Abstinence from alcohol may indeed be the best policy: 32 month longitudinal outcomes among adolescents in the United Kingdom.

Published in:
International Journal of Child and Adolescent Health

Document Version:
Peer reviewed version

Queen's University Belfast - Research Portal:
Link to publication record in Queen's University Belfast Research Portal

Abstinence may indeed be the best policy: 32 month longitudinal outcomes among adolescents in the United Kingdom

Michael T. McKay*[1], Martin Dempster** & Jon C. Cole***

*Centre for Public Health, Liverpool John Moores University, Liverpool, UK

**School of Psychology, Queen's University, Belfast, UK

Michael McKay recruited the schools and gathered the data.

Michael McKay & Jon Cole wrote the Introduction and Methods sections.

Martin Dempster conducted the analyses.

Michael McKay, Martin Dempster & Jon Cole wrote the discussion and both contributed to the editing of

the final manuscript.

---

[1] Corresponding author

M.T.Mckay@ljmu.ac.uk

Tel: 0044 2890 686738

Fax 0044 2890 686720

Abstinence may indeed be the best policy: 32 month longitudinal outcomes among adolescents in the United Kingdom

Abstract

The present study investigated the longitudinal relationship between alcohol consumption at age 13, and at age 16. Alcohol-specific measures were frequency of drinking, amount consumed at last use and alcohol related harms. Self-report data were gathered from 1113 high school students at T1, and 981 students at T2. Socio-demographic data were gathered, as was information on context of use, alcohol-related knowledge and attitudes, four domains of aggression and delay reward discounting. Results indicated that any consumption of alcohol, even supervised consumption, at T1 was associated with significantly poorer outcomes at T2. In other words, compared to those still abstinent at age 13, those engaging in alcohol use in any context reported significantly more frequent drinking, more alcohol-related harms and more units consumed at last use at age 16. Results also support the relationship between higher levels of physical aggression at T1 and a greater likelihood of more problematic alcohol use behaviours at T2. The findings support other evidence suggesting that abstinence in early adolescence has better longitudinal outcomes that supervised consumption of alcohol. These results suggest support for current guidance on adolescent drinking in the United Kingdom (UK).

Key Words: Adolescent, Alcohol, Context of Use, Longitudinal

Introduction

Research has pointed to significant relationships between earlier initiation and later problematic misuse of alcohol (1-2). It has been suggested that the risk of alcohol related harm in adult life is also inversely related to the age of alcohol initiation (3), with those initiated by age 10- to 12-years old particularly vulnerable to subsequent alcohol dependency (4). Longer-term negative outcomes from earlier alcohol initiation include more frequent drinking, alcohol abuse and social problems (2-3). One study found that the clearest predictor of alcohol dependence (of those tested) in young adults was regular alcohol use in the teenage years (1). However, despite a large amount of research in the area, it has been suggested that evidence for a direct causal relationship between adolescent drinking and its impact on adult health is inconclusive (5). The complexity of the relationship between earlier use and later problems appears to be confounded by, for example, parental drinking, and problem behaviours and/or behavioural disinhibition (6) and accordingly some have concluded that earlier initiation is better characterised as a marker of risk, rather than a causal influence. Indeed Rossow & Kuntsche concluded that earlier onset drinking was not responsible for later heavy drinking, except as part of a wider array of conduct problems (7).

Research data in the United Kingdom has consistently reported that while ages 12- to 13-years old is a peak time for initiation into alcohol use behaviours (8), the period between age 13 and age 16 is characterised by increased experimentation, consumption and an increase in the experience of alcohol-related harms (McBride et al., 2004). As well as possible longer-term negative outcomes, alcohol consumption in

adolescence has been associated with short-term negative outcomes including problems at school (e.g. truancy, exclusion, and poor attainment), unsafe sexual behaviour, unintended pregnancies, trouble with police and/or parents, accidents/injuries, aggressive behaviour and falling out with friends (9-10). In view of much of this evidence the Chief Medical Officer for England recently published guidance (11) suggesting that abstinence from alcohol up to at least age 15 was recommended, and even at age 15 that any consumption was to be moderate and to occur under the supervision of adults. This advice underscored the importance of a number of variables in adolescent drinking behaviour including, frequency of use, age of first use, the context of use, and the amount that individuals should be consuming.

