White Rose Research Online

eprints@whiterose.ac.uk
https://eprints.whiterose.ac.uk
Universities of Leeds, Sheffield and York

Deposited via The University of Sheffield.

White Rose Research Online URL for this paper:
https://eprints.whiterose.ac.uk/id/eprint/140162/

Version: Accepted Version

Article:
Norman, P., Webb, T. and Millings, A. (2019) Using the theory of planned behaviour and implementation intentions to reduce binge drinking in new university students. Psychology and Health, 34 (4). pp. 478-496. ISSN: 0887-0446

https://doi.org/10.1080/08870446.2018.1544369

This is an Accepted Manuscript of an article published by Taylor & Francis in Psychology and Health on 12/01/2019, available online:
http://www.tandfonline.com/10.1080/08870446.2018.1544369

Reuse
Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

Takedown
If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

UNIVERSITY OF LEEDS
University of Sheffield
UNIVERSITY of York

Using the theory of planned behaviour and implementation intentions to reduce binge drinking in new university students

Paul Norman*

Department of Psychology, University of Sheffield,

Cathedral Court, 1 Vicar Lane, Sheffield, S1 2LT, UK.

p.norman@sheffield.ac.uk

Thomas L. Webb

Department of Psychology, University of Sheffield,

Cathedral Court, 1 Vicar Lane, Sheffield, S1 2LT, UK.

t.webb@sheffield.ac.uk

Abigail Millings

Department of Psychology, University of Sheffield,

Cathedral Court, 1 Vicar Lane, Sheffield, S1 2LT, UK.

a.millings@sheffield.ac.uk

* Corresponding author

Author version of paper accepted for publication in *Psychology & Health* on 30 October, 2018. Doi: 10.1080/08870446.2018.1544369

This article may not exactly replicate the authoritative document published in the journal. It is not the copy of record.

Abstract

Objective: Excessive alcohol consumption, including binge drinking, increases when students enter university. This study tests whether combining messages targeting theory of planned behaviour (TPB) constructs with if-then plans (i.e., implementation intentions) to avoid binge drinking reduces binge drinking in new university students.

Design: One month after starting university, students (N = 407) were randomly assigned to condition in a 2 (TPB messages) × 2 (implementation intentions) factorial design.

Main Outcome Measures: Cognitions about binge drinking were assessed immediately post-intervention. Frequency of binge drinking was assessed at one-month follow-up (n = 205).

Results: Participants who viewed the messages had significantly weaker intentions to engage in binge drinking and less favourable cognitions about binge drinking (affective attitude, descriptive norms, and self-efficacy) than those who did not view the messages. In addition, participants who formed an implementation intention to avoid binge drinking reported significantly fewer instances of binge drinking at follow-up.

Conclusion: The findings provide some support for the use of interventions based on the TPB to reduce intentions to engage in binge drinking and for forming implementation intentions to reduce the frequency of binge drinking in new university students. No evidence was found for the synergistic effect of combining the two interventions.

Keywords: heavy episodic drinking; college; online; intervention; experiment; randomised controlled trial

Introduction

Binge drinking [1] (i.e., heavy episodic drinking) is associated with an increased risk of a range of short-term negative outcomes (e.g., accidents, physical assaults, unsafe sex, poor academic performance) (Kuntsche, Kuntsche, Thurl, & Gmel, 2017). Continued excessive alcohol consumption has, in turn, been related to various long-term negative outcomes (e.g., cirrhosis of the liver, heart disease, cancer) (NHS, 2014). The economic burden of excessive alcohol consumption is substantial; for example, in the UK the cost of alcohol-related harm to the NHS has been estimated to be £3 billion per year (Balakrishnan, Allender, Scarborough, Webster, & Rayner, 2009), and the cost of alcohol-related crime and anti-social behaviour has been estimated to be £11 billion per year (Booth, Meier, Shapland, Wong, & Paisley, 2010).

Binge drinking is a common behaviour in young people. A recent national survey in the USA indicating that 24% of 19-20 year olds had engaged in binge drinking in the previous two weeks (Patrick & Terry-McElrath, 2017). Binge drinking is also more prevalent in university students than their non-student peers (Gill, 2002) and increases when young people enter university (Cameron et al., 2015; Fromme, Corbin, & Kruse, 2008). In the US, 38% of college students aged 18-22 reported engaging in binge drinking in the previous month compared with 33% of their non-student peers (SAMHSA, 2015), and in the UK, in excess of 60% university students have reported engaging in binge drinking in some studies (Cooke, Sniehotta, & Schüz, 2007; Norman, Conner, & Stride, 2012). The increased prevalence of binge drinking in university students may, in part, be due to the fact that starting university often involves moving away from home thereby bringing freedom from parental supervision at a time when young people are likely to be exploring various health-risk behaviours (Joffe, Radius, & Gall, 1988). Moreover, excessive alcohol consumption is seen to be an integral part of the student identity (Colby, Colby, & Raymond, 2009) and the university environment affords many opportunities to engage in heavy episodic drinking (Carpenter et al., 2008).

