex, 2007; Ellis & Garber, 2000; Moffitt, Caspi, Belsky, & Silva, 1992), and externalizing behaviours (Ellis et al., 2003; Ge, et al., 2002).

This study examined the extent to which positive and negative dimensions of family relationships moderated the association of pubertal development and alcohol use. This is important to evaluate, because different studies show each to be significantly related to alcohol use in early maturing girls, yet these dimensions are obliquely related, and there are gender differences in how alcohol use develops in response to family problems (Chan, et al., 2013; Kelly, et al., 2011b). We examined these associations in a large sample of young adolescents (10-14 years of age), given the importance of this age period in the development of alcohol use and the significant role of parents in this developmental period relative to later periods (Bray, Adams, Getz, & Baer, 2001). Controls included age, parental substance use, involvement in peer drinking networks, and school-level variance in alcohol use. Following Costello, et al. (2007) and Shelton and van den Bree (2010), we hypothesized that family factors would moderate the association of pubertal stage with alcohol use, with this effect most pronounced for girls.

## **2.0 METHODS**

### *2.1 Participants*

Participants were students who participated in the Healthy Neighbourhoods Study (2006). The survey involved 7866 students (10-14 years old) from 231 schools located in 30 communities across three States in Australia ( $N = 7866$ ). Surveys were administered in school classrooms (Jacka et al., 2010). Communities were selected by random stratification according to socioeconomic disadvantage (Australian Bureau of Statistics, 2009). Within each community, primary ( $n=164$ ) and secondary schools ( $n=82$ ) were invited to participate, 83% schools ( $n = 443$ ) responded, and 52% of schools agreed to participate. Students only

participated if signed parent consent was obtained (67%), and 92% of students who returned permission forms consented to participation. The survey was web-based and completed at school (paper copies available if needed). The research was approved by an Institutional Research Ethics Committee.

Of the full sample, 152 participants were excluded because of low self-report reliability (see 2.2), 41 were excluded due to missing values for alcohol consumption, 22 who did not report their age, and 515 who did not respond to puberty items. The final analysis sample consisted of 7136 adolescents (91% of the consented sample, 47% male, modal age 12). Compared to those meeting inclusion criteria, excluded participants were more likely to be male ( $\chi^2 = 5.55$ ,  $p < .05$ ).

## 2.2 MEASURES

Measures were based primarily on the *Communities That Care Youth Survey* (Arthur, Hawkins, Pollard, Catalano, & Baglioni, 2002; Glaser, Van Horn, Arthur, Hawkins, & Catalano, 2005).

*Recent Alcohol Use* was measured using the item “In the past 30 days have you had more than just a few sips of an alcoholic beverage (like beer, wine or spirits)?” (0 ‘No’, 1 ‘1-2 times’, 2 ‘3-5 times’, 3 ‘6-9 times’, 4 ‘10 or more times’). Scores were collapsed to create a binary variable (any alcohol use, yes/no).

*Pubertal Development* was measured using a modified self-report version of the Pubertal Development Scale (PDS) (Petersen, Crockett, Richards, & Boxer, 1988) which has been validated for Australian school use (Bond et al., 2006). Both males and females completed 3 items about their height, body hair growth and skin changes on a 4-point scale (0 ‘has not started yet’, 1 ‘has barely started’, 2 ‘has definitely started’, 3 ‘seems complete’). Males and

females completed two other gender-specific item (males; “Have you begun to grow hair on your face?” and “Have you noticed a deepening of your voice?” females; “Have you noticed that your breasts have begun to grow?” and “Have you begun to menstruate (started to have your period)?”). Summed scores were used to capture overall pubertal development for males/females ( $\alpha = .74/.75$  respectively). Based on summed scores, participants were categorised according to Tanner Stage (Patton et al., 2004; Tanner & Whitehouse, 1976). Only 6% of the participants were in Tanner Stage I (start of physical maturation) and only 1% of participants were in Tanner Stage V (completion of physical maturation). Therefore, Tanner Stages were collapsed into *initial puberty* (Stage I/II, 34% of the sample), *middle puberty* (Stage III, 38%) and *advanced puberty* (Stage IV/V, 28%) (Patton, et al., 2004).