The rapid escalation in numbers of lifetime users and levels of use throughout adolescence is mirrored by the progressive detachment of adolescents from their parents, and an increase in parental tolerance of adolescent drinking behaviour (12). Although there are significant shifts in adolescents' attachments from parents to peers there is still evidence that that the influence of parents is considerable up to later adolescence and into early adulthood (13). In a review of current evidence, Gilligan and colleagues classified the environmental factors that determine adolescents' propensity to engage in risky drinking as; (i) Social and (ii) Peer or Family/Parental (14). In the case of the latter, children are exposed to and learn about alcohol from an early age (14). There has been much debate regarding the extent (if at all) to which parental tolerance of adolescent supervised drinking in the home, and by extension parental supply of alcohol to their children, can reduce heavier drinking and result in greater

responsibility in terms of alcohol use. Young people's drinking behaviours are said to be affected by their parent's attitudes towards this behaviour, and by parental supervision of their drinking (12) and parents often supply alcohol to their children believing that it teaches responsible drinking (15). However, the risk arising from parental supply of alcohol is not well understood, and there is little evidence to support this as a harm-reducing practice (14). In fact, while there is evidence suggesting that parental disapproval of drinking and their limiting of alcohol influences reduced adolescent drinking behaviour (12, 16), some have suggested that parental supply of alcohol may reduce barriers to drinking, encouraging more frequent drinking, consumption of greater amounts of alcohol, and even promoting a progression to unsupervised drinking (17).

Perceived parental approval of drinking has been linked to heavy drinking among high school and college students (18). In support of the argument that permitting drinking at home promotes drinking in other contexts, van der Vorst, Engels, and Burk reported that adolescents who were permitted to drink at home also were more likely to drink outside of the home and to report more alcohol problems over a two-year period than those who were not permitted to drink at all (19). In a survey of almost 12,000 15-16 year olds in the United Kingdom, Bellis and colleagues reported that among those identifying any measure of unsupervised consumption or heavy or frequent drinking there was a significantly greater likelihood of alcohol-related violence, regretted sex or forgetting things after drinking. Further, those reporting any measure of unsupervised consumption were also more likely to drink frequently and to drink heavily (20). Elsewhere results have been equivocal. In a Dutch longitudinal study van der Vorst

(2010) reported no differences in progression to problem drinking among youth whose parents provided high or low levels of supervision of alcohol use. McMorris reported that adult supervised use mediated an increased risk of greater frequency of alcohol use and alcohol-related harms (21). Foley and colleagues in a cross sectional study reported that parental supply of alcohol was associated with lower quantity of consumption per episode when consumption was supervised (22). Finally, Livingston and colleagues, in a one-year follow up of young women making the transition from High school to College reported that women who were allowed to drink at home either at meals or with friends reported more frequent heavy episodic drinking at college, but those allowed to drink with friends reported the heaviest drinking episodes at both time points heavier at drinking on each occasion (23).

The present study aimed to address a number of research questions. Principally to what extent drinking context at age 13 (abstainer, supervised only drinker, unsupervised only drinker, or drinking both supervised and unsupervised) was related to drinking outcomes at age 16. Given previous methodological concerns regarding the allocation of adolescents to "supervision" groups for analysis of this issue (24) and concerns that some previous research had failed to report on amounts of alcohol consumed (14) we used as our main outcome measures; (i) drinking frequency, (ii) alcohol-related harms, and (iii) amount of alcohol consumed at last use. Additionally socio-demographic data were gathered on gender, type of school attended, and percentage entitlement of that school to free school meals. Finally, data were also gathered on context of drinking, alcohol-related knowledge, attitudes towards alcohol, as well as data on aggression and

delay discounting. The scores on these measures can indicate problem behaviours linked to an inability to control impulses to act inappropriately, or a lack of consideration of future conseqeunces. However, given that many school pursuits, such as competitive sports, require a certain amount of controlled aggression it is important to not label all aggression as negative and/or problematic. These measures might best be conceptualised as ones of behavioural dysregulation, and as such would be useful in the analyses given the findings of Rossow and Kuntsche discussed above (7).

