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**Responding to personalised social norms feedback from a web-based alcohol reduction  
intervention for students: Analysis of Think Aloud verbal protocols**

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## **Abstract**

**Objectives:** Web-based interventions enable organisations to deliver personalised individually tailored brief feedback to individuals without the need of a third party. Web-based interventions are effective in reducing alcohol consumption among university students. There is a paucity of evidence to indicate those who access web-based personalised feedback interventions respond in a way consistent with hypothesised active ingredients. This research uses the think aloud technique to explore how students respond to instant web-based personalised normative feedback. **Methods:** Between-subjects experimental design employing qualitative methods. Twenty-one UK university students generated think aloud transcripts while completing a web-based intervention (Unitcheck). This was followed by a semi-structured interview. One coding frame was developed to classify all utterances. **Results:** Narrative synthesis revealed five meta-themes: active thinking about alcohol use; comparisons with others; beliefs and knowledge about alcohol consumption; inter-relationship between personal codes and context; and engagement with Unitcheck. **Conclusions:** Students willingly engaged with the online assessment and personalised feedback. Students consciously engaged with the intervention and this engagement prompted students to actively consider their own behaviour, knowledge, perceptions, and to reflect on future behaviour. The ability of web-based personalised feedback interventions to effect change in individual's behaviours is likely related to their ability to encourage cognitive engagement and active processing of the information provided.

## **Introduction**

Electronic personalised feedback interventions, delivered over the World Wide Web, can be effective in reducing alcohol consumption among university/college students (Walters and Neighbors, 2005; Kypri et al., 2009; Bewick et al, 2010; Cunningham, Wild, Cordingley, van Mierlo and Humphries, 2009; Doumas, McKinley and Brook., 2009; Neighbors, Lewis, Bergstrom and Larimer, 2006). Reviews highlight the heterogeneous effect of interventions that include personalised normative feedback (Moreira and Foxcroft,2009; Elliot, Carey and Bolles, 2008; Bewick et al., 2008; Khadjesari, Murray, Hewitt, Harley and Godfrey., 2010). Previous work suggests the assessment process embedded in the web based interventions and the presentation of personalised normative feedback are likely active ingredients (Kypri et al., 2004; Chiauzzi, Green, Lord, Thum and Goldstein, 2005). It is hypothesised that the saliency of the normative feedback is important; in particular individuals are more likely to be influenced by large, proximal, strong, and personally similar groups (Festinger 1954; Latane, 1981). The personalisation of feedback is thought to increase the saliency of the information (Lewis and Neighbors, 2006). There remains a paucity of research investigating how individuals respond to the assessment process embedded in the web-based interventions and to the personalised feedback.

### *Personalised normative feedback interventions*

Historically personalised feedback was carried out face-to-face with an expert and was a tool for use within the consultation only. These early interventions included personalised normative feedback within the context of alcohol-focussed education that sought to enhance motivation and self-efficacy for protective behaviours (e.g. BASICS Dimeff et al., 1999). Face-to-face feedback is resource intensive and was therefore targeted at those in most need, for example delivered to those mandated to undergo alcohol education. The resource intensity of face-to-face intervention restricted the ability for personalised feedback to be used as a

prevention/early-intervention strategy. Web-based programmes have enabled organisations to deliver personalised individually tailored brief feedback without the need of a third party. The anonymity afforded by web-based platforms means people can use illness prevention interventions they would not have accessed via usual health systems. One group to benefit are university/college students who are not engaged with health services and/or who are often reluctant to seek help for their alcohol use behaviours (Kaner and Bewick, 2011). Effective electronic feedback interventions include (1) those that mirror the intensive face-to-face programmes incorporating most/all of the BASICS components combined with personalised feedback and (2) interventions that focus on delivering the normative re-education component of the BASICS feedback. There is, however, a paucity of evidence to indicate those who access web-based personalised normative feedback interventions respond in a way consistent with the active ingredients of a normative intervention. There is a need for qualitative process evaluations to better understand pathways to change and to identify mechanisms of change (Moore et al., 2015).

