

Original article

Heavy episodic drinking and sensation seeking in adolescents as predictors of harmful driving and celebrating behaviors: implications for prevention

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Abstract

Objectives: Effectiveness of strategies to counter injurious risk-taking in adolescents depends on the degree to which behaviors are modifiable or intrinsic to a sensation-seeking personality. Alcohol consumption is often targeted because it is seen as a modifiable determinant. This study sought to clarify the relative importance of engagement in heavy episodic drinking (HED) independently of sensation-seeking tendency (SS), as a predictor of potentially harmful (and protective) behaviors.

Methods: A written survey was administered to students aged 15–17 years in 40 high schools in New South Wales (NSW), Australia to measure HED, SS, and harmful and protective behaviors associated with drug and alcohol use, driving, and celebrating.

Results: Of 2705 respondents, 60% reported HED, 36% failed to wear a seatbelt, 23% rode with an alcohol-impaired driver, 23% rode with a drug-impaired driver and 9% had been alcohol impaired while driving. Two-thirds (65%) had engaged in harmful behaviors and 99% had engaged in protective behaviors while celebrating. SS, gender, income, and age were significant predictors of HED. HED and SS were significant, independent predictors of every harmful or protective behavior. HED had the greatest effect on harmful celebrating behaviors, riding with an alcohol-impaired acquaintance, and riding with a drug-impaired driver. HED had a stronger effect than SS, for alcohol-impaired driving, riding with an alcohol-impaired acquaintance, riding with a drug-impaired driver, and harmful celebrating behaviors.

Conclusions: The vast majority of adolescents who are low to average sensation seekers may benefit from population-based prevention strategies emphasizing that decisions leading to harmful outcomes are more likely if they engage in HED. © 2005 Society for Adolescent Medicine. All rights reserved.

Keywords: Harm reduction; Alcohol; Driving; Celebrating; Risk taking

Risk taking behavior of adolescents often results in injury. Heavy episodic drinking (HED) has been identified as a major contributor to such behaviors and their harmful outcomes in the context of social and sexual interactions and motor vehicle use [1,2]. Specifically, HED is linked

with increased likelihood of riding with an alcohol-impaired driver, driving after drinking, driving recklessly, early onset of sexual activity, and use of less effective means of contraception [2–4].

In many cases the underlying pattern of heavy alcohol use among young adults is a continuation of earlier use established during school years [5,6]. The resulting level of alcohol use and associated potentially harmful behaviors may be viewed as part of a broad complex of physiological, psychosocial, and environmental factors [2,7,8]. A key

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component in most explanatory models is the degree of ‘sensation seeking’ inherent in an individual’s personality [9–14]. Indeed, sensation seeking has proven to be a strong predictor of engagement in harmful driving and social behaviours, including HED [15–17].

Although sensation-seeking personality traits may not be easily modified, there is evidence that the potentially harmful behaviors adolescents engage in may be amenable to change through well-designed interventions targeting other established determinants such as HED [18–20].

This article seeks to clarify the degree to which potentially harmful behaviors associated with driving, drug and alcohol use, and celebrating among school students aged 15 to 17 years may be associated with their propensity for heavy episodic drinking, independent of their tendency to be sensation seekers.

Methods

Design, setting and subjects

A cross-sectional survey was conducted in March 2003 as part of the formative evaluation of the RRISK (Reduce Risk Increase Student Knowledge) program. RRISK aims to provide students with the skills to make informed decisions about risk-taking associated with drug and alcohol use, driving, and celebrating.

The study population was students in years 10 and 11 in 40 high schools in coastal northeast New South Wales, Australia (around 90% of Government and Catholic schools from Port Macquarie to Tweed Heads). The survey was completed by students who: (a) were present on the day of the survey, (b) were not required for compulsory school events, and (c) had provided their teacher with written parental consent. Contact teachers were asked to arrange venues that allowed adequate spacing between students. Once students arrived at the venue, all interaction with students was carried out by trained survey administrators following a standardized protocol.