The link between child/adolescent aggression and substance use has been well established, with empirical support consistently indicating that child aggression typically precedes substance use (25). The type of impulsive decision making referred to as delayed reward discounting (DRD, or delay discounting) derives from behavioural economics, and describes the extent to which an individual discounts the value of a delayed reward because of a delay in its occurrence (26). Those who choose smaller and more immediate rewards over larger, but delayed, rewards are said to be less able to delay gratification, and are therefore more impulsive. In human studies strong relationships have been reported between delay discounting and substance use more generally, and many forms of addictive behaviour. Accordingly, those reporting more problematic alcohol use and/or alcohol dependence have also been shown to be more likely to choose smaller more immediate rewards over larger delayed ones. This will have clear implications for school children as the rewards of their efforts are in the future, particularly with their education. In addition, although not prospective studies,

high DRD in adolescence has been found to be associated with an earlier onset of symptoms of alcohol use disorders (22).

Given the advice of the Chief Medical Officer for England (11) on the value of abstinence up to and including age 15, we hypothesised that abstinence at age 13 would be associated with better outcomes in all three analyses at age 16. We also hypothesised that higher levels of aggression and DRD at age 13 would be associated with more problematic outcomes at age 16.

Methods

Participants

Participants were pupils from 13 post-primary (High) schools in the Greater Belfast Area of Northern Ireland. In Northern Ireland, there is a system of academic selection between primary and post-primary schools. Grammar schools are typically considered to be more academic and admit pupils who have scored highly on the academic selection exam, while Secondary schools are considered more comprehensive/vocational. Schools were stratified for inclusion according to attendance at Grammar or Secondary school and randomly chosen for participation to ensure, where possible, equal numbers of Grammar and Secondary pupils, and equal numbers of male and female participants. All schools which were randomly chosen agreed to participate.

Data collection

On the day of data collection participants were assigned fixed positions around the test centre by school staff in order to help facilitate confidentiality. Participants were asked to include their date of birth, gender and home postcode on the completed questionnaire, but not their name. This information was used to link questionnaires across the study period. On the basis that no one from the school would see the completed questionnaires, the pupils were asked neither to withhold nor to exaggerate the truth. Some participants had poor literacy and/or concentration skills, therefore all questionnaires were administered verbally, and students were required to tick or circle an answer sheet (available upon request). The test procedure lasted approximately 40 minutes which was the maximum amount of time available for data collection.

Consent

Each participating school which consented to take part was supplied with Parental Consent forms for the parents of each pupil. A form of "opt out" consent was approved by the Ethics Committee of the University of Liverpool so that parents received detailed information on the study and were only required to respond if they were unhappy about their child's participation. On the day of the study each participating pupil was also asked to give their own Informed Consent, indicating their willingness to take part.

Measures

Participants were asked to complete a battery of questionnaires, the order and content of which was consistent in each school and, was repeated at both T1 and T2. Questionnaire presentation was in the same order as McBride and colleagues (10). Alcohol-related knowledge was measured using a 19-item knowledge index (Cronbach's α = 0.73) (10) which assessed how much participants knew about alcohol and the effects of alcohol consumption (e.g., *you can do things to sober up more quickly*, or *Alcohol is a drug*). The three response options were *true, false* or *don't know*. Correct responses were summed to give a total knowledge score.

Attitudes towards alcohol were measured using a six-item scale (Cronbach's α = 0.64) (10). In this study the scale was scored so that a higher attitude score reflected safer attitudes (e.g., *It is okay for young people to drink as long as they do it safely,* or *Young people can enjoy alcohol without having to get drunk*). Participants rated their attitudes on a 5-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*).

Harms associated with own use of alcohol was measured using a 16-item scale (Cronbach's α = 0.90) (10). Participants rated their experience of alcohol related harms within the past year (e.g., *trouble with Police*, *experiencing physical illness and a result of drinking alcohol*, *getting into a fight while intoxicated etc…*) on a 6-point Likert-type scale (0 = *never* to 6 = *12 or more times*). A higher score indicated a greater level of alcohol-related harms.

Alcohol consumption items measured age of first use, frequency of use, and the quantity of alcohol consumed per typical and last drinking episode. Context of use was measured by asking participants to indicate lifetime use from a choice of six possible contexts. This allowed each participant to be allocated to one of four categories: *non-*

drinker, *supervised drinker only, unsupervised drinker only, and those who reported lifetime supervised **and** unsupervised drinking.* Supervised drinkers were those who reported only ever having consumed alcohol in the company of their parents. Subjects were allocated to the unsupervised category if they reported ≥1 consumption episode without parental supervision.