### *Unitcheck*

Unitcheck is an established web-based intervention (Bewick, Trusler, Mulhern, Barkham and Hill, 2008; Bewick et al., 2010; Bewick et al., 2013) providing university/college students with immediate fully automated personalised information on alcohol consumption and social norms. By providing personalised feedback on ones own drinking behaviour and that of salient peers (i.e. other university students at the same institution) the intervention seeks to educate and to correct misperceptions of the social norm, providing participants with accurate information about student drinking norms and associated behaviour. Unitcheck has been evaluated in a series of RCTs where allocation to receive the Unitcheck intervention, compared to those allocated to a control condition, was associated with reductions in the amount of alcohol consumed over the previous week (Bewick et al., 2010; Bewick et al.,

2013); these reductions were sustained in the medium term (ie, 19 weeks after the intervention was withdrawn; Bewick et al., 2013). When students use Unitcheck they first complete an online assessment. The assessment includes a 7-day retrospective drinking diary. This method is recommended for use within samples that consume alcohol regularly (Dawson, 2003). The diary included a list of common alcoholic beverages and for each day of the last week/per average occasion asked participants to indicate how many of each drink they had consumed over the relevant time period. The assessment process also includes completion of the Alcohol Use Identification Test (AUDIT). The AUDIT is a 10-item measure investigating the quantity and frequency of alcohol consumption, problems related to use, and dependence symptoms. The cross-national validation study of the AUDIT found high levels of sensitivity (.92) and specificity (.94) (Saunders, Aasland, Babor, de la Fuente and Grant, 1993) and the measure has been widely used. Immediately after completing the assessment students receive personalised information consisting of three main sections:

- (1) Feedback on the level of alcohol consumption. Participants are presented with statements indicating the number of alcohol units they consumed per week and the associated level of health risk. Statements are standardized for each risk level (within recommended, hazardous, harmful) and given advice about whether personal alcohol consumption should be reduced or maintained within the current sensible levels. The number of alcohol-free days is indicated, alongside information stating that it is advisable to have at least two per week. Statements relating to binge drinking behaviour (ie, drinking at least twice the recommended daily limit is one session) are also presented. Text is accompanied by graphs showing students the number of units they have consumed and how this related to UK government recommendations.
- (2) Social norms information. Personalised statements are presented that indicate to the user the percentage of students who report drinking less alcohol than them.

This is calculated relative to the risk level generated in section 1 of the feedback, and the frequency of students within each risk level was taken from data collected as part of an earlier university wide survey investigating aspects of student life in Leeds (Bewick et al., 2008). Text is accompanied by a pie chart showing students how their consumption compares to that of their peers. Information is also provided about the negative effects of alcohol intake reported by students who consume similar amounts of alcohol (ie, who are within the same risk category).

(3) Generic information. Standard advice is provided on calculating units, the general health risks of high levels of consumption, and outlined sensible drinking guidelines publicized in the United Kingdom. Tips for sensible drinking and contact details of both local and national support services are presented.

Results from the Unitcheck Randomised Controlled Trials (RCTs) indicated there is a need to understand the processing of the assessment, the personalised normative feedback, and the referent group used on an individual level. Results from the RCTs suggested that the assessment and the personalised information with normative feedback were active ingredients of the intervention.

Examining personal responses to the web-based assessment and personalised normative feedback can increase understanding of the types of information individuals draw upon when processing feedback. This understanding can be used to modify interventions to maximise effect. This article describes our research using think aloud to explore how students respond to instant, web-based personalised normative feedback. We use think aloud to explore student responses to instant, web-based personalised normative feedback, specifically: (1) what, if any, aspect of the personalised normative feedback was consciously attended to; (2) to establish how relevant and credible students considered the personalised feedback to be; and

(3) to explore if instant personalised normative feedback is responded to differently when presented in the context of a more or less socially proximal normative referent group.

## **Method**

### *Participants and recruitment*

To recruit to the think aloud study first year undergraduate students living in halls of residence at the University of Leeds were emailed an invitation to take part in an online survey about alcohol consumption. Survey responders were entered into a prize draw to win one of three printer credit vouchers (1x£20, 2x£10). The online survey included: demographic information, contact details, and self-reported daily alcohol consumption over the previous week. The 7-day retrospective drinking diary was the same as that used in Unitcheck. Respondents were asked if they would consider taking part in a follow-up interview study about an online resource. Respondents were invited to participate in the present study if they indicated they were willing to take part, aged 21 or younger, a UK-student, and had consumed more alcohol in the preceding week than recommended levels (i.e. greater than 14 standard UK drinks for females, greater than 21 standard UK drinks for males; one UK unit equals 10ml ethanol). Of the 156 eligible respondents ( $n=98$  females,  $n=58$  males), 13% participated ( $n=14$  female,  $n=7$  male). Students selected to participate were invited, by email, to interview in their first year of study; half participated before the summer break (1<sup>st</sup> year of study) and half participated after (2<sup>nd</sup> year of study). There is no axiom for calculating the sample size required for this study design and method. Previous research suggests data saturation will be met by about ten participants per condition (Abyhankar, Bekker, Summers and Velikova, 2010). The study was approved by University of Leeds School of Medicine Joint Ethics Committee (HSLTLM/10/016).

