1-2009

A brief live interactive normative group intervention using wireless keypads to reduce drinking and alcohol consequences in college student athletes

Joseph W. LaBrie
Loyola Marymount University, jlabrie@lmu.edu

Justin F. Hummer
Loyola Marymount University, jhummer@usc.edu

Karen K. Huchting
Loyola Marymount University, karen.huchting@lmu.edu

Clayton Neighbors
University of Washington

Published in final edited form as:
Drug Alcohol Rev. 2009 January ; 28(1): 40–47. doi:10.1111/j.1465-3362.2008.00012.x.

A brief live interactive normative group intervention using wireless keypads to reduce drinking and alcohol consequences in college student athletes

JOSEPH W. LABRIE, PhD[1] **[Associate Professor of Psychology, Director of Heads UP]**, **JUSTIN F. HUMMER, BA**[1] **[Assistant Director of Heads UP]**, **KAREN K. HUCHTING, MA**[1] **[Associate Professor of Psychiatry and Behavioural Sciences]**, and **CLAYTON NEIGHBORS, PhD**[2] **[Associate Professor of Psychiatry and Behavioural Sciences]**

[1]Department of Psychology, Loyola Marymount University, Los Angeles, USA

[2]Department of Psychiatry and Behavioural Sciences, Seattle, USA

Abstract

Introduction and Aims—Misperceptions of how members of one's social group think and act influence behaviour. The current study was designed to extend the research of group-specific normative feedback interventions among salient campus groups with heightened risk. Although not a randomised controlled trial, this research used normative feedback that was obtained using wireless keypad technology during a live session, within sex-specific student athlete groups to extend the proof of concept of using this brief interactive intervention.

Design and Methods—Participants included 660 intercollegiate athletes from all varsity athletic teams at two private, mid-size universities. Intervention data were gathered *in vivo* using computerised handheld keypads into which group members entered in personal responses to a series of alcohol-related questions. These questions assessed perceptions of normative group behaviour and attitudes as well as actual individual behaviour and attitudes. These data were then immediately presented back in graphical form to illustrate discrepancies between perceived and actual group norms.

Results—Results revealed that at 1 month post-intervention, perceived group norms, behaviour, attitudes and consequences reduced compared with baseline. These reductions were maintained at 2 month follow up. Latent growth modelling suggested that the reductions in perceived norms and attitudes were associated with reductions in individual drinking behaviour and negative consequences.

Discussion and Conclusions—These results are among the first to suggest the effectiveness of a novel, group-based normative alcohol intervention among student athletes. Limitations of the design preclude strong inferences about efficacy; however, the findings support further trialling of such information technology in alcohol treatment research.

Keywords

normative feedback; student athlete; alcohol intervention; handheld keypad

Correspondence to Dr Joseph LaBrie, Department of Psychology, Loyola Marymount University, 1 LMU Drive, Suite 4700, Los Angeles, CA 90045, USA. Tel: 310 338 5238; Fax: 310 338 7726; jlabrie@lmu.edu.

Introduction

Student athletes are an at-risk group for problematic drinking on college campuses [1], drinking more frequently and more quantity per occasion, engaging more frequently in heavy episodic drinking and sexual violence and experiencing more negative alcohol-related consequences, as compared with non-athletes [2–5].

Social influence

During college, peer influence is one of the biggest determinants of student behaviour [3]. The beliefs individuals hold regarding their social group's typical behaviour (i.e. descriptive norms) or attitudes (i.e. injunctive norms) can be a powerful influence on that individual's own attitudes and behaviours. The social norms approach to college student drinking suggests that the majority of college students overestimate peer alcohol norms [4–6] and that these overestimations influence behavioural decisions. They have been consistently related to individuals' own quantity and frequency of drinking [7–10], including athletes [11–14]. Moreover, descriptive and injunctive norms have been shown to be among the best predictors of alcohol consumption in heavy-drinking college students [15].

Social norms interventions

Individually-delivered interventions which provide personalised feedback to students regarding social norms have been generally found to be effective in reducing normative misperceptions and subsequent drinking [16,17]. Although none of these methods has been applied to student athlete groups, another type of social norms intervention (social norms marketing campaigns) has been used with mixed results in this population. In these campaigns, survey data of accurate normative drinking rates of a population are displayed (i.e. on posters, flyers). Thombs and Hamilton [18] showed no differences in drinking outcomes between athletes who recalled campaign messages and a group of athletes that remained unexposed to the messages, whereas Perkins and Craig [11] found success in reducing both misperceptions and subsequent drinking outcomes among student athletes who were exposed to a marketing campaign. However, Perkins and Craig's study relied on an extensive implementation method.

