

Personalized feedback based on a drink-pouring exercise may improve knowledge of, and adherence to, government guidelines for alcohol consumption

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Abstract

Background: Although most people are aware of government guidelines for alcohol consumption, few have accurate knowledge of these and fewer still use these guidelines to monitor their drinking. Most people also lack accurate knowledge of the alcohol content of the drinks they consume. The aim of the study reported here was to examine whether or not personalised feedback on alcohol consumption based on performance in a drink pouring task and self-reported alcohol intake would improve university students' knowledge of alcohol consumption guidelines and reduce their alcohol intake. **Methods:** A quasi-randomised control trial with a two-month follow-up was conducted with 200 students aged 18-37 in the south of England. Participants were allocated to a "pour + feedback" group that completed a drink pouring task and received personalised feedback, a "pour only" group that completed the drink pouring task but did not receive feedback, and a control group. **Results:** At follow-up, participants in the "pour + feedback" group had significantly better knowledge of government guidelines, and significantly lower weekly alcohol intake when compared to the "control" and "pour only" groups. **Conclusions:** Further refinement of the drink-pouring intervention and feedback reported in this paper, and assessment of their impact in various populations may lead to better understanding of which elements of personalised feedback have the greatest influence on young people's alcohol use.

keywords: alcohol, guideline, feedback, pouring, knowledge

There is widespread concern about the health and social consequences of excessive alcohol consumption, particularly among young people. Alcohol is one of the most important contributors to the overall burden of disease in young people (Gore et al., 2011; Jones et al., 2008). Excessive alcohol consumption is linked to a higher risk of acute adverse outcomes such as accidents and injuries, as well as numerous chronic health conditions (Jones et al., 2008; Hosking & Benger, 2013). Excessive alcohol consumption among young people is a particular focus of concern, because young people are more likely than older adults to engage in heavy episodic drinking, also known as “binge drinking” (Herring, Berridge & Thom, 2008; Nicholls, 2010; White et al., 2011). Heavy episodic drinking is associated with an increased risk of alcohol poisoning, accidents and injury, and being the victim or perpetrator of violence (Boles & Miotto, 2003; Cherpitel et al., 2003;). Furthermore, alcohol problems among older adults are predicted by heavy drinking in youth (Merline et al., 2004).

As in many other countries, the UK government has developed guidelines to encourage moderate alcohol consumption (Furtwängler & de Visser, 2013; Kerr & Stockwell, 2012; National Health Service [NHS], 2013). The UK guidelines are expressed in terms of “units” of alcohol (10mL or 8g of pure ethyl alcohol). The recommended daily unit intake maxima are 3-4 units for men and 2-3 units for women, and it is advised that people have at least 2 alcohol-free days per week (NHS, 2013). These units and daily guidelines were initially published nearly 20 years ago (Department of Health [DoH], 1995). Implementation of the Public Health Responsibility Deal (DoH, 2011) means that since 2011 at least 80% of alcohol product labels must state the unit content as well as the recommended daily intake maxima.

If people are to adhere to government guidelines, it is important that they possess accurate knowledge of units and appropriate attitudes and skills. However, research suggests that these attributes are lacking in most drinkers. Studies of the general public (Gill & O’May, 2006; Office for National Statistics [ONS], 2010) and university students (de Visser & Birch, 2012;

Gill & O'May, 2007a) have revealed that although most people in the UK are aware of the government's alcohol units, few have accurate knowledge of unit-based guidelines, and fewer still use these guidelines to monitor their drinking. Studies of students and the general population in the UK and other countries have revealed that people generally lack accurate knowledge of the alcohol unit content of various packaged drinks, and that most people misperceive the alcohol content of the drinks they pour for themselves (de Visser & Birch, 2012; Devos-Comby & Lange, 2008; Gill & O'May, 2007a; Hasking et al., 2005; Kaskutas & Graves, 2000; Kerr & Stockwell, 2012; ONS, 2010). Studies of students and the general population in the UK and other countries also show that when people are asked to pour their "usual drinks" or what they believe to be "one unit" or "one standard drink" they tend to pour drinks that contain markedly more than one unit (de Visser & Birch, 2012; Devos-Comby & Lange, 2008; Gill & Donaghy, 2004; Kerr et al., 2005, 2009; White et al., 2003; 2005).