### *Design*

A between-subjects experimental design employing qualitative methods. After consent, participants were randomly assigned by use of a randomisation script embedded into the experimental version of Unitcheck to one of two conditions:

- (1) Typical student normative feedback on weekly consumption was sex-specific but the sex was not made explicit “X% of students at the University of Leeds ...”
- (2) Same sex student normative feedback on weekly consumption was explicitly labelled as sex-specific e.g. “X% of female students from the University of Leeds ...”.

The participant and researcher were blind to the feedback condition until the feedback was presented; the participants’ verbalisations revealed the condition to the researcher.

Participants were not aware of the differences between the two conditions and/or that there were only two conditions. Think aloud verbal protocol technique (Ericsson, 2003) followed by a semi-structured interview were used to elicit data.

#### Procedure

Think aloud encourages verbalisation of thoughts during concurrent engagement with a task, the task being working through Unitcheck. The resulting transcript was used as a means of “inferring thought processes and heeded information from behaviour” (Green, 1995, p. 126).

The method has been used to access cognitive processes including decision making and user interactions with prototype interface design (Abhyankar, Bekker, Summers, Velikova, 2010; Wright & Monk, 1991). In the current study, as the participant completed Unitcheck, verbalisation was prompted by the researcher by a neutral statement “Please keep thinking your thoughts aloud”. The researcher sat behind and to the side of the participant to minimise intrusion and make the participant feel more comfortable with thinking their thoughts aloud. Participants verbalised their thoughts while completing Unitcheck – including when they received their personalised feedback. The semi-structured interview immediately followed the think aloud procedure. The semi-structured interview asked participants their views on: Unitcheck in terms of acceptability, recall of information, alcohol facts, and their/others

drinking experience. Participants were audio-taped during the study and recordings transcribed by a third party. Completion of Unitcheck while thinking aloud took each participant 25.62mins on average (*SD* 6.26 mins; *range* 14.00-38.48 mins).

### *Development of Coding Frame*

One coding frame, informed by framework analysis, was developed to classify all utterance by participants (Ritchie, Spencer, and O'Connor, 2003). Four transcripts were purposefully selected to include one male and female participant from each condition. For each transcript the following procedure was followed: SM read the transcript at least twice to familiarize herself with the content, SM broke the responses into self-contained meaningful units; SM developed codes for these units; SM, HLB, and BMB discussed codes until consensus was reached on their meaning and label, discussion reduced codes from 260 to 52; SM grouped the codes of similar meanings; SM, HLB and BMB discussed these groups until consensus was reached on their homogeneity; these groups formed the structure of the coding frame; a colleague independently applied the coding frame to two participants; SM applied the coding frame to all participant utterances using NVivo 9.0 to manage the coding process. The coding frame had twelve themes (see Table 1) and one miscellaneous category. Less than 1% of utterances were coded as miscellaneous, this category refers to comments that could not be assigned meaning because they were incomplete and/or were asides made by participants about the study and procedures.

The twelve themes elicited from the data were: (1) responses and comments to questions and information; (2) context and environmental factors linked to alcohol consumption; (3) engagement with summary information about personalised alcohol consumption; (4) evaluation of self with guidelines on alcohol consumption; (5) evaluation of self with referent group; (6) response to normative feedback; (7) challenging information and feedback; (8) personal standards around drinking behaviour; (9) evaluation of self as a drinker; (10)

reflection of knowledge about alcohol consumption; (11) reflection on (not) changing personal drinking behaviour; and (12) response to ratings questions.

## Analysis

Narrative synthesis is used to synthesise the findings under five categories or meta-themes:

(1) active thinking about alcohol use; (2) comparisons with others; (3) beliefs and knowledge about alcohol consumption; (4) inter-relationship between personal codes and context; and (5) engagement with Unitcheck. The meta-theme is described and quotes representative of the theme provided to illustrate participant responses; numbers are used qualitatively to illustrate pattern of response across the sample.

## Results

Two-thirds of the sample were female, the majority were White British, and the average age was 19.33 years old (*SD* 0.86). Demographic characteristics were similar between the two conditions (Table 2). At the time of interview the median number of standard UK units for participants was 36.5 (11.5-15) and 28 (7.5-51) (group 1 and 2 respectively;  $U=32.00$ ,  $p=0.11$ ). the level of risk for females and males was: 28% of women were in the recommended range, 36% as hazardous and 36% as harmful; 0% of men were in the recommended range, 71% as hazardous and 29% as harmful. There was one outlier in our sample, a male student in the no specific sex labelling group who reported consuming 150 units in the week preceding the study.

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INSERT TABLE 2 WITH DEMOGRAPHICS

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(1) Active thinking about current drinking.