*Parent- child emotional closeness* was measured separately for mothers and fathers with three items (e.g., “Do you feel very close to your mother/father?”, 1-4 point scale,  $\alpha = .80/.82$  for mothers/fathers). *Family Conflict* was measured with three items (e.g., “people in my family often insult and yell at each other”, 1-4 point scale,  $\alpha = .79$ ). *Parental permissiveness* was measured separately for beer/wine and spirits (e.g. ‘How wrong do your parents feel it would be for you to drink beer or wine/spirits regularly (at least once or twice a month)?’ (1 ‘Not wrong at all’, 2 ‘A little bit wrong’, 3 ‘Wrong’, 4 ‘Very wrong’,  $\alpha = .85$ ). *Involvement in peer drinking networks* was assessed with the question “How many of your best friends have tried alcohol (like beer, wine or spirits) when their parents didn’t know about it?” (0-4). Scores were collapsed to a binary variable (0/1+) (Kelly, et al., 2012; Kelly et al., 2011a). *Parental alcohol use* was measured separately for mother and father, “Does your mother/father drink alcohol?” (0 ‘Never’ to 3 ‘Every day’). *Parental education* was measured with the items ‘What is your mother/father’s highest level of education?’ (1 ‘Didn’t complete high school’, 2 ‘Completed high school’, 3 ‘Has a degree from a university’). Adolescents were excluded

if they reported low self-report reliability by endorsing the question “I was not honest at all” (about completing the survey) or the use of a fictitious drug.

### 2.3 ANALYSIS PLAN

Statistical analyses were performed with STATA 11 (StataCorp., 2009). The main statistical design was a 2-level logistic regression model (individuals nested within schools), with random effect estimations for school, and recent alcohol use (present/absent) as the dependent variable. The influence of *pubertal stage* was measured separately for each gender. Power analyses were estimated using G\*Power 3 (Faul, Erdfelder, Buchner, & Lang, 2009). To detect OR = 1.2 at 80% power, a sample of 961 is required, so the present sample was easily sufficient. In a stepped approach, main effects were entered into the models first followed by key interactions simultaneously. Best fit of main effect versus interaction models was determined using Likelihood-ratio tests.

## 3.0 RESULTS

### 3.1 Preliminary analyses

A higher proportion of boys had consumed alcohol ( $p < .001$ ), and as expected, alcohol use was related to advanced pubertal stages ( $p < .001$ ) (see Table 1). There were lower levels of emotional closeness, higher levels of family conflict, and more parent permissiveness of alcohol use in adolescents who had consumed alcohol compared to those who had not ( $ps < .001$ ). There were comparable numbers of boys and girls in *middle* puberty, but most boys (52%) were at the *initial* stage. A larger proportion of girls were in the *advanced* stage of puberty (40% compared to 12% for boys).

[INSERT TABLE 1 ABOUT HERE]



### 3.2 Main Analyses

Main effects for pubertal development, family factors, and controls were first entered into main effect models, then puberty-family interactions were entered. Gender effects were modelled separately given established findings in the area (Hummel et al., 2013). For boys, the main effects models indicated that recent alcohol use was significantly associated with *Middle* puberty (relative to *initial* puberty,  $p < .05$ ), family conflict ( $p < .001$ ), and parental permissiveness ( $p < .001$ ). For girls, recent alcohol use was significantly associated with *Advanced* puberty (relative to *initial* puberty,  $p < .01$ ), family conflict ( $p < .001$ ), and parental permissiveness ( $p < .001$ ). In both models, these effects were independent of controls, including peer alcohol use ( $p < .001$ ), and mothers/fathers alcohol use (everyday alcohol use relative to none,  $p < .001$  to  $p < .05$ ). Low emotional closeness to parents was not associated with alcohol use in either model. When interactions for the three family variables and pubertal stage were added to each main effects model, Likelihood ratio tests indicated that interaction terms did not improve model fit for males ( $\chi^2 = 7.08, p = .53$ ) or females ( $\chi^2 = 14.56, p = .07$ ). Because model fit was not improved, further analysis of interaction terms was inappropriate, and the main effects model was retained as the model of best fit (see Table 2)

[INSERT TABLE 2 ABOUT HERE]

## 4.0 DISCUSSION

The present study is unique in that it assessed the simultaneous contribution of both positive and negative dimensions of family relationship quality on alcohol use. Contrary to our hypothesis, and despite having sufficient statistical power, it was found that family factors did not moderate the association of pubertal stage with alcohol use. Pubertal status, parental

permissiveness, and family conflict were significant independent associates of alcohol use, but these effects were independent of each other. Consistent with our hypotheses, advanced pubertal status was associated with alcohol use in girls but not boys.