The inaccuracies in knowledge described in the preceding paragraph generally result in people underestimating how much they drink and in their drinking in excess of government guidelines. However, the results of studies using drink pouring methods suggest that feedback from such activities may be an important part of interventions to promote better understanding of alcohol units, more accurate reporting of alcohol consumption, and enhanced capacity to monitor alcohol consumption (de Visser & Birch, 2012; Gill & O'May, 2007a, 2007b; White et al., 2003). For example, after being given feedback on the inaccuracy of their knowledge of standard drinks, students have been found to revise upwards estimates of their alcohol consumption (White et al., 2003). Furthermore, many people report that feedback based on a drink pouring task would influence them to reduce their usual drink size (Gill & O'May, 2007b).

An underlying assumption of alcohol consumption guidelines - and most models of health behaviour (Ajzen, 1991; Becker, 1974; Fisher et al., 1994) - is that knowledge about the

adverse effects of excessive alcohol use will influence patterns of alcohol consumption. Given that people tend to have poor knowledge of guidelines and tend to underestimate their alcohol intake, interventions that improve people's knowledge of unit-based guidelines and provide feedback on how their actual alcohol consumption compares to guidelines should motivate more moderate intake. However, to date, there is a lack of evidence as to whether personalised feedback on tests of guideline knowledge and/or performance in drink pouring tasks leads to significant changes in alcohol-unit-related knowledge, beliefs, or behaviour.

Recent research has attempted to change people's alcohol intake by providing personalised feedback on self-reported alcohol consumption in relation to (mis)perceived peer drinking norms, with equivocal evidence of success among a sample of over 1600 students at one UK university (Bewick et al., 2013), a sample of over 1700 students at 22 UK universities (Moreira et al., 2012), and a sample of over 1700 Canadian adults who had expressed an interest in receiving alcohol self-help materials (Wild et al., 2007). In such studies, the intervention took the form of feedback that emphasised how an individual's alcohol intake compared to perceived and/or actual alcohol intake among peers. The aim of the study reported here was to examine whether a different kind of personalised feedback based on performance in a drink pouring task and self-reported alcohol intake would lead to changes in university students' knowledge of unit-based alcohol consumption guidelines and changes in alcohol intake.

METHODS

Design

The study was a quasi-randomised control trial with a two-month follow-up. Participants were allocated to the control group - whose members only completed baseline and follow-up questionnaires - or one of two intervention groups. People in the "pour + feedback" group completed the baseline questionnaire and a drink pouring task and received personalised

feedback on both of these tasks twice within two weeks of the baseline assessment, and then completed the follow-up questionnaire. People in the “pour only” group completed the baseline questionnaire and drink pouring task but did not receive feedback until after they had completed the follow-up questionnaire. This design allowed analysis to disaggregate effects of drink pouring *per se* from those of personalised feedback based on drink pouring.

Sample

The sample was recruited in late 2013 via announcements on a student subject pool website and in lectures to undergraduate students at a university in the south of England. It consisted of 110 women and 90 men aged 18-37 (mean = 20.2, s.d. = 2.8) who had consumed alcohol in the previous week. The opportunistic sampling procedure meant that it was not possible to calculate the response rate. The ethnic profile of the sample reflected the student body at the university: 84% white, 7% Asian; 4% mixed race; 3% Middle-Eastern, 1% Black, 1% Latino.

Materials

Drink pouring

Three types of clear shatterproof plastic glasses were used for the drink pouring activity: 570mL beer glass; 250mL wine glass; 255mL tumbler. Three types of bottles were used: 660mL brown glass beer bottle; 750mL green glass red wine bottle; 375mL clear glass vodka bottle. These bottles were re-filled with red coloured water (“red wine”), ginger beer (“beer”), and water (“vodka”). Participants were informed that bottle contents were not genuine, but were asked to pour drinks as if they were “regular strength” wine, beer and vodka. If they asked, participants were instructed to assume the following alcohol content by volume (ABV): wine = 12%, beer = 4%, vodka = 40%.