The Aggression Questionnaire (27) consists of 29 items that represent our subscales of the questionnaire: (1) verbal aggression, (2) physical aggression, (3) anger and (4) hostility. Internal consistency reliability reported by Buss and Perry was as follows: physical aggression, (Cronbach's α = 0.85), verbal aggression = 0.72, anger = 0.83, hostility = 0.77 and the total score = 0.89, indicating adequate internal consistency (27). Correlations between the AQ and other personality traits have shown strongest relationships between the subscales and impulsiveness, assertiveness and competitiveness, with anger correlating most closely with impulsiveness (Buss & Perry, 1992). Test–retest coefficients were also found to have acceptable reliability (27).

The Monetary Choice Questionnaire (MCQ) is a measurement of delay discounting (28). Participants were offered choices of immediate monetary rewards ranging from £11 to £80, or larger rewards ranging from £25 to £85, available after delays ranging from one week to six months. The original design using U.S. Dollars (28) was amended to Pounds Sterling (£) for the present study. Participants were asked to imagine that they were choosing between real amounts of money, not merely fictional ones. Larger *k* values (higher delay discounting scores) indicate that the delayed rewards are being discounted more steeply, and consequently, that the individual is more impulsive.

Socio-demographic measures included sex, type of school attended (Grammar/Secondary) and free school meals entitlement. This latter variable was only available at the school level, and indicated the total percentage of children at a given school who were entitled to a free school meal. A higher value is indicative of a lower socio-economic profile.

Analyses

Dependent variables in the analyses were assessed at 32 months after first data collection and were: frequency of drinking, amount of drink consumed in a single session, and experience of alcohol-related harm to self. The predictor variables, which were all assessed at baseline were: type of supervised drinking; gender; age; knowledge; attitudes; delay discounting; frequency of drinking; anger; hostility; verbal aggression; and physical aggression. To determine the relationship between the predictor variables and the dependent variables, generalized estimating equations were used. This enabled the clustering effect of schools to be incorporated in the analyses, as generalized estimating equations adjust the standard errors to account for the intra-cluster correlation. Gender and type of supervised drinking are categorical variables and, therefore, a reference category was chosen for each. Males were treated as the reference category for gender and abstainers were treated as the reference category for type of supervised drinking. All analyses were conducted using SPSS version 20.

Results

A total of 1113 adolescents (mean age 13.8) participated at time 1 of which 431 (38.8%) were male and 682 were female. At time 2 participants totalled 996 (mean age 16.4) of which 379 (38.0%) were male and 619 were female, suggesting an attrition rate of 11.5%. Descriptive data for each of the alcohol use groups (abstainers, supervised only, unsupervised only and both supervised and unsupervised) are displayed in table one.

Insert Table 1 here

In line with general developmental and prevalence patterns the numbers of abstainers and supervised drinkers decreased from time 1 to time 2, while the numbers of unsupervised drinkers increased from time 1 to time 2. Additionally the amounts consumed at last use increased with time both for supervised and unsupervised drinkers alike. The increase in alcohol-related harms with time was observed only for those drinking both supervised and unsupervised. Results suggest that within each of the 4 analysis groups, mean scores on aggression subscales and delay discounting remained stable over time.

The results of the analyses examining the role of the potential predictors are presented in Tables 2-4. The results broadly indicate that participants who were abstinent at baseline drink significantly less alcohol, less frequently and experience less harm at follow-up than those who were drinking at the baseline time point. The difference is smallest between abstainers and those who were drinking in supervised settings only and greatest between abstainers and those drinking in both supervised and

unsupervised settings. In other words, participants drinking in supervised and unsupervised contexts were at greatest risk of future heavy drinking and alcohol-related harm; participants drinking in unsupervised contexts were at less risk; and participants drinking in supervised only contexts were at less risk again, but still at significantly higher risk of future adverse events when compared to abstainers. In addition, participants with higher physical aggression scores at baseline are significantly likely to drink more, more frequently, and to experience more harm at the follow-up time point. There is a similar, but weaker relationship between verbal aggression and frequency of drinking and experience of harm.