The null result for puberty – family interactions appeared at variance with two key studies in this area, where puberty-related effects were noted for lax supervision (a variable related to the present variable ‘parental permissiveness’), and positive family relationship quality (a variable similar to parent-adolescent emotional closeness) (Costello, et al., 2007; Shelton & van den Bree, 2010). While a host of cross-study methodological differences are likely to be relevant, perhaps the most likely reason for the variation in findings relates to a focus on pubertal timing in earlier research versus pubertal status in the present study. We did not evaluate effects for pubertal timing, in part because the cross-sectional design precluded assessment of when pubertal stages were reached. It remains possible that pubertal timing might have accounted for the present finding in relation to pubertal status. The role of positive and negative dimensions in moderating the effect of pubertal stage and timing on adolescent alcohol use is an area for further research.

The present study has implications for prevention of alcohol-related risks during adolescence. Girls with more advanced pubertal status may be at elevated risk of alcohol use compared to boys, pointing to the value of monitoring involvement of girls with older peer groups where drinking cultures are established. The statistical independence of family factors and pubertal status points to the value of family-oriented prevention and addressing contextual risks in both early and late pubertal stages. Because the design was cross-sectional, causal inferences are inappropriate. Active parental consent may have biased the sample towards those with fewer problems (Kelly & Halford, 2007). Findings may not generalize to children whose pubertal status advances before age 10, or who are substantially delayed in their

pubertal development. The study relied on adolescent self-report data only. Recent alcohol use (30 days) was the primary outcome measure and results may not have captured alcohol use during other time periods. The present study demonstrates that parental effects and pubertal development independently account for recent alcohol use in both boys and girls.

#### 4.0 ACKNOWLEDGEMENTS

This research was funded by an NHMRC Project Grant to J. Williams, J. Toumbourou, R. Homel, and G. Patton. Data analysis and preparation of this manuscript was supported by NHMRC Project 569539 and ARC DP130102015 to A. B. Kelly (first investigator). The first author is a PhD student under the supervision of the second and fourth authors. Study sponsors were not directly involved in the production of this manuscript or decision to submit the manuscript for publication. We thank Ross Young and Lake-Hui Quek for their review of earlier drafts.

## 6.0 REFERENCES

- Arthur, M. W., Hawkins, J. D., Pollard, J. A., Catalano, R. F., & Baglioni, A. J. J. (2002). Measuring risk and protective factors for use, delinquency, and other adolescent problem behaviors: The communities that care youth survey. *Evaluation Review*, *26*, 575-601. doi: 10.1177/0193841X0202600601
- Australian Bureau of Statistics. (2009). *Socio-economic indices for areas*. Canberra: Australian Bureau of Statistics Retrieved from [http://www.abs.gov.au/websitedbs/D3310114.nsf/home/Seifa\\_entry\\_page](http://www.abs.gov.au/websitedbs/D3310114.nsf/home/Seifa_entry_page).
- Belsky, J., Houts, R. M., DeHart, G., Roisman, G. I., Steinberg, L. D., Friedman, S. L., . . . Susman, E. (2007). Family rearing antecedents of pubertal timing. *Child Development*, *78*, 1302-1321. doi: 10.2307/4620704
- Bond, L., Clements, J., Bertalli, N., Evans-Whipp, T., McMorris, B. J., Patton, G. C., . . . Catalano, R. F. (2006). A comparison of self-reported puberty using the Pubertal Development Scale and the Sexual Maturation Scale in a school-based epidemiologic survey. *Journal of Adolescence*, *29*, 709-720. doi: 10.1016/j.adolescence.2005.10.001
- Bray, J. H., Adams, G. R., Getz, J. G., & Baer, P. E. (2001). Developmental, family, and ethnic influences on adolescent alcohol usage: A growth curve approach. *Journal of Family Psychology*, *15*, 301- 314. doi: 10.1037/0893-3200.15.2.301
- Chan, G. C. K., Kelly, A. B., & Toumbourou, J. W. (2013). Accounting for the association of family conflict and very young adolescent female alcohol use: The role of depressed mood. *Journal of Studies on Alcohol and Drugs*, *74*, 396- 505. Retrieved from [http://www.jsad.com/jsad/article/Accounting\\_for\\_the\\_Association\\_of\\_Family\\_Conflict\\_and\\_Heavy\\_Alcohol\\_Use\\_Amo/4811.html](http://www.jsad.com/jsad/article/Accounting_for_the_Association_of_Family_Conflict_and_Heavy_Alcohol_Use_Amo/4811.html)
- Choquet, M., Hassler, C., Morin, D., Falissard, B., & Chau, N. (2008). Perceived parenting styles and tobacco, alcohol and cannabis use among French adolescents: Gender and