Brief live interactive normative group intervention

One reason social norms interventions may have mixed results is that students question the reliability and credibility of the data source. The information might be discounted if students see the normative information as coming from a disreputable source [6,19,20]. Combating the tendency to disbelieve the actual norms presented to students is critical to the success of any social norms intervention [21]. Providing feedback derived *in vivo* from the participants themselves might lend the credibility that is needed to accept the information and promote change. Live interactive norms presentation also ensures attention and processing of normative information that might be more difficult to inspire in other existing methods.

Recently, LaBrie *et al.* [8] evaluated a brief novel group-specific social norms intervention that used wireless keypad technology to derive and present norms live in Greek-affiliated campus groups. Results indicated that unlike the control group, intervention participants reduced their misperceptions of group norms and their actual drinking behaviour, at both 1 and 2 month follow ups. Moreover, analyses showed that changes in perceived norms mediated reductions in drinking.

The current study sought to extend previous research by assessing the feasibility and practicality of implementing the brief live interactive group (BLING) intervention among student athletes at two universities while obtaining high recruitment and sufficient retention

among this population. However, the current research did not use a randomised clinical trial. Rather, this intervention used normative feedback that was obtained using wireless keypad technology during a live session, within a sex-specific student athlete group to extend the proof of concept of using BLING to intervene in salient campus groups with heightened risk. Insofar as it would strengthen the applicability of this new technique, it was anticipated that student athletes receiving the live group-specific normative feedback would adjust their misperceptions regarding both injunctive and descriptive norms to more closely conform to the actual norms presented, and that this change in both injunctive and descriptive norms would be associated with reductions in attitudes towards drinking, drinking behaviour and negative alcohol-related consequences.

Methods

Participants

Participants were recruited from all varsity athletic teams at two private, midsize universities (from the west and east coasts of the USA). All 705 student athletes received an electronically mailed invitation to participate in a study about alcohol-related behaviours. Six hundred and sixty students (94%) were successfully recruited, electronically signed an informed consent and completed at least one assessment point. The mean age of the sample was 19.6 years (standard deviation = 1.34) and 61.2% were reportedly 'in-season'. The majority of the participants were female (56.1%) and Caucasian (72.1%).

Design and procedure

Participants completed an initial Web-based survey approximately 1 month into the spring semester, followed by the group intervention approximately 2 weeks later. Follow-up surveys were administered online at 1 and 2 month post-interventions and assessed changes in misperceptions, negative alcohol-related consequences and alcohol use. The 1 month and 2 month follow-up assessments were completed by 82% and 80% of the sample, respectively. Overall, 493 (74.7%) participants completed both follow-up assessments and 82 participants (12.4%) completed neither (see Figure 1 for the consort flowchart of this study).

Measures

Attitudes towards drinking and injunctive norms were assessed in parallel by five similar items, each regarding acceptability of specific behaviours. Two items were adapted from the House Acceptability Questionnaire [22] (e.g. 'becoming intoxicated at a party' and 'missing a class because you are intoxicated or hung-over'). Three additional items were created for this study (i.e. 'getting drunk during in-season', 'drinking within 3 days of a match/game' and 'initiating new members of the team with activities involving alcohol'). As an example of the parallel structure, women were asked, 'How acceptable does a typical "X" University female athlete think it is to … ?' (injunctive norm) and 'How acceptable do you think it is to … ?' (actual individual attitude). Response options for all items ranged from 1 (not acceptable) to 7 (very acceptable). Reliability coefficients were acceptable for injunctive norms ($\alpha = 0.79$) and individual attitudes ($\alpha = 0.76$). Composite scores used in analyses were calculated as the mean of the five items for each variable.

Participant drinking behaviour and descriptive norms were similarly assessed in parallel with five items assessing quantity, frequency, drinks per week, peak drinks and heavy episodic drinking. All items were measured on 9-point Likert type scales with higher numbers indicating more drinking. Anchor descriptions varied by item (see Appendix I for a list of questions and response options). Reliability coefficients were acceptable for

descriptive norms ($\alpha = 0.85$) and individual drinking behaviour ($\alpha = 0.92$). Composite scores used in analyses were calculated as the mean of the five items for each variable.

Alcohol consequences were assessed with the Brief Young Adult Alcohol Consequences Questionnaire [23] that included 24 'yes' or 'no' items assessing past month consequences (e.g. 'I have woken up in an unexpected place after heavy drinking'). Scores reflect number of items endorsed ($\alpha = 0.92$).

BLING intervention

Equipment—The OptionFinder interactive polling system used in the group intervention is a combination of PowerPoint-based software and wireless handheld single-response keypad systems given to individuals. Facilitators pose questions while response choices are projected onto a large screen. Individual participants enter personal responses to the questions posed. The database immediately tallies the group's responses and presents frequency charts on the large screen with percentages of the group that endorsed a specific response option. The OptionFinder system produces equivalent data on demographic and drinking questions to traditional confidential surveys [24].