Baseline questionnaire

The first section of the questionnaire gathered demographic data. In the second section, respondents estimated the alcohol unit content of 11 drinks selected to cover different sized

servings of various alcoholic drinks consumed by young men and young women. Colour pictures of each drink were accompanied by brief descriptions: pint (568mL) of regular strength beer; 330mL bottle of Corona lager; 500mL can of Stella Artois lager; 440mL can of Carling lager; pint (568mL) bottle of Bulmer's cider; single (25mL) measure of a spirit; single measure mixed drink; 275mL bottle of Smirnoff Ice mixed vodka drink; 275mL bottle of Bacardi Breezer mixed rum drink; 250mL (large) glass of red wine; 175mL (medium) glass of red wine. Estimates were considered to be correct if they were within ± 0.2 units of the actual alcohol unit content (see de Visser & Birch, 2012; Gill & O'May, 2007b). Participants were given a score denoting the number of estimates within this range.

Five items assessed knowledge of alcohol units and unit-based guidelines. Participants indicated what they believed to be: the volume (in mL) of pure ethanol in a "unit"; and government guidelines (in units) for maximum daily intake for men and women, and maximum weekly intake for men and women. The number of correct responses was recorded as a total knowledge score.

Respondents used 7-point likert scales (end points "not at all", "extremely") to indicate: how useful they believed the concept of "units" to be; how interested they were in changing the number of days on which they drink alcohol; and how interested they were in changing the amount of alcohol they drink each week. Responses to the latter two items were closely correlated $r = .87$, so they were combined as a measure of interest in changing alcohol intake.

Respondents were provided with a visual guide to the unit content of various drinks to help them to give accurate reports of the number of units of alcohol they consumed on each day of the preceding week. These reports were used to create three consumption variables: total number of units consumed in the previous week; number of days in the previous week on which the recommended maximum unit intake was exceeded; number of alcohol-free days in the previous week. The measure of weekly unit intake was derived by dividing the total

number of units by the sex-specific recommended maximum. The resulting variable had a marked positive skew, which was corrected by using a square root transformation.

The order of presentation of items was fixed, and the questionnaire was set up to forbid backtracking. This meant that respondents could not use information about units provided in the latter part of the questionnaire to go back to check or correct earlier responses.

Follow-up questionnaire

The follow-up questionnaire was administered two months after the baseline questionnaire. It repeated a selection of the measures included in the baseline questionnaire: the 11 items used to assess knowledge of the unit content of different drinks; the five items used to assess knowledge of alcohol units and unit-based guidelines; and the items used to record alcohol consumption in the previous week. Respondents in the “feedback” group completed one additional item: they rated the usefulness of the feedback they were sent using a 5-point scale (end points “not at all useful”, “extremely useful”). Upon completion of the follow-up questionnaire, all participants were provided with the contact details of providers of information and advice about alcohol use.

Procedure

Ethical approval was granted by the host university research governance committee. All participants read and completed an information and consent form. Participants were non-randomly allocated to one of three experimental groups: "pour + feedback", "pour only", and "control" according to which day of the week they enrolled in the study. In all groups, knowledge, beliefs, and self-reported alcohol intake were recorded at baseline and at two-month follow-up via online questionnaires hosted on a secure server.

Participants in the "pour + feedback" group began by completing the drink pouring task described below. While they completed the baseline questionnaire, their poured drinks were measured and converted to units. Within two weeks of completing the questionnaire, they

received personalised feedback in the form of a PDF attached to an email (see supplementary file): the majority received this within one week. This document informed participants of: the actual and estimated unit content of their three poured “usual” drinks; the unit content of their three poured “units”; and the number of their 11 estimates of the unit content of the various drinks that were correct. These results were followed by the statement “The results suggest that you may be unaware of how much alcohol you are actually consuming”. A statement of recommended intake maxima: “The NHS recommends that [women/men] should not regularly drink more than [2-3/3-4] units per day” was followed by a report of how frequently they exceeded this amount, and how many of their “usual” drinks would take them over this limit. The sheet included statements that “The government advises having at least 2 alcohol-free days per week”, and that “[women/men] are often advised not to have more than [14/21] units per week. These were followed by a report of how many units respondents reported having in the week prior to baseline data collection. The feedback sheet also contained the statement “For [women/men], binge drinking is often defined as more than [6/8] units in a single session”, followed by a statement of whether the individual would be categorised as a binge drinker using this definition. The lower portion of the feedback form contained the statement “Pouring small drinks will benefit you now and in the future: for more information go to: www.nhs.gov/alcohol” and the visual guide used in the baseline questionnaire to show the unit content of various drinks. This feedback was re-sent within two weeks of the initial feedback message. Participants in the "pour only" group completed the drink-pouring task and the baseline questionnaire, but did not receive feedback until after the two-month follow-up. Participants in the "control" group only completed the baseline and follow-up questionnaires.