family structure differentials. *Alcohol & Alcoholism*, 43, 73- 80. doi:

10.1093/alcalc/agm060

Costello, E. J., Sung, M., Worthman, C., & Angold, A. (2007). Pubertal maturation and the development of alcohol use and abuse. *Drug and Alcohol Dependence*, 88, S50-S59.

doi: 10.1016/j.drugalcdep.2006.12.009

Ellis, B. J. (2004). Timing of pubertal maturation in girls: An integrated life history approach.

*Psychological Bulletin*, 130, 920- 958. doi: 10.1037/0033-2909.130.6.920

Ellis, B. J., Bates, J. E., Dodge, K. A., Fergusson, D. M., Horwood, L. J., Pettit, G. S., &

Woodward, L. (2003). Does father absence place daughters at special risk for early sexual activity and teenage pregnancy? *Child Development*, 74, 801-821. doi:

10.2307/3696230

Ellis, B. J., & Essex, M. J. (2007). Family environments, adrenarche, and sexual maturation:

A longitudinal test of a life history model. *Child Development*, 78, 1799-1817. doi:

10.2307/4620739

Ellis, B. J., & Garber, J. (2000). Psychosocial antecedents of variation in girls' pubertal

timing: Maternal depression, stepfather presence, and marital and family stress. *Child Development*, 71, 485-501. doi: 10.2307/1132004

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.-G. (2009). Statistical power analyses using

G\*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, 41, 1149- 1160.

Ge, X., Brody, G. H., Conger, R. D., Simons, R. L., & Murry, V. M. (2002). Contextual

amplification of pubertal transition effects on deviant peer affiliation and externalizing behavior among African American children. *Developmental*

*Psychology*, 38, 42-54. doi: 10.1037//0012-1649.38.1.42

- Glaser, R. R., Van Horn, M. L., Arthur, M. W., Hawkins, J. D., & Catalano, P. (2005). Measurement properties of the Communities that Care Youth Survey across demographic groups. *Journal of Quantitative Criminology*, *21*, 73- 102. doi: 10.1007/s10940-004-1788-1
- Habib, C., Santoro, J., Kremer, P., Toumbourou, J. W., Leslie, E., & Williams, J. (2010). The importance of family management, closeness with father and family structure in early adolescent alcohol use. *Addiction*, *105*, 1750-1758.
- Hummel, A., Shelton, K. H., Heron, J., Moore, L., & van den Bree, M. B. M. (2013). A systematic review of the relationships between family functioning, pubertal timing and adolescent substance use. *Addiction*, *108*, 487-496.
- Jacka, F. N., Kremer, P. J., Leslie, E. R., Berk, M., Patton, G., Toumbourou, J. W., & Williams, J. W. (2010). Associations between diet quality and depressed mood in adolescents: Results from the Australian Healthy Neighbourhoods Study. *Australian and New Zealand Journal of Psychiatry*, *44*, 435-442. doi: 10.3109/00048670903571598
- Kaltiala-Heino, R., Koivisto, A.-M., Marttunen, M., & Fröjd, S. (2011). Pubertal timing and substance use in middle adolescence: A 2-year follow-up study. *Journal of Youth and Adolescence*, *40*, 1288-1301. doi: 10.1007/s10964-011-9667-1
- Kelly, A. B., Chan, G. C. K., Toumbourou, J. W., O'Flaherty, M., Homel, R., Patton, G. C., & Williams, J. (2012). Very young adolescents and alcohol: Evidence of a unique susceptibility to peer alcohol use. *Addictive Behaviors*, *37*, 414-419. doi: 10.1016/j.addbeh.2011.11.038
- Kelly, A. B., & Halford, W. K. (2007). Responses to ethical challenges in conducting research with Australian adolescents. *Australian Journal of Psychology*, *59*, 24- 33. doi: 10.1080/00049530600944358