Intervention—Four interventions were conducted at each site and all occurred within 2 weeks of each other. The groups were constructed as a function of sex, school and whether athletes were in season or not, thus there were eight groups. In total, 524 (79%) participants received the intervention in group sizes ranging from 50 to 80 participants. On arrival, each participant received a wireless keypad. The intervention began with an introduction and statement of purpose. Participants were then asked a series of questions regarding age, sex and class year. Frequency charts were displayed immediately after each question, showing that the system instantly and accurately reported group responses. The immediate visual feedback option was then turned off/disabled. Participants proceeded to answer the injunctive and descriptive norms, attitudes and drinking behaviour questions, both for 'a typical *School Name: Gender* athlete' and for their own actual attitudes or behaviour. After completing all questions, the graphical response pattern technology was re-enabled. The facilitator then led the group through a presentation of their data. Slides were presented with group frequencies for each response item. The facilitator drew attention to discrepancies between the actual normative data (the participants' responses) and the group's perceived norms (e.g. 'Here is what the group said you thought a typical athlete of your sex does, and here is what your group actually does—according to your own responses.'). Thus, participants were able to determine how their own alcohol use compared with their group-specific peers, as well as if their perceptions about others in their group were discrepant. Participants were encouraged to examine their personal perceptions and behaviours compared with the actual norms.

Results

Analysis strategy

Primary analyses used repeated measures analysis of variance (ANOVA), where outcomes at baseline, 1 and 2 month follow ups were evaluated as a function of sex, season and campus. Effect sizes were calculated using the formula $r = \sqrt{F/F + df_{within}}$ [25]. Evaluations of associations between changes in drinking as a function of changes in descriptive norms, injunctive norms and attitudes were evaluated separately using latent growth modelling (LGM). LGM was chosen as the analysis strategy because it is ideally equipped to evaluate the relationship between change in one construct and change in another. Change is characterised by specifying individual observations over time as a function of two latent constructs: an intercept and a slope. Factor loadings for the intercept are constrained to

unity. Factor loadings for the slope represent the growth function. The intercept is interpreted in terms of the zero-point of the growth function. This approach has been used with increasing frequency in the alcohol literature and several excellent papers are available which discuss and provide examples (e.g. [26–28]). The repeated measures ANOVA were conducted using complete cases, whereas the LGM analyses were intention-to-treat and used all cases.

Misperceptions in perceived and actual descriptive and injunctive norms

Table 1 documents baseline normative misperceptions by presenting means and standard deviations for perceived and actual norms items and composites. Given the number of comparisons, alpha was set at $P = 0.001$ to reduce alpha inflation. The student athletes overestimated all descriptive and injunctive norms items. Furthermore, for all norms items, the perceived norm at 1 and 2 month follow up was lower than the perceived norm at baseline. This was also true in nearly all actual norms items, thus representing significant reductions from baseline to follow ups in pro-alcohol attitudes and actual drinking.

Changes in drinking outcomes, norms and attitudes

Table 2 presents repeated measures ANOVA results for changes in drinking, alcohol-related consequences, attitudes, injunctive norms and descriptive norms over time and as a function of group-level effects (i.e. sex, school and season). Marginal means and standard errors for each construct at each time point are presented in Table 3. Follow-up analyses indicated that for each variable, reduction was evident from baseline to 1 month follow up with no subsequent changes from 1 to 2 month follow up. Group-level effects as represented by interactions between time and sex, school and season showed relatively few effects. The exceptions to this were that both drinking and descriptive norms decreased more for men than for women and changes in both attitudes and injunctive norms were more evident at one school than the other.

Changes in drinking outcomes as a function of changes in norms and attitudes

After evaluation of univariate changes in study variables, we sought to determine whether the changes observed in drinking were directly associated with changes in norms and attitudes. To evaluate these questions we used LGM, where change in each construct was specified as two latent variables, one representing the intercept and the other representing change. Each time point was included as an indicator of each latent construct. The observed means and analyses described above indicated that for each construct the primary change was a reduction between baseline and 1 month follow up with no significant change from 1 to 2 month follow up. Accordingly, latent slope variable indicator paths were specified as 0, −1 and −1 for baseline, 1 month and 2 month follow up, respectively. Intercept paths were fixed to unity.

Error terms were assumed to be independent and are not presented for the sake of clarity. Standardised path coefficients for the three latent growth models are presented in Figure 2. For each predictor, the intercept was positively associated with the drinking intercept. Furthermore, for each predictor the slope was significantly and positively associated with the drinking slope. In sum, and consistent with expectations, these results suggested that changes in attitudes, descriptive norms and injunctive norms were all strongly associated with changes in drinking.