Respondents were offered £10 (approx. USD16) for completing the follow-up questionnaire, which was administered online. The £10 reward was used to maximise the

retention of participants at follow-up. Two months after completing baseline measures, participants received an email containing a unique identity code and the URL for the follow-up questionnaire. After this initial request to complete the follow-up questionnaire, participants were sent three reminders separated by 4 days. Those who had not responded after these reminders had been sent were deemed lost to follow-up. The follow-up retention rate was 88% (176/200). The two-month follow-up period was chosen so that: (1) baseline assessment would not be unduly influenced by “freshers’ week” activities characterised by heavy drinking that commonly occur at the start of the academic year; and (2) follow-up assessment would not clash with major assessment periods when alcohol consumption may vary from usual patterns.

Drink pouring

First, participants were instructed to use one of the large glasses to pour their usual glass of regular strength beer. They were then asked to estimate how many units of alcohol they thought this drink contained. Next, participants were instructed to use one of the wine glasses to pour their usual glass of regular strength red wine and to estimate its unit content. Participants were then asked to use one of the tumblers to pour their usual glass of a spirit and to estimate its unit content. They were instructed that if they usually consume spirits as a mixed drink, then they should pour the volume of spirit they would pour in before adding the mixer. After each drink had been poured it was removed from the participant’s sight.

In the second part of the drink pouring activity, participants repeated the process described above in the same order. However, this time they were asked to pour what they thought was one unit of each drink. After each drink had been poured it was removed from their sight.

Rather than randomizing the order, the same “usual drink” then “one unit” order was used for all participants. Past research has identified reactivity to drink pouring tasks that may enhance social desirability effects that arise when people pour “usual drinks” after pouring

“units” (White et al., 2003). Drink volumes were measured to the nearest mL using shatterproof plastic graduated cylinders and converted to units using the ABVs reported earlier. Estimates of unit content of “usual drinks” within ± 0.2 units of the actual unit content were considered to be accurate, as were “units” that were within the range 0.8 - 1.2 units (see de Visser & Birch, 2012; Gill & O’May, 2007b).

Analytic strategy

Five outcome measures were used. Two were measures of knowledge: accuracy of estimates of the unit content of 11 drinks; and accuracy of knowledge of unit-based alcohol consumption guidelines. Three were measures of alcohol consumption: units consumed in the previous week; days in the previous week on which the recommended maximum unit intake was exceeded; alcohol-free days in the previous week. Repeated measures ANOVAs were carried out to identify whole-sample and group-specific changes between baseline and follow-up measures of the five outcome variables

RESULTS

Table 1 displays baseline descriptive statistics and tests of differences among people with complete follow-up data in each of the three experimental conditions and participants who did not complete the follow-up questionnaire. There were no significant differences between those who completed and those who did not complete the follow-up. Each group contained similar proportions of men and women ($\chi^2_{(3)} = 0.38, p = .94$). The lack of differences between the three experimental conditions indicates that the quasi-random allocation of participants to conditions did not produce any systematic differences between conditions.

Table 1

Among the 127 respondents who completed the drink-pouring task, the means and confidence intervals (CI) indicate that all three “usual drinks” contained significantly more than one unit of alcohol: beer - mean = 1.64 (95%CI = 1.57 - 1.70); wine - mean = 1.91

(95%CI = 1.83 - 1.99); spirit - mean = 2.14 (95%CI = 1.98 - 2.30). Comparisons between the three experimental groups revealed no significant differences in the mean unit content of their “usual” glasses of beer ($F_{(2,126)} = 0.72, p = .49$), wine ($F_{(2,126)} = 1.91, p = 0.15$) or spirits ($F_{(2,126)} = 0.16, p = .85$).

