

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

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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, midsize 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. [LaBrie JW, Hummer JF, Huchting KK, Neighbors C. A brief live interactive normative group intervention using wireless keypads to reduce drinking and alcohol consequences in college student athletes. *Drug Alcohol Rev* 2009;28:40–47]

Key words: normative feedback, student athlete, alcohol intervention, handheld keypad.

3 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

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1 that the majority of college students overestimate peer
2 alcohol norms [4–6] and that these overestimations
3 influence behavioural decisions. They have been con-
4 sistentlly related to individuals' own quantity and fre-
5 quency of drinking [7–10], including athletes [11–14].
6 Moreover, descriptive and injunctive norms have been
7 shown to be among the best predictors of alcohol con-
8 sumption in heavy-drinking college students [15].

9 *Social norms interventions*

11 Individually delivered interventions which provide per-
12 sonalised feedback to students regarding social norms
13 have been generally found to be effective in reducing
14 normative misperceptions and subsequent drinking
15 [16,17]. Although none of these methods has been
16 applied to student athlete groups, another type of social
17 norms intervention (social norms marketing cam-
18 paigns) has been used with mixed results in this popu-
19 lation. In these campaigns, survey data of accurate
20 normative drinking rates of a population are displayed
21 (i.e. on posters, flyers). Thombs and Hamilton [18]
22 showed no differences in drinking outcomes between
23 athletes who recalled campaign messages and a group
24 of athletes that remained unexposed to the messages,
25 whereas Perkins and Craig [11] found success in reduc-
26 ing both misperceptions and subsequent drinking out-
27 comes among student athletes who were exposed to a
28 marketing campaign. However, Perkins and Craig's
29 study relied on an extensive implementation method.

31 *Brief live interactive normative group (BLING)* 32 *intervention*

33 One reason social norms interventions may have mixed
34 results is that students question the reliability and cred-
35 ibility of the data source. The information might be
36 discounted if students see the normative information as
37 coming from a disreputable source [6,19,20]. Combat-
38 ting the tendency to disbelieve the actual norms pre-
39 sented to students is critical to the success of any social
40 norms intervention [21]. Providing feedback derived *in*
41 *vivo* from the participants themselves might lend the
42 credibility that is needed to accept the information and
43 promote change. Live interactive norms presentation
44 also ensures attention and processing of normative
45 information that might be more difficult to inspire in
46 other existing methods.

47 Recently, LaBrie *et al.* [8] evaluated a brief novel
48 group-specific social norms intervention that used
49 wireless keypad technology to derive and present norms
50 live in Greek-affiliated campus groups. Results indi-
51 cated that unlike the control group, intervention par-
52 ticipants reduced their misperceptions of group norms
53 and their actual drinking behaviour, at both 1 and

2 month follow ups. Moreover, analyses showed that
54 changes in perceived norms mediated reductions in
55 drinking. 56

57 The current study sought to extend previous research
58 by assessing the feasibility and practicality of imple-
59 menting the BLING intervention among student
60 athletes at two universities while obtaining high
61 recruitment and sufficient retention among this popu-
62 lation. However, the current research did not use a
63 randomised clinical trial. Rather, this intervention used
64 normative feedback that was obtained using wireless
65 keypad technology during a live session, within a sex-
66 specific student athlete group to extend the proof of
67 concept of using BLING to intervene in salient campus
68 groups with heightened risk. Insofar as it would
69 strengthen the applicability of this new technique, it
70 was anticipated that student athletes receiving the live
71 group-specific normative feedback would adjust their
72 misperceptions regarding both injunctive and descrip-
73 tive norms to more closely conform to the actual norms
74 presented, and that this change in both injunctive and
75 descriptive norms would be associated with reductions
76 in attitudes towards drinking, drinking behaviour and
77 negative alcohol-related consequences. 78

79 **Methods**

80 *Participants*

81 Participants were recruited from all varsity athletic
82 teams at two private, midsize universities (from the west
83 and east coasts of the United States). All 705 student
84 athletes received an electronically mailed invitation to
85 participate in a study about alcohol-related behaviours.
86 Six hundred and sixty students (94%) were successfully
87 recruited, electronically signed an informed consent
88 and completed at least one assessment point. The mean
89 age of the sample was 19.6 years (standard devia-
90 tion = 1.34) and 61.2% were reportedly 'In-Season'.
91 The majority of the participants were female (56.1%)
92 and Caucasian (72.1%). 93

94 *Design and procedure*

95 Participants completed an initial web-based survey
96 approximately 1 month into the spring semester, fol-
97 lowed by the group intervention approximately 2 weeks
98 later. Follow-up surveys were administered online at 1
99 and 2 month post-interventions and assessed changes
100 in misperceptions, negative alcohol-related conse-
101 quences and alcohol use. The 1 month and 2 month
102 follow-up assessments were completed by 82% and
103 80% of the sample, respectively. Overall, 493 (74.7%)
104 participants completed both follow-up assessments and
105 82 participants (12.4%) completed neither.