- Kelly, A. B., O'Flaherty, M., Connor, J. P., Homel, R., Toumbourou, J. W., Patton, G. C., & Williams, J. (2011a). The influence of parents, siblings and peers on pre- and early-teen smoking: A multilevel model. *Drug and Alcohol Review, 30*, 381-387. doi: 10.1111/j.1465-3362.2010.00231.x
- Kelly, A. B., O'Flaherty, M., Toumbourou, J. W., Connor, J. P., Hemphill, S. A., & Catalano, R. F. (2011b). Gender differences in the impact of families on alcohol use: A lagged longitudinal study of early adolescents. *Addiction, 106*, 1427-1436.
- Kelly, A. B., Toumbourou, J. W., O'Flaherty, M., Patton, G., Homel, R., Connor, J. P., & Williams, J. (2011c). Family relationship quality and early alcohol use: Evidence for gender-specific risk processes. *Journal of Studies in Alcohol and Drugs, 72*, 399-407. Retrieved from [http://www.jsad.com/jsad/article/Family\\_Relationship\\_Quality\\_and\\_Early\\_Alcohol\\_Use\\_Evidence\\_for\\_GenderSpec/4571.html](http://www.jsad.com/jsad/article/Family_Relationship_Quality_and_Early_Alcohol_Use_Evidence_for_GenderSpec/4571.html)
- Luyckx, K., Tildesley, E. A., Soenens, B., Andrews, J. A., Hampson, S. E., Peterson, M., & Duriez, B. (2011). Parenting and trajectories of children's maladaptive behaviors: A 12-year prospective community study. *Journal of Clinical Child and Adolescent Psychology, 40*, 468-478. doi: 10.1080/15374416.2011.563470
- Moffitt, T. E., Caspi, A., Belsky, J., & Silva, P. A. (1992). Childhood experience and the onset of menarche: A test of a sociobiological model. *Child Development, 63*, 47-58. doi: 10.2307/1130900
- Patton, G. C., McMorris, B. J., Toumbourou, J. W., Hemphill, S. A., Donath, S., & Catalano, R. F. (2004). Puberty and the onset of substance use and abuse. *Pediatrics, 114*, 300-306. doi: 10.1542/peds.2003-0626-F



- Petersen, A. C., Crockett, L., Richards, M., & Boxer, A. (1988). A self-report measure of pubertal status: Reliability, validity, and initial norms. *Journal of Youth and Adolescence*, *17*, 117-133. doi: 10.1007/bf01537962
- Shelton, K. H., & van den Bree, M. B. M. (2010). The moderating effects of pubertal timing on the longitudinal associations between parent child relationship quality and adolescent substance use. *Journal of Research on Adolescence*, *20*, 1044-1064. doi: 10.1111/j.1532-7795.2010.00643.x
- Simons- Morton, B. (2004). Prospective association of peer influence, school engagement drinking expectancies and parent expectations with drinking initiation among sixth graders. *Addictive Behaviors*, *29*, 299- 309. doi: 10.1016/j.addbeh.2003.08.005
- StataCorp. (2009). Stata Statistical Software: Release 11. TX: StataCorp LP.
- Tanner, J. M., & Whitehouse, R. H. (1976). Clinical longitudinal standards for height, weight, height velocity, weight velocity, and stages of puberty. *Archives of Disease in Childhood*, *51*, 170- 179. doi: 10.1136/adc.51.3.170

Table 1.