When asked to pour a “unit”, participants poured significantly less than one unit of beer (mean = 0.76, 95%CI = 0.71 - 0.82), approximately one unit of wine (mean = 1.07, 95%CI = 1.00 - 1.14), and significantly more than one unit of spirits (mean = 1.34, 95%CI = 1.23 - 1.44). Comparisons between the three experimental groups revealed no significant differences in how many units they poured when asked to pour “units” of beer ($F_{(2,126)} = 1.57, p = .21$), wine ($F_{(2,126)} = 2.62, p = .08$), or spirits ($F_{(2,126)} = 2.96, p = .06$).

The data in the lower portion of Table 1 show that participants tended to be inaccurate when estimating the unit content of their “usual” drinks - the overall mean score was 0.62 correct estimates out of three. Furthermore, when asked to pour a “unit” they tended not to pour within the ± 0.2 unit tolerance - the overall mean score was 1.33 out of three drinks. There were no significant differences between the four groups in terms of accuracy of estimates of the unit content of “usual drinks”, but in the “unit” pouring task, the “pour + feedback” group performed significantly less well than the “pour only” group.

Repeated measures ANOVAs were conducted to identify changes between baseline and follow-up measurement for the five variables displayed in Table 2. There was a significant increase in picture estimate accuracy across all participants ($F_{(1,173)} = 10.73, p < .01$), but there was no significant interaction effect for group membership ($F_{(2, 173)} = 2.92, p = .06$).

Table 2

There was no significant change in knowledge of guidelines across all participants ($F_{(1, 173)} = 2.01, p = .15$), but there was a significant interaction effect for group membership ($F_{(2, 173)} = 3.43, p = .04$): significant increases in knowledge were observed in the “pour + feedback”

group, but not in the “pour only” or control groups.

There was a significant decline in alcohol unit intake relative to guidelines in the previous week for the whole sample ($F_{(1, 173)} = 5.15, p = .02$), and there was a significant interaction effect for group membership ($F_{(2, 173)} = 4.05, p = .02$), with significant reductions in unit intake only observed in the “pour + feedback” group.

There was no significant change in the number of days in the previous week that participants exceeded the recommended daily unit maximum ($F_{(1, 173)} = 4.00, p = .05$). However, there was a significant interaction effect for group membership ($F_{(2, 173)} = 5.12, p = .01$) such that reductions in the number of days of excessive drinking were only found in the “pour + feedback” and control groups.

Across all participants there was a significant decline in the number of alcohol-free days per week ($F_{(1, 173)} = 4.82, p = .03$), but there was no interaction effect for group membership ($F_{(2, 173)} = 0.31, p = .73$).

Respondents in the “pour + feedback” group provided mean ratings of the feedback that were just above the mid-point of the 0-4 scale (mean = 2.02, s.d. = 0.78). All respondents indicated that they received the feedback. Within the “pour + feedback” group, repeated measures ANCOVAs (with feedback usefulness included as a covariate) revealed that perceived usefulness of feedback was not a significant influence on change in picture estimate accuracy ($F_{(1,54)} = 1.04, p = .31$), knowledge of guidelines ($F_{(1,54)} = 3.17, p = .08$), alcohol unit intake in the previous week ($F_{(1,54)} = 0.35, p = .56$), number of days of excessive drinking per week ($F_{(1,54)} = 0.04, p = .84$), or number of alcohol-free days per week ($F_{(1,54)} = 0.03, p = .88$).

DISCUSSION

The data presented in this paper indicate that feedback based on self-reported alcohol consumption and performance in a drink pouring task may be one way to promote increases

in knowledge of unit-based alcohol consumption guidelines, and reductions in weekly alcohol consumption. The results of between-group comparisons indicated that it was feedback after pouring rather than the pouring task *per se* that was associated with these changes. These findings suggest that provision of personalised feedback may lead to better knowledge of alcohol intake relative to government guidelines - which is not only beneficial for individuals, but also for researchers and health care professionals whose decisions may be influenced by self-reported alcohol consumption - and can encourage more moderate alcohol consumption.