Insert Table 2 here

Insert Table 3 here

Insert Table 4 here

Discussion

The consumption of alcohol by those under the age of 18 years old remains a public health concern in the United Kingdom (UK), and while it has been suggested that alcohol consumption may be decreasing in some European Union (EU) countries, the UK is a notable exception. It has also been suggested that regional variation in drinking

patterns across the UK is a reality and that adolescents in Northern Ireland (NI) may be at particular and increased risk of negative alcohol-related outcomes (29). In studies of adolescent drinking behaviours, the importance of distinguishing between occasional recreational use of alcohol by teenagers and potentially harmful consumption, or less problematic and more problematic patterns of behaviour has been stressed. However, the results of the present study suggest that, compared to abstinence at age 13, any consumption of alcohol, even supervised consumption, is associated with more frequent use, greater amounts consumed and greater alcohol-related harms 3 years later.

The decrease in the proportion of abstainers from time 1 to time 2 and the increase in the proportion of those reporting unsupervised drinking at time 2 compared to time 1, suggests that these data are broadly in line with prevalence data observed in this geography (8) and more generally in adolescence (30). Additionally a range of other researchers have described how levels of consumption increasing during adolescence is the norm, and this increase will be most manifest when parents are not physically present (22).

Broadly speaking any consumption of alcohol at time 1 (compared to abstinence) was associated with greater reported consumption at time 2, greater frequency of drinking at time 2 and a greater amount of alcohol-related harm at time 2. This was true controlling for a range of socio-economic variables, as well as aggression and delay discounting. In other words, any consumption of alcohol, including that consumed under the supervision of parents, was predictive of higher levels of use, more frequent use, and a

greater levels of alcohol-related harms, 32 months later. The operational definition of "supervised drinkers" in the present study was those whose reported alcohol consumption occurred only in contexts where their parents are present (meals, family events and celebrations). Results of descriptive data confirm that drinking in such contexts "only" was associated with substantially less consumption at "last use" than for those whose lifetime use of alcohol had involved drinking in unsupervised contexts. In 2009, the Chief Medical Officer for England recommended that, given the relationship between early initiation into drinking and subsequent problems with alcohol, adolescents refrain from drinking any alcohol until age 18, and at a minimum, age 15 (11). These data suggest that, in line with these recommendations, the consumption of any alcohol before age 15 is predictive of higher levels of consumption, more frequent drinking and the experience of more alcohol-related harms at age 16.

However, results also support the idea that if drinking in adolescence is going to occur, drinking under the supervision of parents is the least bad option. The strongest statistical prediction of greater consumption at last use, more frequent drinking and more alcohol-related harms was observed for those adolescents who reported unsupervised drinking, with the smallest χ^2 values in all three analyses observed for those reporting supervised only drinking at time 1. This suggests that although supervised only drinking is associated with more negative outcomes at time 2 (compared to those abstinent at time 1), the magnitude of that prediction is lower than for those drinking unsupervised at time 1. However, the outcomes still differ significantly from those for abstainers at age 13.

Results of previous cross-sectional research have suggested that adolescents drink less at home, under parental supervision, (22) and studies have reported that the volume of alcohol supplied by parents is smaller than that supplied when sourced elsewhere (31). In terms of descriptive data, the present study would support this. However, using longitudinal data van der Vorst and colleagues, in a study of Dutch families, raised concerns about whether supervised drinking by parents can reduce the development of adolescent alcohol use and associated problems (19). Previously van der Vorst and colleagues reported that drinking at home (or outside the home) was associated with an increased risk for heavier and problematic drinking patterns in these settings 2 years later (12). The present findings suggest that, compared to abstinence at age 13, even supervised drinking among adolescents is predictive of greater problems some 32 months later.

Moreover previous cross-sectional studies have shown that children of parents who provide them alcohol had more experiences with drinking (22, 32). Examination of the descriptive results in the present study suggests that these findings are not necessarily supported. The self-reported amounts of alcohol consumed for unsupervised drinkers only and those who have drunk both supervised and unsupervised are remarkably similar. However, the allocation of individuals to categories in the present study was not related to the frequency of such drinking experience, but to lifetime use in such contexts. So, for example an individual could be allocated to the "both" category having had only one or many experiences of supervised drinking with parents, and only one or

many experiences of unsupervised drinking with friends or alone. One study (22) reported that if parents drank alcohol with their children, this was associated with less alcohol use overall. Results of our longitudinal data suggest that delaying the onset of unsupervised drinking behaviour is associated with better outcomes statistically in respect of amount, frequency of drinking and alcohol-related harms.