Descriptive statistics and univariate analyses of alcohol use split by gender.

|                                | Males                        |                  | $\chi^2$  | Females                      |                  | $\chi^2$  |
|--------------------------------|------------------------------|------------------|-----------|------------------------------|------------------|-----------|
|                                | Last 30 days alcohol use (%) |                  |           | Last 30 days alcohol use (%) |                  |           |
|                                | No<br>(n = 2432)             | Yes<br>(n = 751) |           | No<br>(n = 3319)             | Yes<br>(n = 634) |           |
| <b>Pubertal Stages</b>         |                              |                  |           |                              |                  |           |
| Initial puberty                | 1347 (82%)                   | 295 (18%)        | 66.45***  | 722 (92%)                    | 64 (8%)          | 191.82*** |
| Middle puberty                 | 839 (72%)                    | 326 (28%)        |           | 1414 (90%)                   | 158 (10%)        |           |
| Advanced puberty               | 246 (65%)                    | 130 (35%)        |           | 1183 (74%)                   | 412 (26%)        |           |
|                                | Mean (SD)                    | Mean (SD)        | t tests   | Mean (SD)                    | Mean (SD)        | t tests   |
| <b>Low closeness to mother</b> | 1.50 (.55)                   | 1.68 (.64)       | -7.60***  | 1.43 (.56)                   | 1.70 (.75)       | -9.99***  |
| <b>Low closeness to father</b> | 1.57 (.63)                   | 1.75 (.71)       | -6.51***  | 1.70 (.70)                   | 2.00 (.82)       | -9.24***  |
| <b>Family conflict</b>         | 2.11 (.82)                   | 2.35 (.81)       | -7.05***  | 2.06 (.82)                   | 2.46 (.85)       | -11.03*** |
| <b>Parental permissiveness</b> | 1.31 (.62)                   | 1.91 (.88)       | -20.93*** | 1.29 (.61)                   | 1.97 (.87)       | -23.76*** |
| Age                            | 11.55 (.02)                  | 11.77 (.03)      | -6.71***  | 11.46 (.01)                  | 11.89 (.03)      | -12.43*** |
| <b>Controls</b>                | Last 30 days alcohol use (%) |                  | $\chi^2$  | Last 30 days alcohol use (%) |                  | $\chi^2$  |
|                                | No<br>(n = 2432)             | Yes<br>(n = 751) |           | No<br>(n = 3319)             | Yes<br>(n = 634) |           |
| <b>Peer alcohol use</b>        |                              |                  |           |                              |                  |           |
| Yes                            | 537 (56%)                    | 425 (44%)        | 324.80*** | 668 (61%)                    | 420 (39%)        | 565.47*** |
| No                             | 1882 (85%)                   | 332 (15%)        |           | 2630 (93%)                   | 212 (7%)         |           |
| <b>Mother's alcohol use</b>    |                              |                  |           |                              |                  |           |
| Never                          | 726 (89%)                    | 89 (11%)         | 150.95*** | 841 (92%)                    | 77 (8%)          | 95.53***  |

|                             |            |           |           |            |           |           |
|-----------------------------|------------|-----------|-----------|------------|-----------|-----------|
| Occasionally                | 1502 (75%) | 513 (25%) |           | 2151 (83%) | 436 (17%) |           |
| Most Days                   | 159 (59%)  | 110 (41%) |           | 259 (75%)  | 85 (25%)  |           |
| Everyday                    | 31 (48%)   | 34 (52%)  |           | 52 (60%)   | 34 (40%)  |           |
| <b>Father's alcohol use</b> |            |           |           |            |           |           |
| Never                       | 414 (89%)  | 49 (11%)  | 131.44*** | 540 (94%)  | 37 (6%)   | 106.34*** |
| Occasionally                | 1453 (79%) | 387 (21%) |           | 2045 (85%) | 352 (15%) |           |
| Most Days                   | 412 (66%)  | 217 (34%) |           | 522 (76%)  | 169 (24%) |           |
| Everyday                    | 115 (58%)  | 85 (43%)  |           | 145 (71%)  | 60 (29%)  |           |

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . *Notes.* For males, alcohol was negatively associated with mothers' and fathers' education respectively ( $\chi^2 = 18.90$ ,  $p < .001$ ;  $\chi^2 = 18.78$ ,  $p < .001$ ). State, *n.s.* For females, alcohol was negatively associated with mothers' and fathers' education respectively ( $\chi^2 = 11.23$ ,  $p = .01$ ;  $\chi^2 = 21.00$ ,  $p < .001$ ). Participants in Victoria had higher rates of alcohol use than the other two States ( $\chi^2 = 27.41$ ,  $p < .001$ ).