This theme summarises participants' utterances about their current drinking and its implications. There was evidence of this active evaluation early on in their use of Unitcheck, before receipt of feedback. Seventeen of the 21 participants evaluated negatively some aspect of their drinking behaviour prior to receiving any feedback.

“Um, so that would be 100ml, 200ml, er, lets call it ...15 actually and then I had couple of shots when I got to the club as well. God <pauses> that's really bad!”

(P16; Male; condition: no sex-specific labelling)

Active reasoning was evident in consideration of where they personally stand in relation to the information they have been presented with. Participants actively considered the impact of negative consequences from drinking as summarised and presented back in the feedback:

“... that's your life that's like life recommendations to you and it's saying that I'm it's putting it that I weekly, yeh have arguments with my girlfriend, I break the law, but you know that's and they are because of drinking, yeh, arguments with the Mrs are definitely because of drinking she said on our one year anniversary she said that I had a drinking problem, I was like well and I think that's literally that's just hit me now .. which is shit, yeh, it's literally just hit me” (P7; Male; condition: sex-specific labelling).

## (2) Comparison with others

This theme summarised utterances comparison with other students, starting with a participant's estimate of their drinking in comparison to other student group as they complete the assessments. It continues with their initial cognitive and emotional appraisal of the normative feedback they receive and concludes with their evaluation of the feedback and the specific normative reference group used. Participants frequently responded to feedback

on an emotional level. Many described feeling shocked or surprised by the normative feedback. Surprise was often conceptualised in terms of their own estimation of their relative position to others.

“Yeh, I just think like ... I am just shocked ... I guess I thought I drank pretty much the same as the majority of people and according to the results they've got on there I don't at all, I drink more than the majority” (P5; Female; condition: sex-specific labelling)

Shock and surprise was accompanied by immediate cognitive appraisal of feedback information; the appraisal lead to information being accepted, considered, and/or not believed. Most contentious was information regarding the percentage of students that drink more, the same as, or less than the participant.

“At least 75% . . . they drink less than me – are you sure? Only 20% of female university students drink... Really? I don't know if I believe it. Um, a female – I really don't believe it actually” (P3; Female; condition: sex-specific labelling)

Having acknowledged themselves as heavy drinkers, two participants then questioned the percentage of students who drink within recommended limits, believing this to be an underestimation.

“In the past week you had 7 ½ units of alcohol. You shouldn't consume more than 14. Like you the majority of students also drink within the recommended limits <chuckles a little> <pauses> um okay. Interesting to know that the majority of students at Leeds drink within the recommended limit! 'cause that's definitely not what I'd have thought.” (P4; Female; condition: no sex-specific labelling)

There was evidence of changes in opinion, with participants moving between disbelief, consideration and acceptance when considering their drinking in relation to that of other

students. One participant specifically referred to the cognitive process he went through when considering the normative feedback.

“it's hard to believe but at the same time you do have a niggling feeling that it could be . . . it probably is true. It's just difficult to believe . . . well, . . . you either feeling that it's hard to believe, it sort of instantly quashed by the reason in your mind and why it sort of says it's probably right. 'You probably do drink too much and you know it. Stop being a pratt'” (P12; Male; condition: sex-specific labelling)

Five of the seven female participants from the sex specific feedback condition saw sex specific feedback as positive. They drew on physiological distinctions in alcohol tolerance and personal identification of females.

“I think it was very good that they did just females. It was very good way 'cause I remember when I was going through the questions, it did prick up in my mind that when answering this am I going to be compared to like everyone or is there going to be separation. So it's really good that it was university females 'cause obviously we have very different drinking habits not only what we drink but obviously how much because obviously our bodies can control or um, so that's very good that it was um, like split into female” (P11; Female; condition: sex-specific labelling)

The remaining two female participants from the sex specific feedback condition objected to the use of female specific feedback.

“...just because we're of the same gender doesn't mean we have . . . we know anything about each other or can connect at all but it might do. I think there's . . .

Two of the three males in the sex-specific labelling condition registered the use of sex specific feedback but this was not explicitly commented upon. Only one participant, who was female, from the no sex-specific labelling condition suggested using sex specific information in the feedback.

There was an expectation that certain year groups, specifically Freshers (i.e. first year undergraduate students), drink more than other years. Therefore participants suggested that university specific data should be presented by year of study.

"... if you looked the Freshers would be like miles ahead of everybody else, the second years would probably be up there and the third years I think, I don't know because I haven't been in the third year, but I'm guessing they'd probably calm down a bit more, as you go up Uni I reckon you calm down a bit more so" (P7; Male; condition: sex-specific labelling).

Normative feedback was separated out as a focus of interest and consideration. The process of comparison was an uncomfortable experience that displaced participants from the security of the "average" into the territory of the minority.