Variables and analysis

The 20-minute questionnaire items were drawn, where possible, from validated or recognized instruments. Demographic variables included school year, age, gender, weekly available spending money, and driver license status. Key items relevant to the current study focused on sensation-seeking personality traits and both harmful and protective behaviors associated with alcohol, drugs, driving, and celebrating. The two key explanatory variables were frequency of HED and Sensation Seeking personality score. The former was gauged by asking respondents to recall the number of times they had consumed 6 or more standard drinks on one occasion during the months of January and February 2003 [21,22]. The latter was measured using the 19-point Zuckerman Sensation Seeking Scale [16].

Table 1
Protective and harmful celebrating items

| Protective | Harmful |
|---|---|
| Agreed with a friend to look after each other. | Ended up with no safe way home from the party. |
| Told a parent or guardian where I was going. | Got so drunk I felt ill. |
| Had a way my parents or guardian could contact me. | Drove under the influence of either alcohol or drugs. |
| Planned a safe way home, prior to the party. | Was a car or bike passenger with a driver I suspected was influenced by alcohol or drugs. |
| Called a parent, friend, carer or relative to collect me. | Smoked marijuana. |
| Took a taxi home. | Felt ill from using drugs. |
| Caught a bus home. | |

Two sets of behavioral outcomes were explored. The first set contained driving-related behaviors measured as reported frequencies, during January and February 2003, of having been a:

1. passenger of an alcohol-impaired family member,
2. passenger of an alcohol-impaired acquaintance,
3. alcohol-impaired driver,
4. car occupant traveling without using a seatbelt, and
5. passenger of a drug-impaired driver (drugs other than alcohol).

The second set of outcomes was protective and harmful celebrating behaviors. These consisted of ‘harmful’ or ‘protective’ behavior survey questions (7 for ‘protective’ and 6 for ‘harmful’, Table 1). These questions established the proportion of parties attended during January and February 2003 for which respondents reported a particular behavior. Aggregated scores were also calculated by summing the proportions of parties where these behaviors occurred and then converting the results to a scale of 10 (e.g., for ‘harmful’ behaviors, a score of 3 out of 6 was converted to 5 out of 10).

Multivariate, multi-level regression modeling was performed using MLwiN with link functions appropriate to the distribution of the response variable (normal for protective behavior aggregated score, logistic for alcohol-impaired driving, riding with alcohol- and drug-impaired drivers; negative binomial for HED and nonuse of seatbelts) [24–27]. A one-level multinomial regression of aggregated harmful celebrating behavior scores was performed using SAS [23] as school level variation was not significant. All final models included only significant predictor variables. Outputs of normal and negative-binomial models included predicted means and scores for given categories of HED, SS, and other significant demographic variables (gender, license status, age, and income). Outputs of logistic models included odds and probability (in percentage) of engagement in the harmful outcome behavior.

Table 2
Frequency distribution by risk category, gender and age

| Risk category | | Gender/age | | | | All (n = 2698) % |
|--|-------|---------------------------------------|---------------------------------------|---------------------------------------|---------------------------------------|------------------------|
| | | Females | | Males | | |
| | | 14–15 (n = 886 ^a) % | 16–17 (n = 628 ^a) % | 14–15 (n = 627 ^a) % | 16–17 (n = 557 ^a) % | |
| Heavy episodic drinking (Occasions 6+ drinks Jan 2003) | 0 | 49 | 36 | 44 | 26 | 40 |
| | 1–2 | 25 | 28 | 26 | 24 | 26 |
| | 3+ | 27 | 36 | 30 | 50 | 34 |
| Sensation seeking score (tercile) ^b | Low | 34 | 37 | 31 | 28 | 33 |
| | Mid | 34 | 34 | 37 | 36 | 35 |
| | High | 32 | 29 | 31 | 36 | 32 |
| Passenger of family member driver under alcohol influence (Times Jan 2003) | 0 | 76 | 79 | 76 | 76 | 77 |
| | 1–2 | 17 | 14 | 15 | 14 | 15 |
| | 3+ | 8 | 6 | 9 | 10 | 8 |
| Passenger of acquaintance driver under alcohol influence (Times Jan 2003) | 0 | 79 | 76 | 78 | 72 | 77 |
| | 1–2 | 14 | 16 | 14 | 16 | 15 |
| | 3+ | 7 | 8 | 8 | 12 | 8 |
| Drove under the influence of alcohol (Times Jan 2003) | 0 | 96 | 94 | 87 | 82 | 91 |
| | 1–2 | 3 | 5 | 7 | 11 | 6 |
| | 3+ | 1 | 1 | 6 | 7 | 3 |
| Not worn a seat belt when traveling in a car (Times Jan 2003) | 0 | 62 | 68 | 62 | 64 | 64 |
| | 1–2 | 20 | 17 | 14 | 15 | 17 |
| | 3+ | 18 | 15 | 24 | 21 | 19 |
| Passenger of driver under drug influence (Times Jan 2003) | 0 | 78 | 74 | 80 | 74 | 77 |
| | 1–2 | 10 | 13 | 11 | 12 | 11 |
| | 3+ | 12 | 13 | 8 | 14 | 12 |
| Harmful celebrating behavior (Score categories) ^c | Never | 38 | 32 | 39 | 26 | 34 |
| | Low | 43 | 48 | 37 | 45 | 43 |
| | Mid | 13 | 16 | 15 | 19 | 15 |
| | High | 7 | 4 | 9 | 10 | 7 |
| Protective celebrating behavior (Score terciles) ^d | Low | 45 | 39 | 62 | 55 | 50 |
| | Mid | 23 | 27 | 21 | 23 | 24 |
| | High | 32 | 33 | 17 | 22 | 26 |