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/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

Table 1. Means (M) and standard deviations (SD) of descriptive and injunctive norms across time

Norm type	Baseline		1 month follow up		2 month follow up	
	Perceived norm M (SD)	Actual norm M (SD)	Perceived norm M (SD)	Actual norm M (SD)	Perceived norm M (SD)	Actual norm M (SD)
<i>Descriptive norms</i>						
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
<i>Injunctive norms</i>						
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's were 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).

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.

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., degree 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

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

The Consort Flowchart

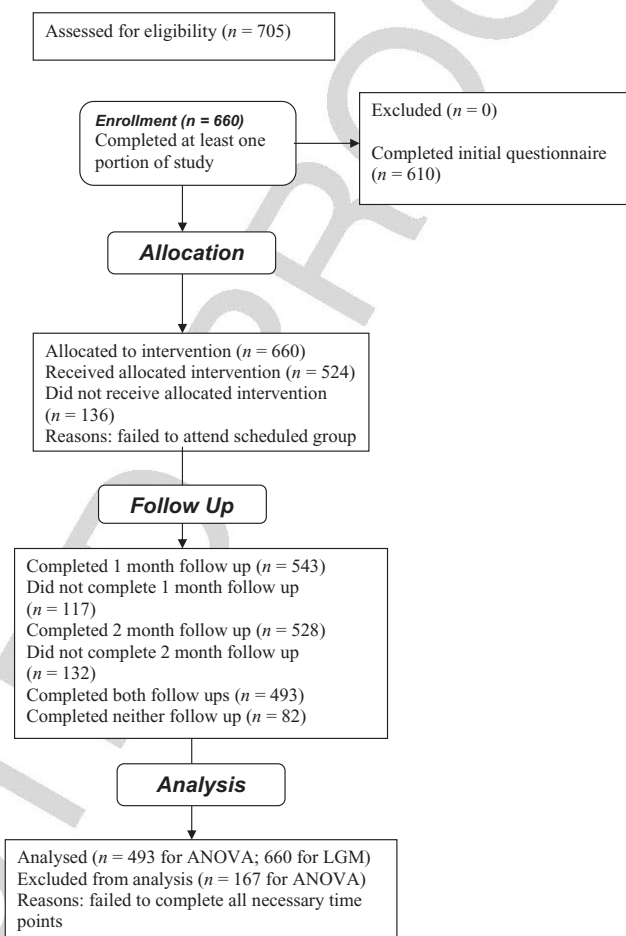
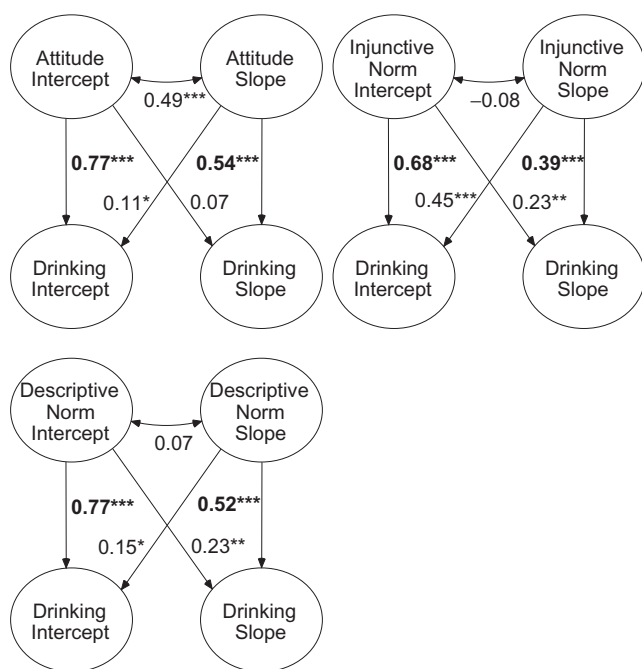


Figure 1. The consort e-flowchart.

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.



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

3 In sum, and consistent with expectations, these results
 4 suggested that changes in attitudes, descriptive norms
 5 and injunctive norms were all strongly associated with
 6 changes in drinking.