Table 2.

*Adjusted odds ratio estimates of last 30 days alcohol use.*

| Main effects                                 | Males (n = 2797) |                     | Females (n = 3435) |                     |
|--|------------------|---------------------|--------------------|---------------------|
|  | ORs              | 95% CIs             | ORs                | 95% CIs             |
| <b>Pubertal Stages</b> (ref: initial stages) |                  |                     |                    |                     |
| Middle stage                                 | 1.28*            | (1.03- 1.61)        | 1.13               | (.78- 1.63)         |
| Advanced stages                              | 1.34             | (.96- 1.86)         | 1.78**             | (1.22- 2.58)        |
| <b>Family conflict (Std)</b>                 | <b>1.22***</b>   | <b>(1.09- 1.35)</b> | <b>1.27***</b>     | <b>(1.13- 1.43)</b> |
| Low emotional closeness to mother (Std)      | 1.06             | (.93- 1.20)         | 1.02               | (.91- 1.15)         |
| Low emotional closeness to father (Std)      | 1.05             | (.92- 1.19)         | 1.07               | (.96- 1.20)         |
| <b>Parental permissiveness</b>               | <b>1.70***</b>   | <b>(1.55- 1.87)</b> | <b>1.81***</b>     | <b>(1.65- 1.99)</b> |
| Controls                                     |                  |                     |                    |                     |
| Age  | 1.00             | (.86- 1.17)         | 1.04               | (.86- 1.25)         |
| Involvement with peer drinkers               | 2.91***          | (2.35- 3.59)        | 4.46***            | (3.52- 5.64)        |
| Mother's drinking (Ref: never)               |                  |                     |                    |                     |
| Occasionally                                 | 2.19***          | (1.61- 2.97)        | 1.28               | (.92- 1.79)         |
| Most Days                                    | 2.78***          | (1.81- 4.28)        | 1.52               | (.96- 2.42)         |
| Everyday                                     | 2.42*            | (1.14- 5.12)        | 2.65**             | (1.30- 5.41)        |
| Father's drinking (Ref: never)               |                  |                     |                    |                     |
| Occasionally                                 | 1.57*            | (1.04- 2.36)        | 2.30**             | (1.43- 3.70)        |
| Most Days                                    | 2.09**           | (1.34- 3.28)        | 2.71***            | (1.62- 4.54)        |

| Everyday              | 2.91***  | (1.68- 5.05) | 2.32**   | (1.23- 4.37) |
|-----------------------|----------|--------------|----------|--------------|
|                       | Estimate | SE           | Estimate | SE           |
| School level variance | .21      | .11          | .24      | .12          |

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ . Notes. For males, mother's education, *n.s.*, father's education, *n.s.*, and state of residence, *n.s.* For females, mother's education, *n.s.*, father's education, *n.s.*, but state of residence less in QLD compared to VIC ( $p < .01$ ).

**AUTHOR DISCLOSURE STATEMENTS****Statement 1: Role of Funding Sources**

This research was funded by an NHMRC Project Grant to J. Williams, J. Toumbourou, R. Homel, and G. Patton. The study was supported by a VicHealth Research Fellowship awarded to J. Toumbourou. Data analysis and preparation of this manuscript was supported by NHMRC Project 569539 and ARC DP130102015 to A. B. Kelly (first investigator). Study sponsors were not directly involved in the production of this manuscript or decision to submit the manuscript for publication.

**Statement 2: Contributors**

Li is a PhD student under the supervision of the second and fourth authors. Chan assisted Li in the initial data analysis. Li and Kelly wrote the first draft of the manuscript and all authors contributed to and have approved the final manuscript.

**Statement 3: Conflict of Interest**

All authors declare that they have no conflicts of interest.

**Statement 4: Acknowledgements (optional)**

We thank Ross Young and Lake-Hui Quek for their review of earlier drafts.

**Puberty and young adolescent alcohol use: What role do parents have in moderating this association?** *Journal of Addictive Behaviors*.

Research Highlights

- Highlights the role of family functioning on adolescent alcohol use in the context of varying degrees of pubertal development
- Examines both positive and negative dimensions of family functioning in very early adolescents
- Accounts for school level clustering effects in a large sample of 7631 Australian school students