^a Totals vary due to missing values.

^b Low = 0–9.5, Med = 9.6–12.9, High = 13–19.

^c Never = 0, Low = 0.1–1.7, Med = 1.8–3.3, High = 3.4–10.

^d Low = 0–3.7, Med = 3.8–5.4, High = 5.5–10.

Results

Descriptive and univariate analyses

The 2705 respondents represent 49.1% of all attendees on the day and approximately 65.5% of students actually available at the time of the survey (about 25% were unavailable owing to curricula and other demands). Of these, 43.9% were male and 56.1% female. Most were aged 15 (53.8%) or 16 years (39.4%). A quarter (23.8%) had some form of driver's license, of which 94.5% were Learner drivers. One-quarter (24.8%) had weekly disposable incomes of less than \$10 and 36.4% had over \$40.

Sixty percent reported engaging in HED, 36% had failed to wear a seatbelt, 23% rode with an alcohol-impaired driver, 23% rode with a drug-impaired driver, and 9% had been alcohol impaired while driving (January). Two-thirds (65%) had engaged in some harmful behaviors and 99% had engaged in some protective behaviors while celebrating. Table 2 provides a frequency breakdown of the survey sample for each of the risk-related variables by gender and age of respondent. Distributions for all variables except SS and protective celebrating behaviors were highly skewed with most respondents reporting 0–1 occasions of potentially harmful behavior and successively fewer reporting higher levels.

Table 3
Predicted numbers of self-reported heavy episodic drinking sessions during January for selected combinations of age, gender and income

| Age | Income | Gender | |
|-----|--------|--------|------|
| | | M | F |
| 15 | \$0 | 1.61 | 1.12 |
| 16 | \$0 | 2.21 | 1.54 |
| 15 | > \$40 | 3.60 | 2.51 |
| 16 | > \$40 | 4.93 | 3.43 |

Multivariate analyses

HED and SS. Regression of (log) HED with the Zuckerman SS score indicated a significant association ($\beta = .194$, $SE = .008$) with SS score accounting for 18% of variation in (log) HED ($r^2 = .185$). Other significant predictors of HED were gender ($\beta = -.280$, $SE = .061$ for $\delta = 0$ and $\text{♀} = 1$), weekly available income ($\beta = .654$, $SE = .143$ for $> \$40/\0) and age ($\beta = .318$, $SE = .051$)(Table 3).

Predicting harmful and protective behaviors with HED and SS. HED and SS both proved statistically significant, independent, and strong predictors of every potentially harmful or protective behavior examined (adjusted for gender, age, weekly income, and driver license status). February frequencies of harmful behaviors were lower, but followed the same patterns of significance as January’s. For brevity and simplicity, only January results were included for drinking- and driving-related outcome variables in Table 4. Table 4 shows the probability of respondents to have engaged in harmful behaviors in four combinations of HED and SS.