Other results of the present study are worthy of discussion. More safe or healthy attitudes towards alcohol (but not knowledge about alcohol) are consistently predictive of better outcomes at 32 month follow up. This provides further support for the idea that prevention efforts with this age group should focus on adolescents' attitudes towards substances and not just provide information about substances (10). Of additional interest is the fact that gender was not a significant predictor in any of the analyses. This is further evidence to support the idea of females "catching up" with their male counterparts in respect of more potentially problematic drinking behaviour in a Northern Irish context (8).

Results of the present study support the previously discussed relationship between aggressive behaviour and alcohol use. However, results for impulsive decision making, assessed using the delay discounting measure, were non-significant in all analyses. At the core of this is behavioural under-control or dis-inhibition, a pattern of behaviours and personality traits characterised by impulsivity, sensation seeking, inattention and aggression. Using UK data, Percy and Iwaniec reported that heavy and hazardous adolescent drinkers had significantly higher levels of antisocial behaviour than their

peers (30). In fact they reported that childhood problem behaviours, including bullying, fighting, teasing others and breaking things, predicted those young people who progressed beyond moderate drinking to heavier problematic drinking. Using a 5-class analysis Percy and Iwaniec reported that behavioural under-control was a key predictor of adolescent drinking patterns across all types of drinking with the exclusion of the higher end drinking where there were no differences between heavy and hazardous drinkers on behavioural under-control indicators (30). Moreover behavioural under-control has been cited as a key proximal developmental factor linking alcohol problems, hyperactivity, inattention, and externalising behaviours in boys (33). The present study supports the relationship between heavy drinking and earlier signs of aggression, particularly physical aggression, which may be a manifestation of this under-control. However, the research suggests that impulsivity that is not translated into or accompanied by aggression is unlikely to predict future problematic drinking.

Conclusions

Of the variables examined in the present study, lifetime use of alcohol (as opposed to being abstinent), and higher levels of physical aggression at age 13 were the strongest predictors of frequency of drinking, harms associated with drinking and greater amount consumed at last use at age 16. This is rigorous evidence of these relationships, based on a large scale, longitudinal study, and suggests that in line with the current UK guidance (11), abstinence may indeed be the best policy.

References

1. Bonomo YA, Bowes G, Coffey C, Carlin JB, Patton C. Teenage drinking and the onset of alcohol dependence: A cohort study over seven years. Addiction 2004; 99:1520–28.

2. De Wit DJ, Adlaf EM, Offord DR, Ogborne AC. Age at first alcohol use: A risk factor for the development of alcohol disorders. Am J Psychiatry 2000;157:745–50.

3. Hingson RW, Heeren T, Winter MR. Age at drinking onset and alcohol dependence: Age at onset, duration, and severity. Arch Pediatr Adolesc Med 2006;160:739–46.

4. Gruber E, DiClemente RJ, Anderson MM, Lodico M. Early Drinking Onset and Its Association with Alcohol Use and Problem Behavior in Late Adolescence. Preventative Medicine 1996;25:293-300.

5. McCambridge J, Mcalaney J, Rowe R. Adult consequences of late adolescent alcohol consumption: a systematic review of cohort studies. PLoS Med 2011;8:e1000413.

6. Donovan & Molina Donovan JE, Molina BS. Children's introduction to alcohol use: sips and tastes. Alcohol Clin Exp Res 2008;32:108–19.

7. Rossow I, Kuntsche E. Early Onset of Drinking and Risk of Heavy Drinking in Young Adulthood – A 13-Year Prospective Study. Alcohol Clin Exp Res 2013;37:E297-E304.

8. Northern Ireland Statistics and Research Agency (NISRA). Young person's behaviour and attitudes survey – Headline bulletin. Belfast: Author, 2008.

9. Masterman PW, Kelly AB. Reaching adolescents who drink harmfully: Fitting intervention to developmental reality. J Subst Abuse Treat 2003;24:347–55.

10. McBride N, Farringdon F, Midford R, Meuleners L, Phillips M. Harm minimization in school drug education: Final results of the School Health and Alcohol Harm Reduction Project (SHAHRP). Addiction 2004;99:278–91.

11. Donaldson L. Guidance on the consumption of alcohol by children and young people. London: Department of Health, 2009.