Discussion

The current findings extend previous research by using innovative, technologically-advanced techniques in the application of group-specific normative feedback with student

athletes. Discrepancies were challenged in a live feedback setting, which authenticated the presence of misperceptions that were held by the group and allowed for homogenous exposure across participants. This created an environment through which the theoretical foundation of the research design could be realised. Although the lack of a control condition precludes inferences about causation, the presentation of accurate and salient behavioural and attitudinal norms was associated with reported reductions in norms, attitudes, behaviour and consequences. Thus, the value of this study lies in the innovative technology used and support for the proof of concept in the application of this technology to an at-risk group: student athletes. The current study is the first to apply this approach to student athletes and intervene with perceptions of both descriptive and injunctive norms. While initial equipment costs, facilitator training and time spent organising intervention meetings exist with the current approach, once these early preparations are in place, group interventions can be conducted on a frequent basis and in a short amount of time. Moreover, effect sizes observed in this study and a previous controlled trial evaluating this approach [8] are similar to those reported for individually delivered interventions for college students that include a social norms component ([17], see [29] for meta-analysis, [30]).

Researchers are encouraged to continue to test the efficacy of BLING with other groups of high-risk drinkers. In addition, college personnel might wish to use BLING, especially with tight-knit or high-risk drinking groups, such as incoming freshmen students, to disrupt the development and sway of alcohol misperceptions. For example, this BLING intervention could be implemented as a regular part of freshmen orientation or within residence halls, to examine and challenge stereotypes of the ‘typical incoming freshman’ or provide actual healthy norms of and to groups of residents living on the same floor. Although speculative, the influence of this group-specific feedback might lie in mini-mising some of the drawbacks associated with failed marketing campaigns that have traditionally targeted such groups, such as varying levels of exposure across targeted groups and individuals, disbelief of normative information, lengthy implementation periods and unfavourable reactions to the normative messages [6,21,27,31].

Study strengths must be viewed in light of several limitations. First, as noted earlier, the current study did not use an experimental design with a randomised matched control group. Therefore, post-intervention reductions in primary alcohol-related outcomes of the study cannot be reliably attributed specifically to the intervention. One possible explanation consistent with the pattern of results is regression to the mean. Although the use of two distinct athletic populations on opposite coastal regions helps validate the methodological applicability and feasibility of the research protocol, future research should trial the intervention procedures with the use of a control group and evaluate the longer-term effects among participants. In addition, the majority of outcomes were technically count data, which have been shown to yield biased results in ANOVA and related approaches [32,33]. This limitation is somewhat offset by the use of composite variables (five items), resulting in at least 35 possible response options. A theoretical limitation is the possibility that providing norms to light drinkers and abstainers might have iatrogenic effects. However, a recent universal prevention using personalised feedback, which included campus norms, showed a protective effect of the intervention rather than an iatrogenic one on abstaining students [34]. Finally, the intervention attendance rate of 79% is a notable limitation, although this rate is similar to or slightly better than the rates for previous evaluations of group-based interventions in which social norms information has been presented, where attendance has ranged between 63% and 72% [35,36]. Overall, the current research provides positive indication for the practicability of a novel approach to normative feedback interventions with student athletes to promote health and wellness, particularly as it relates to alcohol use.

Acknowledgments

This research was funded by a grant from the Alcoholic Beverage Medical Research Foundation and grant U18 AA015451-01 from the National Institute of Alcohol Abuse and Alcoholism.