It is important to note that although participants tended not to exceed recommended weekly intake maxima, they still reported exceeded daily intake maxima an average of 1.5 to 2 days per week. These data accord with earlier findings that young people tend to concentrate their alcohol consumption into a few higher intake days or drinking sessions (Centers for Disease Control, 2012; ONS, 2010).

Despite the promising findings reported here, it is important to note that the mean ratings of the usefulness of the feedback that was given were only just above the mid-point of the rating scale. Furthermore, the perceived usefulness of feedback was not a significant influence on either of the two knowledge-related outcome variables or the three behaviour related outcome variables. It would be helpful to understand how participants in this study used the feedback, to develop a better sense of which elements of the feedback had the greatest influence on knowledge and behaviour, and to determine how to improve the perceived usefulness and actual efficacy of the feedback.

The data reported in this paper reiterate earlier findings that people tend not to have very good knowledge of unit-based guidelines, cannot accurately estimate the unit content of packaged drinks or drinks that they pour for themselves, and tend not to be able to pour a unit of beer or spirits (de Visser & Birch, 2012; Devos-Comby & Lange, 2008; Gill & O'May, 2007a; Hasking et al., 2005; Kaskutas & Graves, 2000; ONS, 2010). Given that many models

of health behaviour include knowledge as a precursor to behaviour change (Ajzen, 1991; Becker, 1974; Fisher et al., 1994), there is likely to be value in improving knowledge of, and ability to apply knowledge of, unit-based alcohol consumption guidelines. Indeed, the data indicated that the personalised feedback was associated with improvements in knowledge and changes in some aspects of alcohol use. However, it must be acknowledged that there are not always simple associations between better knowledge of units and more accurate drink pouring or lower alcohol consumption: heavier drinkers may have better knowledge of alcohol units than moderate drinkers or non-drinkers (Hasking et al., 2005; de Visser & Birch, 2012; White et al., 2003). Furthermore, one qualitative study found that some young people use alcohol unit information on drink labels to help them to select the drinks best suited to achieving their goal of getting drunk (Jones & Gregory, 2009).

It is also important to consider whether people with accurate or better knowledge of unit-based guideline are motivated to put this knowledge into practice and to reduce their levels of alcohol consumption (Fisher et al., 1994). In the sample recruited for this study, interest in changing frequency or volume of alcohol consumption was generally low, with the mean score below the scale mid-point. It is therefore important to identify what does motivate young people to change their patterns of alcohol use, and to focus on those variables in interventions (de Visser et al., 2013; Harrison et al., 2011; Szmigin et al., 2011; Wild et al., 2007). There is also a need to determine whether personalised feedback is best presented with reference to perceived norms and/or performance in a drink pouring task (Bewick et al., 2013; Moreira et al., 2012).

Although the findings reported above are encouraging, it is important to note several limitations of the study. There may be reason to question whether participants' behaviour in the drink pouring task and knowledge test under experimental conditions would necessarily match cognition and behaviour in drinking contexts - particularly given the known effects of

alcohol intoxication on information processing and decision-making (George et al., 2005; Moss & Albery, 2009; Steele & Josephs, 1990). Although several studies have employed drink pouring activities (de Visser & Birch, 2012; Gill & Donaghy, 2004; Kerr et al., 2005, 2009), there is a lack of information about the intra-subject reliability of such measures. The use of non-alcoholic drink substitutes may have affected performance due to differences in appearance and aroma. In addition, the study focused on self-poured drinks, and did not assess the actual or perceived content of drinks poured by other people or consumed directly from a bottle. Furthermore, estimates of alcohol intake were based on an assumption that all drinks were finished, but this may not always be the case (Kerr & Long, 2010). Ideally, feedback in the drink pouring task would have been given immediately (Kulik & Kulik, 1988), but the available resources did not allow this. It is also important to note that some of the outcome measures relied on self-reported alcohol consumption, but that the current study (like past research) showed that self-reports may be unreliable. However, this reliance on self-reported alcohol use is perhaps unavoidable, and like all of the limitations noted so far, it applied to all three experimental groups.