12. Van der Vorst H, Engels RCME, Meeus W, Dekovic M, Van Leeuwe J. The role of alcohol-specific socialization in adolescents' drinking behaviour. Addiction 2005;100:1464-76.

13. Turrisi R, Ray AE. Sustained parenting and college drinking in first-year students. Dev Psychobiol 2010;52:286–94.

14. Gilligan C, Kypri K, Lubman D. Changing Parental Behaviour to Reduce Risky Drinking Among Adolescents: Current Evidence and Future Directions. Alcohol Alcohol 2012;47:349-54.

15. Roberts R, Beckwith M, Watts D. Mothers' intentions to introduce their adolescent to alcohol use: does mothers' alcohol use effect intentions? Aust N Z J Public Health 2010;34:281–7.

16. Ryan SM, Jorm AF, Lubman DI. Parenting factors associated with reduced adolescent alcohol use: a systematic reviewof longitudinal studies. Aust NZ J Psychiatry 2010;44:774–83.

17. Kypri K, Dean JI, Stojanovski E. Parent attitudes on the supply of alcohol to minors. Drug Alcohol Rev 2007;26:41–7.

18. Abar C., Abar B, Turrisi, R. The impact of parental modeling and permissibility on alcohol use and experienced negative drinking consequences in college. Addict Behav 2009;34:542−47.

19. Van der Vorst H, Engels RCE, Burk WJ. Do parents and best friends influence the normative increase in adolescents' alcohol use at home and outside the home? J Stud Alcohol Drugs 2010;71:105-14.

20. Bellis MA, Morleo M, Hughes K, Downing J, Wood S, Smallthwaite L, Cook PA. A cross-sectional survey of compliance with national guidance for alcohol consumption by children: measuring risk factors, protective factors and social norms for excessive and unsupervised drinking. BMC Pub Health 2010; 10:547.

21. McMorris BJ, Catalano RF, Kim MJ et al. Influence of family factors and supervised alcohol use on adolescent alcohol use and harms: similarities between youth in different alcohol policy contexts. J Stud Alcohol Drug 2011;72:418–28.

22. Foley KL, Altman D, Durant RH et al. Adults' approval and adolescents' alcohol use. J Adolesc Health 2004 35:345 e17–26.

23. Livingston JA, Testa M, Hoffman JH et al. Can parents prevent heavy episodic drinking by allowing teens to drink at home? Addict Behav 2010;35:1105–12.

24. Epstein D.H. A commentary on van der Vorst et al. (2010). J Stud Alcohol Drugs 2010;71:615-6.

25. Fite, PJ, Schwartz S, Hendrickson, M. Childhood proactive and reactive aggression: Differential risk for substance use? Aggress Violent Behav 2012; 17:240-46

26. MacKillop J, Amlung MT, Few LR, Ray LA, Sweet, LH, Munafò MR. Delayed reward discounting and addictive behaviour: a meat-analysis. Psychopharmacol 2010;216:305-21.

27. Buss AH, Perry M. The Aggression Questionnaire. J Pers Soc Psychol 1992;63:452–59.

28. Kirby KN, Petry NM, Bickel WK. Heroin addicts have higher discount rates for delayed rewards than non-drug-using controls. J Exp Psychol Gen 1999;128:78–87.

29. Smith L, Foxcroft D. Drinking in the UK: An exploration of trends. York: Joseph Rowntree Foundation 2009. Retrieved from http://www.jrf.org.uk

30. Percy A. Iwaniec D. Teenage Drinking: Causes and Consequences. Saarbrücken: Lambert Academic Publishing, 2010.

31. Dietze PM, Livingston M. The relationship between alcohol supply source and young people's risky drinking and alcohol-related problem behaviours in Victoria, Australia. Aust N Z J Public Health 2010;34:364–7.

32. Komro K.A, Maldonado-Molina MM, Tobler AL, Bonds JR, Muller KE. Effects of home access and availability of alcohol on young adolescents alcohol use. Addiction 2007;102:1597-1608.

33. Dawes, MA, Tarter RE, Kirisci L. Behavioural self-regulation: Correlates and 2 year follow-up for boys at risk of substance abuse. Drug Alcohol Depend 1997;45:165-76.