References

1. National Institute on Alcohol Abuse and Alcoholism (NIAAA). A call to action: changing the culture of drinking at US colleges. Rockville, MD: NIAAA; 2002.
2. Leichliter JS, Meilman PW, Presley CA, Cashin JR. Alcohol use and related consequences among students with varying levels of involvement in college athletics. J Am Coll Health. 1998; 46:257–62. [PubMed: 9609972]
3. Borsari B, Carey KB. Peer influences on college drinking: a review of the research. J Subst Abuse Treat. 2001; 13:391–424.
4. Perkins HW. Surveying the damage: a review of research on consequences of alcohol misuse in college populations. J Stud Alcohol. 2002; 14:91–100.
5. Perkins HW, Haines MP, Rice R. Misperceiving the college drinking norm and related problems: a nationwide study of exposure to prevention information, perceived norms and student alcohol misuse. J Stud Alcohol. 2005; 66:470–8. [PubMed: 16240554]
6. Berkowitz, AD. [accessed September 2007] The social norms approach: theory, research and annotated bibliography. Available at: http://www.alanberkowitz.com/articles/social_norms.pdf
7. Clapp JD, McDonnell AL. The relationship of perceptions of alcohol promotion and peer drinking norms to alcohol problems reported by college students. J Coll Stud Dev. 2000; 41:19–26.
8. LaBrie JW, Hummer JF, Neighbors C, Pedersen ER. Live interactive group-specific normative feedback reduces mis-perceptions and drinking in college students: a randomized trial. Psychol Addict Behav. 2008; 22:141–8. [PubMed: 18298241]
9. Larimer ME, Turner AP, Mallett KA, Geisner IM. Predicting drinking behavior and alcohol-related problems among fraternity and sorority members: examining the role of descriptive and injunctive norms. Psychol Addict Behav. 2004; 18:203–12. [PubMed: 15482075]
10. Lewis MA, Neighbors C. Gender-specific misperceptions of college student drinking norms. Psychol Addict Behav. 2004; 18:334–9. [PubMed: 15631605]
11. Perkins HW, Craig DW. A successful social norms campaign to reduce alcohol misuse among college student-athletes. J Stud Alcohol. 2006; 67:880–9. [PubMed: 17061005]
12. Thombs DL. A test of the preconceived norms model to explain drinking patterns among university student athletes. J Am Coll Health. 2000; 49:75–83. [PubMed: 11016131]
13. Dams-O'Connor K, Martin JL, Martens MP. Social norms and alcohol consumption among intercollegiate athletes: the role of athlete and nonathlete reference groups. Addict Behav. 2007; 32:2657–66. [PubMed: 17544589]
14. Martens MP, Dams-O'Connor K, Duffy-Paiement C, Gibson JT. Perceived alcohol use among friends and alcohol consumption among college athletes. Psychol Addict Behav. 2006; 20:178–84. [PubMed: 16784364]
15. Neighbors C, Lee CM, Lewis MA, Fossos N, Larimer ME. Are social norms the best predictor of outcomes among heavy-drinking college students? J Stud Alcohol Drug. 2007; 68:556–65.
16. Lewis MA, Neighbors C. Social norms approaches using descriptive drinking norms education: a review of the research on personalized normative feedback. J Am Coll Health. 2006; 54:213–18. [PubMed: 16450845]
17. Walters ST, Neighbors C. Feedback interventions for college alcohol misuse: what, why and for whom? Addict Behav. 2005; 30:1168–82. [PubMed: 15925126]
18. Thombs DL, Hamilton MJ. Effects of a social norm feedback campaign on the drinking norms and behavior of division I student-athletes. J Drug Educ. 2002; 32:227–44. [PubMed: 12379053]
19. Etzioni A. Social norms: internalization, persuasion, and history. Law Soc Rev. 2000; 34:157–78.
20. Werch CE, Pappas DM, Carlson JM, DiClemente CC, Chally PS, Sinder JA. Results of a social norm intervention to prevent binge drinking among first-year residential college students. J Am Coll Health. 2000; 49:85–92. [PubMed: 11016132]

21. Granfield R. Alcohol use in college: limitations on the transformation of social norms. Addict Res Theory. 2005; 13:281–92.
22. Larimer, ME. Alcohol abuse and the Greek system: an exploration of fraternity and sorority drinking [Dissertation]. Seattle: University of Washington; 1992.
23. Kahler CW, Strong DR, Read JP. Toward efficient and comprehensive measurement of the alcohol problems continuum in college students: the brief young adult alcohol consequences questionnaire. Alcohol Clin Exp Res. 2005; 29:1180–9. [PubMed: 16046873]
24. LaBrie JW, Earleywine M, Lamb T, Shelesky K. Comparing electronic-keypad responses to paper-and-pencil questionnaires in group assessments of alcohol consumption and related attitudes. Addict Behav. 2006; 31:2334–8. [PubMed: 16626878]
25. Rosenthal, R.; Rosnow, RL.; Rubin, DB. Contrasts and effect sizes in behavioral research: a correlational approach. New York: Cambridge University Press; 2000.
26. Perkins, HW. Designing alcohol and other drug prevention programs in higher education: bringing theory into practice. Newton, MA: The Higher Education Center for Alcohol and Other Drug Prevention; 1997. College student misperceptions of alcohol and other drug use norms among peers: exploring causes, consequences, and implications for prevention programs; p. 177-206.
27. Thombs DL, Dotterer S, Olds RS, Sharp KE, Raub CG. A close look at why one social norms campaign did not reduce student drinking. J Am Coll Health. 2004; 53:61–8. [PubMed: 15495882]
28. Babor TF, Steinberg K, Anton R, Del Boca F. Talk is cheap: measuring drinking outcomes in clinical trials. J Stud Alcohol. 2000; 61:55–63. [PubMed: 10627097]
29. Carey KB, Scott-Sheldon LAJ, Carey MP, DeMartini KS. Individual-level interventions to reduce college student drinking: a meta-analytic review. Addict Behav. 2007; 32:2469–94. [PubMed: 17590277]
30. Larimer ME, Cronce JM. Identification, prevention, and treatment revisited: individual-focused college drinking prevention strategies 1999–2006. Addict Behav. 2007; 32:2439–68. [PubMed: 17604915]
31. Wechsler H, Nelson TF, Lee JE, Seibring M, Lewis C, Keeling RP. Perception and reality: a national evaluation of social norms marketing interventions to reduce college students' heavy alcohol use. Q J Stud Alcohol. 2003; 64:484–94.
32. Horton NJ, Kim E, Saitz R. A cautionary note regarding count models of alcohol consumption in randomized controlled trials. BMC Med Res Methodol. 2007; 7:9. [PubMed: 17302984]
33. Nich C, Carroll K. Now you see it, now you don't: a comparison of traditional versus random-effects regression models in the analysis of longitudinal follow-up data from a clinical trial. J Consult Clin Psychol. 1997; 65:252–61. [PubMed: 9086688]
34. Larimer ME, Lee CM, Kilmer JR, et al. Personalized mailed feedback for drinking prevention among college students: one year outcomes from a randomized clinical trial. J Consult Clin Psychol. 2007; 75:285–93. [PubMed: 17469886]
35. Kivlahan DR, Marlatt GA, Fromme K, Coppel DB, Williams E. Secondary prevention with college drinkers: evaluation of an alcohol skills training program. J Consult Clin Psychol. 1990; 58:805–10. [PubMed: 2292630]
36. Stahlbrandt H, Johnsson KO, Berglund M. Two-year outcome of alcohol interventions in Swedish University Halls of Residence: a cluster randomized trial of a brief skills training program, twelve-step-influenced intervention, and controls. Alcohol Clin Exp Res. 2007; 31:458–66. [PubMed: 17295731]