We found that when the effects of HED and SS were examined separately, they emerged as significant, independent, and strong predictors of all surveyed potentially harmful or protective adolescent behaviors associated with driving and celebrating. The results indicate that the behaviors with the greatest predicted reductions in occurrence associated with a given reduction in HED were harmful celebrating behaviors (aggregated score), followed by riding with an alcohol-impaired acquaintance, followed by riding with a drug-impaired driver (Figure 1).

Discussion

The harmful behaviors that were studied can clearly have a strong detrimental influence on the health of adolescents who engage in them. Such behaviors can also impose severe emotional and physical distress to those around them. An understanding of these associations may help practitioners to plan effective interventions and clarify the likely outcomes of existing ones.

Our finding of a significant association between self-reported HED and a high SS score is consistent with other studies [15–17]. However, our analysis of the relationship

between these two variables allows for the isolation of the effect of HED independent of other variables and sheds new light on the effect of HED on behavior among adolescents with average sensation-seeking tendencies.

That the strong associations between HED, harmful celebrating behaviors, riding with an alcohol-impaired acquaintance, and riding with a drug-impaired driver remain after adjustment for a range of other identified covariates (including sensation-seeking personality, gender, age, license status, and income), supports a possible causal link identified by other studies. Although it may be naive to assume that an intervention targeting HED per se would necessarily result in immediate reductions in these harmful behaviors, our findings may assist practitioners to develop a holistic approach focusing on the network of interacting factors surrounding adolescent HED.

The relative importance of HED and SS as predictors within our study varied considerably depending on the particular behavior in question. This variation can be appreciated by comparing the change in probability of engaging in a potentially harmful behaviour, given an increase in HED (at constant SS), with the change given an increase in SS (at constant HED). In this sense, nonuse of seat belts is influenced much more by differences in sensation-seeking characteristics than heavy episodic drinking, whereas riding with an alcohol-impaired acquaintance is influenced a great deal more by adolescents’ propensity for heavy episodic drinking than their sensation-seeking nature. Other behaviors more ‘responsive’ to differences in HED than SS are: riding with a drug-impaired driver, alcohol-impaired driving, and a higher harmful celebrating behaviors score.

Some caution is required in interpreting our findings as they are subject to limitations typical of all self-report, cross-sectional studies, particularly in that respondents’ retrospective accounts may not faithfully reflect events at the time [19,28]. School staff made it clear that in spite of their best efforts, the newly required active consent process caused a reduced response rate simply because it depended on students to return their consent forms. Although there

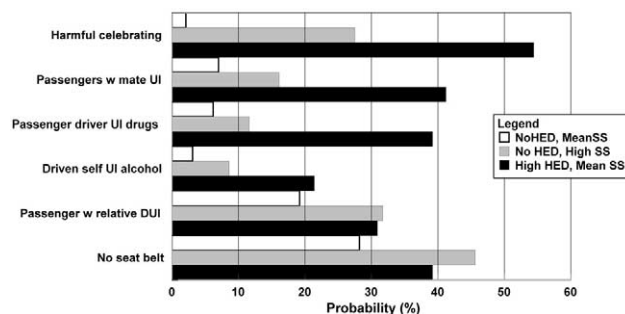


Fig. 1. The effect of: 1. Adolescents having a high sensation-seeking score and 2. Adolescents being frequent heavy episodic drinkers, on the probability of engaging in potentially harmful behaviors.

Table 4

Probability of adolescent engagement in harmful behaviours and prediction of protective behaviour scores for respondents in given HED and SS categories