Table 1 Descriptive data for alcohol use groups and dependent measures at time 1 (T1) and time 2 (T2). Shown are means (SD)

	Knowledge		Attitudes		Last Use		Own Harm		Anger		Hostility		Verbal Aggression		Physical Aggression		*Delay Discounting*	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Abstainer (n=216/50)*	7.14	8.06	20.01	20.76	0	0	0	0	18.56	17.44	21.44	19.02	14.39	12.46	21.82	18.84	0.038	0.033
	(2.59)	(3.05)	(2.19)	(2.43)					(4.98)	(4.85)	(5.68)	(5.26)	(3.48)	(3.35)	(6.81)	(6.51)	(0.05)	(0.04)
Supervised (n=385/141)	7.60	9.09	20.88	21.92	1.83	2.51	1.31	1.40	20.37	18.42	22.73	20.41	15.16	13.96	23.80	20.71	0.039	0.033
	(2.33)	(2.52)	(2.35)	(2.11)	(2.02)	(2.99)	(2.93)	(3.78)	(5.21)	(4.75)	(5.21)	(5.54)	(3.09)	(3.57)	(6.95)	(7.06)	(0.05)	(0.03)
Unsupervised (n=119/57)	7.74	9.02	19.24	19.63	6.24	7.68	11.26	11.70	23.11	21.25	23.82	21.51	16.40	15.65	29.95	25.09	0.043	0.042
	(2.23)	(2.95)	(2.35)	(2.62)	(4.84)	(5.11)	(9.82)	(10.63)	(5.37)	(6.17)	(5.14)	(5.10)	(2.92)	(3.57)	(6.30)	(7.78)	(0.04)	(0.04)
Both (n=393/733)	7.58	9.87	19.68	19.90	7.14	10.90	11.78	17.41	22.49	21.10	24.87	21.88	16.92	15.23	29.38	25.82	0.036	0.039
	(2.32)	(2.58)	(2.56)	(2.83)	(5.67)	(7.33)	(10.86)	(12.53)	(5.31)	(5.43)	(5.22)	(5.50)	(3.41)	(3.49)	(6.88)	(7.64)	(0.04)	(0.04)

*number of participants in each group at T1/T2

Table 2: Baseline predictors of amount of drink consumed in a single session at final time point

	B	Wald χ2	p
(Intercept)	7.472	.436	.509
Supervised and unsupervised drinking vs abstainers	4.209	22.854	<.001
Unsupervised drinking only vs abstainers	3.720	11.065	.001
Supervised drinking only vs abstainers	1.450	4.536	.033
Female vs male	-.629	1.627	.202
Age	.014	.047	.827
Knowledge	-.089	.933	.334
Attitudes	-.203	3.806	.051
Delay discounting	-7.058	2.739	.098
Frequency	-.220	.696	.404
Anger	.029	.223	.636
Hostility	.129	6.086	.014
Verbal Aggression	.110	1.411	.235
Physical Aggression	.150	9.979	.002

Table 3: Baseline predictors of frequency of drinking at final time point

	B	Wald χ2	p
(Intercept)	8.207	13.156	<.001
Supervised and unsupervised drinking vs abstainers	1.025	31.874	<.001
Unsupervised drinking only vs abstainers	.762	11.768	.001
Supervised drinking only vs abstainers	.417	8.190	.004
Female vs male	.069	.503	.478
Age	.027	4.041	.044
Knowledge	-.034	3.019	.082
Attitudes	-.051	7.104	.008
Delay discounting	-.868	.741	.389
Frequency	.125	5.743	.017
Anger	-.020	2.491	.115
Hostility	-.015	2.268	.132
Verbal Aggression	.038	4.445	.035
Physical Aggression	.036	16.291	<.001

Table 4: Baseline predictors of harm to self at final time point

	B	Wald χ2	p
(Intercept)	-9.662	.278	.598
Supervised and unsupervised drinking vs abstainers	9.620	42.234	<.001
Unsupervised drinking only vs abstainers	7.985	17.111	<.001
Supervised drinking only vs abstainers	2.948	7.567	.006
Female vs male	.912	1.246	.264
Age	.136	1.629	.202
Knowledge	-.141	.754	.385
Attitudes	-.554	11.944	.001
Delay discounting	-8.386	1.385	.239
Frequency	-.276	.363	.547
Anger	-.004	.001	.971
Hostility	-.157	3.320	.068
Verbal Aggression	.336	4.820	.028
Physical Aggression	.291	16.311	<.001