Appendix I

Descriptive norms questionnaire

1. How often does a *typical 'X' University 'Gender' athlete* consume alcohol?

1. Never–six times a year	2. 1x a month
3. 2x a month	4. 1x a week
5. 2x a week	6. 3x a week
7. 4x a week	8. 5–6x a week
9. Everyday	

2. How many drinks, on average, does a *typical 'X' University 'Gender' athlete* consume during a typical drinking occasion?

1. None	2. 1–2
3. 3	4. 4
5. 5–6	6. 7–8
7. 9–10	8. 11–12
9. 13 or more	

3. How many drinks does a *typical 'X' University 'Gender' athlete* drink each week?

1. None	2. 1–2
3. 3–5	4. 6–8
5. 9–10	6. 11–14
7. 15–18	8. 19–21
9. 22 or more	

4. Within the past 30 days, what is the maximum number of drinks the *typical 'X' University 'Gender' athlete* consumed during one occasion?

1. None	2. 1–3
3. 4–6	4. 7–9
5. 10–12	6. 13–15
7. 16–18	8. 19–21
9. 22 or more	

5. Over the past 2 weeks, how many times has a *typical 'X' University 'Gender' athlete* had 4/5 or more drinks in a 2 h period?

1. None	2. 1 time
3. 2 times	4. 3 times
5. 4 times	6. 5 times
7. 6 times	8. 7–9 times
9. 10 or more times	

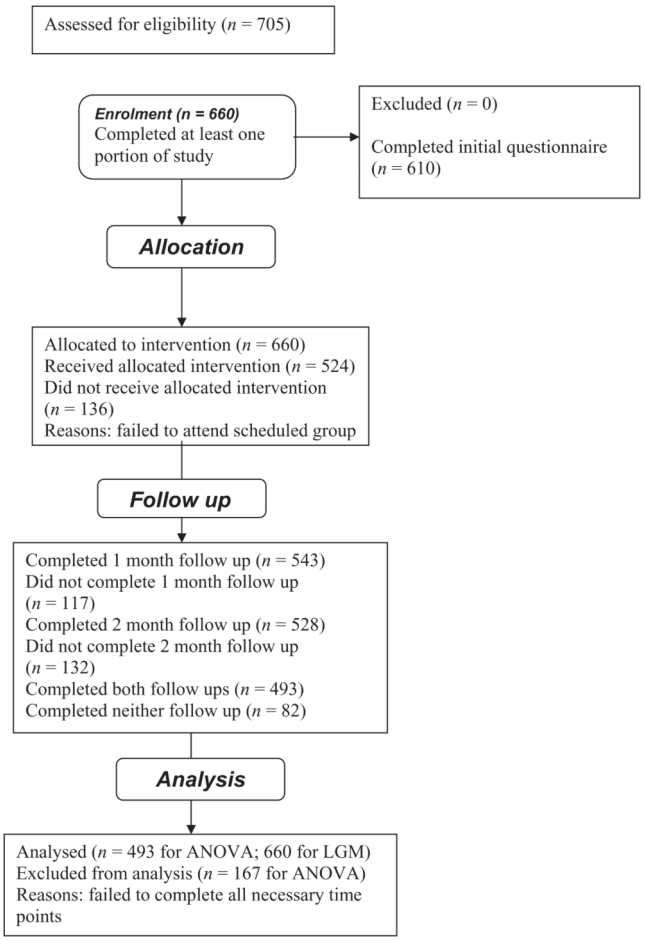

Figure 1.
Consort e-flowchart. ANOVA, analysis of variance; LGM, latent growth modelling.