"Because it makes me seem like I'm like abnormal, um it makes it seem like after reading the information about the other students it makes me feel like I'm not average anymore." (P21; Female; condition: no sex-specific labelling)

### (3) Beliefs and knowledge about drinking behaviour

This theme brings together participants' utterances about their beliefs and knowledge of drinking behaviour, when working through Unitcheck. Participants actively questioned the

accuracy and personal relevance of the normative data. Social norms feedback aims to make visible the discrepancy between perceived normative peer behaviour and actual peer behaviour. Therefore it is perhaps expected that participants viewed normative feedback in light of their own experience and observations. Participants drew on comparisons with friends, or their wider beliefs about student drinking, to challenge the normative feedback.

“<pauses> ‘cause I wonder where all those people are hiding, ‘cause that seems like a hell of a lot of people <pauses> ‘cause you see how rammed all the clubs are on a night are in Leeds (on every day of the week) and it just makes – it does give you ... the media attention that students get at the moment anyway, just generally makes you believe that stu ... that is student, lifestyle, you know. You ... you go out; have a great time; you binge drink; you come into lectures hung-over; you do your best and you look a bit of a state. And, I dunno. It is really ... its endemic in our culture at the moment. So I’m surprised that 75% of people have completed alluded that stereotype” (P8; Male; condition: no sex-specific labelling)

Participants compared their drinking with referent groups of varying proximity ranging from close friends and housemates to unknown others observed on nights out.

“Because, erm, everybody that I've met at Leeds University erm always goes on nights out like erm I've never met somebody that doesn't drink and I've never met somebody that doesn't get drunk, so even though there are people that maybe don't get drunk as many days as I get drunk ... so it's just like where are these people that are in the, are in the under category of me you know where have they been found.” (P5; Female; condition: sex-specific labelling)

The intensity challenges varied with some remaining adamant that the normative data was not correct.

“...as a general statistic I didn’t believe it because I feel like I have experience of something slightly different” (P4; Female; condition: no sex-specific labelling)

Others, however, began to tentatively question their own perceptions of student drinking.

“it made me think about like the students of Leeds University, like, who they are, cos who, it makes me feel like maybe, well I know I’ve only met like a really small percentage of people here but it just makes me feel like I’ve got like the wrong impression of everyone entirely or something...” (P21; Female; condition: no sex-specific labelling)

Participants also questioned the provenance, composition and reliability of normative data. Participants often commented on feeling removed from the comparison group and the impact this had on personal relevance.

“If it had been just me and my mates. Er yeh, if it was like, you know, its statistics on people who I don’t know, or you know, it’s just like male students and I know I know none of my mates have taken part in this, er, it’s the fact that I don’t know who the other people are so I can’t, I don’t think it’s very relevant or I can’t relate to that.” (P7; Male; condition: sex-specific labelling)

Participants questioned the legitimacy of formal drinking recommendations, contrasting guidelines with what they considered to be the social reality. The definition of binge drinking was considered particularly controversial. In explaining their understanding of binge drinking participants referred to drinking motives and behavioural consequences, rather than units consumed. There was an inability to easily understand drinking in terms of units and participants questioned the utility of setting guidelines on this basis.

“Um, I dunno, I think I always considered binge drinkers as like people who don't know how to control themselves and like out of control, and their behaviours awful. And so being told I'm a binge drinker, I think it's quite insulting actually!” (P9; Female; condition: sex-specific labelling)

Overall, participants tended to struggle to relate their personal experience of drinking to the offered drinking guidelines, recommendations, and normative data. The way conflict was resolved varied between participants and appeared to be largely dependent on personal priorities and contextual factors.

#### (4) Inter-relationship of personal code and context

Participants felt that certain behaviour was the accepted student norm, particularly when considering the consequences of drinking. Behaving in an embarrassing way, having a hangover and missing class were dismissed by seven participants, as being a normal, expected part of University life.

“Um . . . er . . . I've not gone to work or missed class because of drinking: yes, I have. I think everyone at Uni has done that once. And if they haven't, they probably shouldn't be at university” (P12; Male; condition: sex-specific labelling)

There was an acceptance that student lifestyle is generally unhealthy and excessive drinking is expected. Participants had not observed any significant impact on their physical health as a result of their drinking. Participants tended to neutralise negative drinking outcomes by downplaying their significance and impact.

“I don't know because I don't feel like it's having a particular harmful effect on me. Clearly it's going to be having a negative effect on my body . . . it's straining my purse a bit but, you know . . . I go to work; I have enough money to drink; I . . . I factor into my budget drinking and enjoy it. I do it sociably. I . . . I don't feel

like it's er <pauses> hugely negative . . .” (P2; Female; condition: no sex-specific labelling)

Providing they felt in control of their drinking it was seen as acceptable in the University context. Drinking was presented as a reward that contributed to healthy work life balance. Excessive drinking was viewed as integral to the student experience, with risks accepted as a part of that experience. Participants assumed that their drinking would automatically reduce as they progressed through, and graduated from, University.