Limitations related to the generalizability of the findings can also be identified. The results of this study may not generalize to other young people or to older segments of the population, given observed differences between patterns of alcohol use and other health behaviours among university students and other people (de Visser et al., 2005, 2006; Gill, 2002; Turrisi et al., 2006). In addition, the recruitment methods used may have resulted in sample that may not have been representative of all students. There would, therefore, be value in replicating this study with broader samples of young people and with older adults to determine whether the findings observed in the convenience samples recruited for this study apply to the broader drinking population. The significant changes in some measures of alcohol consumption in the control group suggest that fluctuations in young people's patterns of drinking may make it

hard to determine the magnitude of intervention effects. There would be value in examining intervention effects over a follow-up period longer than the two month period that was used (Moreira et al., 2012).

The findings of this study indicate that using performance in a drink pouring task to tailor personalised feedback on alcohol consumption may lead to increases in knowledge of unit-based alcohol consumption guidelines, and may help to promote more moderate alcohol consumption. Further refinement of such interventions and assessment of their impact in various populations may lead to better understanding of which elements of personalised feedback have the greatest influence on young people's alcohol use.

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Table 1 Comparison of baseline measures across three experimental conditions and participants lost to follow-up - mean (s.d.)

group	control	pour +	pour only	drop-out	
	(n = 63)	feedback (n = 56)	(n = 57)	(n = 24)	
Accuracy - estimates based on pictures (range = 0-11)	3.49 (1.89)	3.09 (2.25)	3.09 (1.83)	3.50 (2.17)	$F_{(3,196)} = 2.70, p = .58$
Accuracy - knowledge of guidelines (range = 0-5)	2.22 (1.16)	1.77 (1.08)	2.14 (1.19)	1.79 (1.14)	$F_{(3, 196)} = 2.10, p = .10$
weekly unit intake relative to recommended maximum	1.00 (0.40)	0.95 (0.34)	0.99 (0.38)	1.11 (0.47)	$F_{(3, 196)} = 1.00, p = .39$
days over recommended daily maximum	1.94 (1.45)	1.70 (1.17)	1.74 (1.37)	2.08 (1.38)	$F_{(3, 196)} = 0.69, p = .56$
“dry days” in last week	4.08 (1.21)	4.19 (1.18)	3.75 (1.48)	4.08 (1.28)	$F_{(3, 196)} = 1.21, p = .33$
perceived usefulness of guidelines (range = 1-7)	3.11 (1.58)	3.20 (1.73)	3.26 (1.74)	2.83 (1.55)	$F_{(3, 196)} = 0.40, p = .75$
interest in changing alcohol intake (range = 1-7)	3.06 (1.52)	2.96 (1.53)	2.97 (1.37)	2.88 (1.49)	$F_{(3, 196)} = 0.10, p = .96$
drink pouring task		pour + feedback (n = 56)	pour only (n = 57)	drop-out (n = 14)	
accuracy of estimated content of “usual drinks” (range = 0-3)		0.59 (0.71)	0.61 (0.65)	0.79 (0.70)	$F_{(2,126)} = 0.47, p = .62$
accuracy of pouring “units” (range = 0-3)		1.11 (0.80)	1.51 (0.83)	1.50 (1.16)	$F_{(2,126)} = 3.41, p = .04$

Table 2 Baseline and 2-month follow-up data for all five outcome variables across three experimental conditions - mean (s.d.)

group	control (n = 63)		pour + feedback (n = 56)		pour only (n = 57)	
	baseline	follow-up	baseline	follow-up	baseline	follow-up
Accuracy - estimates based on pictures (range = 0-11)	3.49 (1.89)	3.57 (1.78)	3.09 (2.25)	4.29 (2.19)	3.09 (1.83)	3.67 (2.03)
Accuracy - knowledge of guidelines (range = 0-5)	2.22 (1.16)	2.19 (1.23)	1.77 (1.08)	2.27 (1.36)	2.14 (1.19)	2.09 (1.20)
weekly unit intake relative to recommended maximum	1.00 (0.40)	0.92 (0.37)	0.95 (0.34)	0.83 (0.39)	0.99 (0.38)	1.04 (0.45)
days over recommended daily maximum	1.94 (1.45)	1.52 (1.28)	1.70 (1.17)	1.29 (1.00)	1.74 (1.37)	1.98 (1.29)
“dry days” in last week	4.08 (1.21)	4.25 (1.50)	4.19 (1.18)	4.55 (1.61)	3.75 (1.48)	3.93 (1.41)