| Outcome | Heavy episodic drinking ^a | Sensation seeking score ^b | Probability (%) ^c | |
|---|--------------------------------------|--------------------------------------|------------------------------|-----------|
| Passenger of family member driver under alcohol influence ^d | None | Average | 19.2 | |
| | None | High | 31.7 | |
| | High | Average | 30.9 | |
| | High | High | 51.2 | |
| Passenger of acquaintance driver under alcohol influence ^d | None | Average | 7.0 | |
| | None | High | 16.1 | |
| | High | Average | 41.2 | |
| | High | High | 64.3 | |
| Drove under the influence of alcohol ^d | None | Average | 3.1 | |
| | None | High | 8.6 | |
| | High | Average | 21.4 | |
| | High | High | 44.5 | |
| Not worn a seat belt when travelling in a car (Times Jan 2003) ^d | None | Average | 28.2 | |
| | None | High | 45.6 | |
| | High | Average | 39.2 | |
| | High | High | 65.1 | |
| Passenger of driver under drug influence (Times Jan 2003) ^e | None | Average | 6.2 | |
| | None | High | 11.6 | |
| | High | Average | 39.2 | |
| | High | High | 56.3 | |
| Harmful celebrating behaviour ^{d,f} | None | Average | 2.1 | |
| | None | High | 27.5 | |
| | High | Average | 54.4 | |
| | High | High | 95.3 | |
| Adjusted mean scores for protective celebrating behaviors | | | Score | CI |
| Protective celebrating behavior ^{g,h} | None | Average | 4.27 | 4.09–4.44 |
| | None | High | 3.47 | 3.23–3.71 |
| | High | Average | 3.70 | 3.51–3.88 |
| | High | High | 2.90 | 2.73–3.07 |

^a Low = 0 occasions/month. High = 3+ occasions (6+ drinks)/month.

^b Average SS = 11/19; High SS = 19/19; these levels were selected because HED has a reverse 'J' distribution (mode = 0) and SS is normally distributed.

^c Probability of respondents in the category to have engaged in the behavior at least once. Expressed in percentages.

^d No significant variation at school level.

^e Significant variation at school level ($\beta = 0.101$, $se = 0.049$)

^f Probability of being in the 'highest risk' celebrating behavior category (aggregated score = 3.4–10).

^g Adjusted score (out of 10) for unlicensed male in the specified category.

^h Significant variation at school level ($\beta = .023$, $SE = .011$).

was no significant gender or age bias, other undetected biases might still exist. However, within the above limitations, our use of appropriate methodology, validated measures, and sophisticated analytical techniques has maximized the validity of our findings. Consistency of responses across a range of outcome measures demonstrated a high level of reliability and the large sample size, the number of schools, and similarity in responses across the various survey sites lend credibility to our findings. Some bias may have been introduced through differential response rates (e.g., gender) and it was not possible to ascertain whether nonresponders were different in terms of the outcomes of interest. However, the multivariate analyses adjusted for measured covariates and thus minimized such influences.

Implications for intervention

Potentially harmful behaviors identified in our study as highly associated with HED may be more amenable to prevention than those linked more to an underlying sensation-seeking personality. Our study also highlights two salient messages that can be incorporated into health promotion interventions and high school curricula:

1. The chances of engaging in unintended high risk behaviors and finding oneself in potentially harmful situations are significantly increased when one engages in HED, even for people who consider themselves relatively cautious or average sensation seekers/risk takers. This message may encourage those who perceive themselves to

be low risk takers to reassess their drinking behavior in social situations and be less resistant to harm minimization education campaigns that specifically target adolescent alcohol consumption.

2. The increase of potential harmful behaviors such as choosing to be a passenger of a drunk or drug-affected driver, driving under the influence of alcohol, and risky celebrating behaviors occurs incrementally within the typical range of drinking among adolescents (i.e., 60% of respondents reported engaging in HED at least once during January–February), not just with more extreme levels of drinking.

Harm minimization education and campaigns should clearly address both alcohol and drug use and driving and passenger behaviors for this age group, as they are novice drivers and potential passengers of other inexperienced young drivers. A strong link between these behaviors may help to encourage young people to reassess their risk-taking and decision-making across a number of key activities that are part of their social life. Campaigns and educational interventions should emphasize the elevated risk of harm that could occur when drinking at less than perceived extreme levels, especially when coupled with driving and other harmful behaviors when celebrating.

Our study indicated that risky drinking was both prevalent and considered normative by this target group. It would be both difficult and inadvisable to identify and specifically target HED adolescents in a school setting. Thus, we recommend that our findings be incorporated into population-based approaches as they are most likely to target all adolescents regardless of their intrinsic sensation seeking and other personality traits, and address the wide range of risky adolescent behaviors.

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