“My immediate reaction to it now is that, yeah, it's telling me what I already know . . . really I know that I'm drinking too much but I don't care. It's part of what Fres . . . like being at university is. And I think most people will, not all, most people will agree your first year you do drink too much and you know you drink too much. But you stop and that's part of the experience of university and growing up and you stop doing it” (P12; Male; condition: sex-specific labelling)

Other than leaving University, participants were inconsistent in identification of factors that might reduce alcohol consumption. Suggestions included a serious physical health problem clearly linked to alcohol use or the possible impact of experiencing a serious negative consequence as a result of drinking. Financial and academic/paid work commitments tended to be cited as incidental reasons for drinking less in the short term. In contrast to the prevalent resistance to change in behaviour, ten participants were willing to concede that they may change the way that they think about their drinking. They felt that this was unlikely to translate into behaviour change.

I think . . . actually, like I said before like knowing that I'm drinking 14 shots full of vodka I might think a bit more like and think, 'Do I really need 14 shots of

vodka 'cause I'm sure I don't. I could just have, you know a quarter of a bottle and have 7 or whatever and still have a ? but it's a lot less . . . like maybe I'm not realising . . . maybe I'm thinking, 'Oh, yeah, I'm fine' but I'm not actually thinking about how much I've drunk (P15; Female; condition: no sex-specific labelling)

#### (5) Interaction with the programme

This theme encapsulates fractured utterances that held meaning but due to the spontaneous, unstructured nature of the Think-Aloud method were difficult to confidently assign meaning to. Participants frequently read aloud questions and feedback from the programme interspersed with ambiguous vocalisations, or brief asides. These vocalisations, although difficult to code for meaning, suggested that participants were engaged in the task and responding to the information presented.

These fractured utterances also revealed that twelve participants thought the main message of Unitcheck was 'drink less'. Seven participants felt Unitcheck increased awareness of recommended limits and helped to put alcohol consumption into perspective. The health consequences of drinking excessively were explicitly mentioned by five participants, one participant also mentioned financial consequences. Only one participant highlighted the inclusion of comparison with peers at this point. One participant felt that Unitcheck was anti-drinking.

### **Discussion**

This study is one of the first to investigate participants' engagement with an internet-based behaviour change intervention. We found students actively engage with the intervention, in particular they consistently processed feedback received by drawing comparisons to their personal experience, perceptions, and knowledge. These comparisons are consistent with the assertion that to be effective normative feedback must be salient and perceived as relevant to

the individual. The cognitive appraisal of feedback resulted in students being able to recall the normative feedback information and reflect on its perceived relevance (or not) to self. The emotional and cognitive responses to the normative feedback are primarily surprise and disbelief. This immediate reaction was however malleable and tended to fluctuate throughout the interview. The shift in response observed in some participants makes visible how single session personalised feedback might facilitate change within an individual. This finding supports the continued use of personalised normative information in web based student alcohol interventions. Future research would benefit from the inclusion of process evaluation alongside evaluation of outcome to investigate if immediate reactions are associated with changes in behaviour.

Participants were more willing to accept feedback on their personal consumption (e.g. units consumed last week) than on norms. It was not unusual for participants to state that they simply did not believe the normative feedback information, particularly on their first viewing of the information. This initial appraisal tended to be explored by participants and shifted throughout the course of the interview. Student response to the normative feedback has not been widely investigated, although the expression of surprise and questioning of the normative data was noted by Lewis and Neighbors (2007). Initial student resistance to normative information (or “push back” (Bauerle, 2012)) is likened to the beginnings of a conversation, opening up the possibility of a change in student perception and leading to changes in behaviour. There is a need for future research to investigate if presentation of personalised normative feedback interrupts the availability heuristic, correcting inaccurate perceptions and supporting positive changes in behaviour.

The active resistance to changing appraisal of self was similar across the two conditions. It does not appear that the addition of sex-specific labelling helps to break down initial resistance to accepting the personalised feedback. The use of normative comparison group

labelled as sex specific was consciously attended to only by female participants. That male participants did not comment specifically on sex specific labelled feedback is perhaps not surprising given that nearly 95% of men perceive the typical student as male (Lewis and Neighbors, 2006) are therefore more likely to assume that feedback would typically refer to male students. The extent to which the participant identifies with same sex peers appears to be important in determining how individuals processed normative feedback labelled as sex specific. For some female students sex-specific feedback was not deemed to be of relevance, this finding is consistent with the identification of a sub-culture of female students who identify their drinking with male peers and who therefore do not see themselves as part of the female student drinking culture (Gill, 2002; Neighbors et al., 2010; Suls and Green, 2003); in such cases alternative referent groups are likely to be more personally salient.