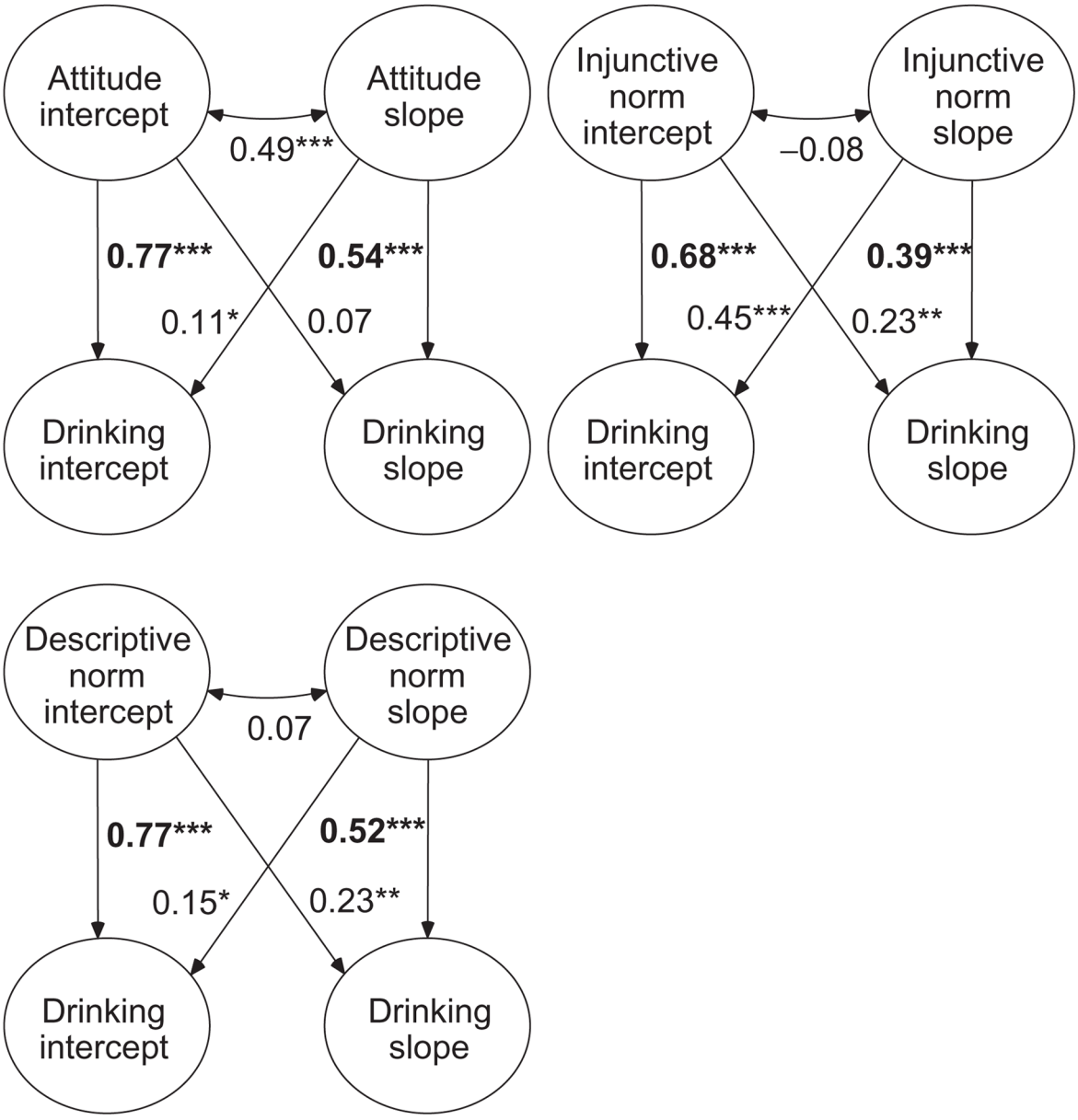

Figure 2.
Standardised path coefficients for the three latent growth models (n = 660).

Table 1

Means (M) and standard deviations (SD) of descriptive and injunctive norms across time