7 **Discussion**

8 The current findings extend previous research by using
 9 innovative, technologically advanced techniques in the
 10 application of group-specific normative feedback with
 11 student athletes. Discrepancies were challenged in a live
 12 feedback setting, which authenticated the presence of
 13 misperceptions that were held by the group and allowed
 14 for homogenous exposure across participants. This
 15 created an environment through which the theoretical
 16 foundation of the research design could be realised.
 17 Although the lack of a control condition precludes
 18 inferences about causation, the presentation of accurate
 19 and salient behavioural and attitudinal norms was asso-
 20 ciated with reported reductions in norms, attitudes,
 21 behaviour and consequences. Thus, the value of this
 22 study lies in the innovative technology used and
 23 support for the proof of concept in the application of
 24 this technology to an at-risk group: student athletes.
 25 The current study is the first to apply this approach to
 26 student athletes and intervene with perceptions of both
 27 descriptive and injunctive norms. While initial equip-
 28 ment costs, facilitator training and time spent organis-
 29 ing intervention meetings exist with the current
 30

31 approach, once these early preparations are in place,
 32 group interventions can be conducted on a frequent
 33 basis and in a short amount of time. Moreover, effect
 34 sizes observed in this study and a previous controlled
 35 trial evaluating this approach [8] are similar to those
 36 reported for individually delivered interventions for
 37 college students that include a social norms component
 38 ([17], see [29] for meta-analysis, [30]).

39 Researchers are encouraged to continue to test the
 40 efficacy of BLING with other groups of high-risk drink-
 41 ers. In addition, college personnel might wish to use
 42 BLING, especially with tight-knit or high-risk drinking
 43 groups, such as incoming freshmen students, to disrupt
 44 the development and sway of alcohol misperceptions.
 45 For example, this BLING intervention could be imple-
 46 mented as a regular part of freshmen orientation or
 47 within residence halls, to examine and challenge stereo-
 48 types of the 'typical incoming freshman' or provide
 49 actual healthy norms of and to groups of residents
 50 living on the same floor. Although speculative, the influ-
 51 ence of this group-specific feedback might lie in mini-
 52 mising some of the drawbacks associated with failed
 53 marketing campaigns that have traditionally targeted
 54 such groups, such as varying levels of exposure across
 55 targeted groups and individuals, disbelief of normative
 56 information, lengthy implementation periods and
 57 unfavourable reactions to the normative messages
 58 [6,21,27,31].

59 Study strengths must be viewed in light of several
 60 limitations. First, as noted earlier, the current study did
 61 not use an experimental design with a randomised
 62 matched control group. Therefore, post-intervention
 63 reductions in primary alcohol-related outcomes of the
 64 study cannot be reliably attributed specifically to the
 65 intervention. One possible explanation consistent with
 66 the pattern of results is regression to the mean.
 67 Although the use of two distinct athletic populations on
 68 opposite coastal regions helps validate the method-
 69 ological applicability and feasibility of the research pro-
 70 tocol, future research should trial the intervention
 71 procedures with the use of a control group and evaluate
 72 the longer-term effects among participants. In addition,
 73 the majority of outcomes were technically count data,
 74 which have been shown to yield biased results in ANOVA
 75 and related approaches [32,33]. This limitation is
 76 somewhat offset by the use of composite variables (5
 77 items), resulting in at least 35 possible response
 78 options. A theoretical limitation is the possibility that
 79 providing norms to light drinkers and abstainers might
 80 have iatrogenic effects. However, a recent universal pre-
 81 vention using personalised feedback, which included
 82 campus norms, showed a protective effect of the inter-
 83 vention rather than an iatrogenic one on abstaining
 84 students [34]. Finally, the intervention attendance rate
 85 of 79% is a notable limitation although this rate is
 86

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.

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Appendix I. Descriptive norms questionnaire

1. How often does a *typical 'X' University 'Gender' athlete* consume alcohol? 71
1. Never-six times a year 2. 1x a month 59
3. 2x a month 4. 1x a week 60
5. 2x a week 6. 3x a week 61
7. 4x a week 8. 5-6x a week 62
9. Everyday 63
2. How many drinks, on average, does a *typical 'X' University 'Gender' athlete* consume during a typical drinking occasion? 64
1. None 2. 1-2 65
3. 3 4. 4 66
5. 5-6 6. 7-8 67
7. 9-10 8. 11-12 68
9. 13 or more 69
3. How many drinks does a *typical 'X' University 'Gender' athlete* drink each week? 70
1. None 2. 1-2 71
3. 3-5 4. 6-8 72
5. 9-10 6. 11-14 73
7. 15-18 8. 19-21 74
9. 22 or more 75
4. Within the past 30 days, what is the maximum number of drinks the *typical 'X' University 'Gender' athlete* consumed during one occasion? 76
1. None 2. 1-3 77
3. 4-6 4. 7-9 78
5. 10-12 6. 13-15 79
7. 16-18 8. 19-21 80
9. 22 or more 81
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? 82
1. None 2. 1 time 83
3. 2 times 4. 3 times 84
5. 4 times 6. 5 times 85
7. 6 times 8. 7-9 times 86
9. 10 or more times 87

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