Future research is needed to understand if alternative referent groups would increase the believability of normative feedback. Our research suggests students perceive year of study to be salient groups. Student drinking behaviour changes across their degree course (Bewick, Mulhern, Barkham, Trusler, Hill and Stiles, 2008; Lanza and Collins, 2006; Schulenberg and Maggs., 2002; Klein, 1994) and it is not clear at which point in the academic year the referent data should be taken, nor is it understood at what point students begin to identify more closely with the next year of study (e.g. when do students stop thinking of themselves as Freshers and instead align themselves to the wider undergraduate student population). Given this complexity, the effectiveness of normative feedback by year group needs empirical testing. Feedback on one's own behaviour had a lower level of resistance and a higher degree of believability believable than the normative feedback information, irrespective of the labelling of the referent group. It may be that reduced believability ratings are a consequence of web-based personalised feedback interventions challenging common misperceptions about student alcohol consumption (e.g. Bosari and Carey, 2003; McAlaney and McMahan, 2007).

Further research is needed to understand if, within the context of social norms research, it is desirable to achieve relatively high levels of believability at first presentation of normative feedback or if instead the dissonance created provides opportunity for reflection and change.

Reactivity to assessment has been associated with reported changes in behaviour (e.g. Kypri et al., 2004) and monitoring effects have been observed as active ingredients of change (e.g. Bewick et al., 2013). While completing the online assessment our participants actively evaluated their behaviour; this is the first step in the process of change and provides insight into the potential mechanism underlying reactivity to assessment. Our results are consistent with the hypothesis that self-evaluation during self-assessment is an active ingredient of web-based normative feedback interventions. Reviews of electronic interventions for alcohol use in young people have shown inconsistencies in outcomes (e.g. Crouce, Bittinger, Liu, and Kilmer, 2014). Research seeking to identify active ingredients of change should include consideration of the content of assessments embedded into the intervention as well as content of feedback/information provided.

Strengths of this study include its unique use of the think aloud technique to draw data directly from participants' reaction to the intervention as it was presented. By recording participant's immediate reaction, instead of a post-hoc rationalisation, the think aloud technique enabled us to infer thought processes as the participant engaged with the intervention. The think aloud procedure allowed identification of the content attended to and the meaning attributed to content. This identification enabled us to reveal likely active ingredients and mechanisms of change; we are however unable to definitively say what the active ingredients are. By following the think aloud procedure with a semi-structured interview we allowed participants to elaborate on their responses. The study explored University of Leeds student responses to one specific web-based alcohol intervention, Unitcheck. This was useful and appropriate, it does place limitations on the ability to

generalise findings to other student populations and web-based alcohol personalised normative feedback interventions. When considered in the context of existing literature, findings support and build on previous research. Methodological limitations include the presence of the researcher throughout the think aloud protocol task. This was necessary in order to prompt the participant when required and ensure the task ran smoothly. It is reasonable to assume that the presence of the interviewer may have affected participant responses; the most likely outcome is that participants worked through Unitcheck more conscientiously than they might otherwise have done. The impact of working through Unitcheck more conscientiously is unknown however it is likely that the think aloud transcripts provide an amplification of the active ingredients, that is engagement with active ingredients are likely to be muted in effectiveness trials of Unitcheck that did not include think aloud. It is apparent from the data that participants felt comfortable questioning the quality of the feedback and suggesting areas for improvement.

In conclusion, a single session web-based personalised normative feedback intervention can actively engage students and create an opportunity for students to reflect on their own behaviour and its relationship to their peers. The process of engagement and reflection begins during the completion of the embedded assessment; a finding consistent with evidence suggesting that reactivity to assessment is an active ingredient in personalised normative feedback interventions. When engaging with the personalised normative feedback the primary initial emotional and cognitive response was surprise and disbelief. This reaction was malleable and fluctuated as students worked through the intervention; suggesting that personal evaluation of current drinking behaviour altered as a consequence of engaging with the intervention. Reactions to normative feedback specifically labelled as sex specific were heterogeneous. For some female students the inclusion of a sex-specific label resulted in feedback being perceived as of limited personal relevance. Students willingly engaged with the online assessment and personalised feedback received. The process of engaging with the

intervention prompted students to actively consider their own behaviour, knowledge, and perceptions, and to reflect on future behaviour. We conclude that the ability of Unitcheck to effect change in individual's behaviours is likely due to its ability to encourage cognitive engagement and active processing.