	Baseline		1 month follow up		2 month follow up	
Norm type	**Perceived norm M (SD)**	**Actual norm M (SD)**	**Perceived norm M (SD)**	**Actual norm M (SD)**	**Perceived norm M (SD)**	**Actual norm M (SD)**
Descriptive norms						
1. Frequency of consumption	5.00 (1.16)	3.99 (1.67)[a]	4.32 (1.24)[b]	3.54 (1.57)[b]	4.25 (1.52)[b]	3.54 (1.71)[b]
2. Average drinks per Occasion	5.98 (1.55)	5.26 (2.27)[a]	4.88 (1.69)[b]	4.27 (2.00)[b]	4.75 (1.86)[b]	4.12 (2.02)[b]
3. Drinks/week	6.13 (1.93)	4.63 (2.58)[a]	4.63 (1.90)[b]	3.73 (2.04)[b]	4.50 (2.05)[b]	3.67 (2.17)[b]
4. Peak drinks in past 30 days	5.60 (1.60)	4.65 (2.14)[a]	4.46 (1.77)[b]	3.56 (1.94)[b]	4.24 (1.79)[b]	3.48 (1.90)[b]
5. Heavy episodic events before 2 weeks	4.35 (1.73)	3.07 (2.08)[a]	3.38 (1.51)[b]	2.61 (1.66)[b]	3.38 (1.67)[b]	2.63 (1.79)[b]
Descriptive norm composite variable	5.41 (1.23)	4.32 (1.90)[a]	4.33 (1.36)[b]	3.54 (1.61)[b]	4.23 (1.57)[b]	3.49 (1.72)[b]
Injunctive norms						
1. Intoxicated at a party	5.60 (1.35)	5.10 (1.71)[a]	4.80 (1.55)[b]	4.43 (1.68)[b]	4.60 (1.73)[b]	4.19 (1.89)[b]
2. Miss class because of hangover	3.16 (1.69)	2.07 (1.45)[a]	2.76 (1.51)[b]	1.97 (1.32)	2.80 (1.64)[b]	2.04 (1.50)
3. Drunk in-season	4.62 (1.68)	3.97 (1.99)[a]	3.78 (1.61)[b]	3.34 (1.76)[b]	3.67 (1.71)[b]	3.31 (1.78)[b]
4. Drink within 3 days of game	3.31 (1.87)	2.61 (1.96)[a]	2.84 (1.57)[b]	2.35 (1.61)	2.92 (1.70)[b]	2.40 (1.70)
5. Initiation with alcohol	4.75 (1.99)	3.81 (2.27)[a]	3.75 (1.94)[b]	3.17 (1.97)[b]	3.64 (1.95)[b]	3.08 (1.97)[b]
Injunctive norm composite variable	4.28 (1.17)	3.51 (1.43)[a]	3.59 (1.25)[b]	3.06 (1.25)[b]	3.53 (1.41)[b]	3.01 (1.36)[b]

N = 524, 543, and 528 for baseline, 1 month and 2 month follow up, respectively.

[a] $P < 0.001$: differences in perceived norms vs. actual drinking behaviour or attitudes at baseline.

[b] $P < 0.001$: differences across time from baseline for same variable type. Response options for each descriptive norm item are found in Appendix I. Response options for each injunctive norm item range from 1 (not acceptable) to 7 (always acceptable).

Table 2

Repeated measures ANOVA (n = 493)

Dependent variable and effect	d.f.	*F*	*P*	*r*
Drinking composite				
Time	(2, 774)	110.79	<0.001	0.35
Time × sex	(2, 774)	10.12	<0.001	0.11
Time × school	(2, 774)	0.51	0.60	0.03
Time × season	(2, 774)	1.33	0.26	0.04
Alcohol-related consequences				
Time	(2, 736)	12.56	<0.001	0.13
Time × sex	(2, 736)	0.35	0.71	0.02
Time × school	(2, 736)	2.05	0.13	0.05
Time × season	(2, 736)	2.06	0.13	0.05
Attitudes				
Time	(2, 772)	49.80	<0.001	0.25
Time × sex	(2, 772)	2.30	0.10	0.05
Time × school	(2, 772)	3.26	0.04	0.06
Time × season	(2, 772)	0.47	0.63	0.02
Injunctive norms				
Time	(2, 772)	76.08	<0.001	0.30
Time × sex	(2, 772)	0.08	0.92	0.01
Time × school	(2, 772)	3.36	0.04	0.07
Time × season	(2, 772)	1.17	0.31	0.04
Descriptive norms				
Time	(2, 774)	168.96	<0.001	0.42
Time × sex	(2, 774)	6.68	0.001	0.09
Time × school	(2, 774)	1.20	0.30	0.04
Time × season	(2, 774)	0.26	0.77	0.02

ANOVA, analysis of variance; d.f., degrees of freedom.

Table 3

Marginal means and standard errors (SE) (n = 493)

Variable	Mean	SE
Drinking: baseline	4.34	0.09
Drinking: 1 month follow up	3.49	0.08
Drinking: 2 month follow up	3.49	0.09
Alcohol problems: baseline	4.66	0.27
Alcohol problems: 1 month follow up	4.00	0.26
Alcohol problems: 2 month follow up	3.45	0.26
Attitude: baseline	3.45	0.07
Attitude: 1 month follow up	2.98	0.07
Attitude: 2 month follow up	2.98	0.07
Injunctive norm: baseline	4.29	0.06
Injunctive norm: 1 month follow up	3.59	0.07
Injunctive norm: 2 month follow up	3.54	0.07
Descriptive norm: baseline	4.29	0.06
Descriptive norm: 1 month follow up	3.59	0.07
Descriptive norm: 2 month follow up	3.54	0.07