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**Table 1** Coding framework for analysis: meta-themes, themes, and categories

<b>Meta-theme</b>	<b>Theme</b>	<b>Category</b>
Active thinking about alcohol use	<ul style="list-style-type: none"> <li>Evaluation of self with guidelines on alcohol consumption</li> </ul>	<ul style="list-style-type: none"> <li>Neutral self evaluation</li> <li>Negative self evaluation</li> <li>Positive self evaluation</li> </ul>
	<ul style="list-style-type: none"> <li>Evaluation of self as a drinker</li> </ul>	<ul style="list-style-type: none"> <li>Neutral/ambiguous evaluation</li> <li>Negative evaluation</li> <li>Positive evaluation</li> </ul>
	<ul style="list-style-type: none"> <li>Responses and comments to questions and information</li> </ul>	<ul style="list-style-type: none"> <li>Answering the question, neutral/ambiguous</li> <li>Answering the question, negative self evaluation</li> <li>Answering the question, positive self evaluation</li> <li>Answering the question, indecision</li> <li>Answering the question, difficult to remember</li> </ul>
Comparisons with others	<ul style="list-style-type: none"> <li>Response to normative feedback</li> </ul>	<ul style="list-style-type: none"> <li>Does not believe normative feedback</li> <li>Considering normative feedback</li> <li>Accepts normative feedback</li> <li>Emotional reaction to normative feedback</li> </ul>
	<ul style="list-style-type: none"> <li>Evaluation of self with referent group</li> </ul>	<ul style="list-style-type: none"> <li>Comparison of self in relation to reference group                             <ul style="list-style-type: none"> <li>Drink more</li> <li>Drink less</li> <li>Drink same</li> <li>Not specified</li> </ul> </li> <li>Expectation of reference groups</li> <li>Comment on comparison group</li> </ul>
Beliefs and knowledge about alcohol consumption	<ul style="list-style-type: none"> <li>Challenging information and feedback</li> </ul>	<ul style="list-style-type: none"> <li>Challenging the normative data (e.g. stats, agenda, composition of comparison group)</li> <li>Challenge based on personal experience of self and friends</li> <li>Challenging definitions</li> <li>Incorrect input</li> </ul>
	<ul style="list-style-type: none"> <li>Reflection of knowledge about alcohol consumption</li> </ul>	<ul style="list-style-type: none"> <li>Correct/confirmed knowledge</li> <li>Incorrect knowledge</li> <li>Uncertainty/unknown</li> </ul>
Inter-relationship between personal codes and context	<ul style="list-style-type: none"> <li>Context and environmental factors linked to alcohol consumption</li> </ul>	<ul style="list-style-type: none"> <li>Circumstances increase alcohol consumption</li> <li>Circumstances decrease alcohol consumption</li> <li>Impact of circumstances not specified</li> <li>Positives of alcohol consumption</li> </ul>
	<ul style="list-style-type: none"> <li>Personal standards around drinking behaviour</li> </ul>	<ul style="list-style-type: none"> <li>Statement of personal standards</li> <li>Neutralising/discounting negative consequences</li> </ul>
	<ul style="list-style-type: none"> <li>Reflection on (not) changing personal drinking behaviour</li> </ul>	<ul style="list-style-type: none"> <li>Considering change</li> <li>Not considering change</li> <li>Catalyst for change</li> </ul>
Interaction with the programme	<ul style="list-style-type: none"> <li>Engagement with summary information about personalised alcohol consumption</li> </ul>	<ul style="list-style-type: none"> <li>Response to feedback, neutral</li> <li>Response to feedback, accepting</li> <li>Response to feedback, questioning</li> <li>Main message of Unitcheck</li> </ul>
	<ul style="list-style-type: none"> <li>Response to ratings questions</li> </ul>	<ul style="list-style-type: none"> <li>Believability</li> <li>Personal relevance (general)</li> <li>Personal relevance (normative comparison group)</li> <li>Recall of normative comparison group</li> <li>Own evaluation of Unitcheck</li> </ul>

**Table 2** Demographic characteristics of participants by condition

		<b>Condition</b>		
		Standard reference group (n=11)	Same-sex reference group (n=10)	Overall (n=21)
<b>Sex</b>	Female	7 (64%)	7 (70%)	14 (67%)
<b>Year of study</b>	1 <sup>st</sup> year	5 (45%)	5 (50%)	10 (48%)
	2 <sup>nd</sup> year	6 (55%)	5 (50%)	11 (52%)
<b>Ethnic Background</b>	White British	10 (91%)	9 (90%)	19 (90%)
	Mixed British	1 (9%)	1 (10%)	2 (10%)