There is a clear need to develop interventions to reduce binge drinking in university students, particularly as they enter university, before harmful drinking patterns become established. However, previous interventions targeting alcohol consumption in new university students have produced only very small effects on heavy episodic drinking ($d_+ = 0.07$; Scott-Sheldon, Carey, Garey, & Carey, 2014). The current study tests whether combining (i) messages targeting theory of planned behaviour (TPB; Ajzen, 1988) constructs to reduce intentions to engage in binge drinking with (ii) instructions to form if-then plans (implementation intentions; Gollwitzer, 1999) to avoid binge drinking reduces the frequency of binge drinking in new university students.

The Theory of Planned Behaviour

The TPB provides a parsimonious account of the social cognitive determinants of health behaviour. According to the TPB, the most proximal determinant of behaviour is intention. Intention, in turn, is determined by individuals' positive verse negative evaluations of the behaviour (i.e., attitude), their perception of social approval from important others (i.e., subjective norm), and their perception of the ease or difficulty of performing the behaviour (i.e., perceived behavioural control). Perceived behavioural control is also hypothesised to have a direct effect on behaviour. Underlying each of these constructs are behavioural beliefs about the perceived consequences of performing the behaviour, normative beliefs about the views (i.e., approval or disapproval) of specific referents, and control beliefs about the perceived barriers to, and facilitators of, the behaviour. Recent versions of the TPB have been expanded to differentiate between affective attitudes (focusing on affective outcomes such as having fun, enjoyment) and instrumental attitudes (focusing on instrumental outcomes such as health, cost), injunctive norms (focusing on perceptions of the extent to which important others would approve of the person performing the behaviour) and descriptive norms (focusing on perceptions of the extent to which important others perform the behaviour), and perceived control (focusing on perceptions of the extent to which performing the behaviour is under the

person's control) and self-efficacy (focusing on the person's confidence that they can perform the behaviour) (Conner & Sparks, 2015; Fishbein & Ajzen, 2010).

The TPB has been found, on average, to explain 44% of the variance in intention and 19% of the variance in behaviour in prospective tests of health behaviour (McEachan, Conner, Taylor, & Lawton, 2011), whereas expanded versions of the TPB have been found to explain 59% of the variance in intention and 31% of the variance in health behaviour (McEachan et al., 2016). In relation to alcohol, Cooke, Dahdah, Norman, and French (2016) reported that attitude (r_+ = .62), subjective norm (r_+ = .47), and self-efficacy (r_+ = 48) had large sized average correlations with alcohol-related intentions, and that intention (r_+ = .54) and self-efficacy (r_+ = 41) had large and medium-to-large sized average correlations with alcohol-related behaviour, respectively. In contrast, the average correlations between perceived control and both intention (r_+ = -.10) and behaviour (r_+ = -.13) were negative and small. The TPB has also been found to explain significant amounts of variance in the binge drinking intentions and behaviour of university students (Cooke et al., 2007; Hagger, Anderson, Kyriakaki, & Darkings, 2007; Johnson & White, 2003; Norman, 2011; Norman, Armitage, & Quigley, 2007; Norman & Conner, 2006). Taken together, these findings suggest that the TPB provides a strong theoretical basis for developing interventions to change health-risk behaviour, including binge drinking in students. In line with this idea, Sheeran et al. (2016) reported that interventions that produced significant changes in attitudes, norms, and self-efficacy (d_+ = 0.47, 0.62, 0.65, respectively) led to significant changes in both intention (d_+ = 0.48, 0.49, 0.51, respectively) and behaviour (d_+ = 0.38, 0.36; 0.47, respectively). Similarly, Webb, Joseph, Yardley, and Michie (2010) reported that online interventions based on the TPB produced significant changes in health behaviours (d_+ = 0.36).

However, both correlational and experimental work on the TPB has highlighted an important limitation of the model; namely, that good intentions are not always translated into behaviour (for a review, see Sheeran & Webb, 2016). Considering correlational evidence,

McEachan et al. (2011) reported that intention typically explains only 20% of the variance in future behaviour, indicating that other variables are needed to explain the transition from intention to behaviour. Similarly, considering experimental evidence, Webb and Sheeran (2006) reported that interventions that successfully changed intention ($d_+ = 0.66$) only had a small effect on behaviour ($d_+ = 0.35$), thereby indicating that other behaviour change techniques are needed to support the translation of strong intentions into behaviour.

Planning and Implementation Intentions

Planning has been identified as a key variable that may help to bridge the gap between intentions and behaviour. For example, the Health Action Process Approach (Schwarzer, 1992) distinguishes between a motivational phase in which social cognitive variables (i.e., risk perceptions, outcome expectancies, action self-efficacy) are outlined as the key determinants of intention and a volitional (i.e. post-intentional) phase in which other variables including planning, action control, and maintenance/recovery self-efficacy ensure that intentions are translated into behaviour. Accordingly, measures of planning have been found to partially mediate the effect of intention on a number of health behaviours including exercise/physical activity (Conner, Sandberg, & Norman, 2010; Scholz, Schüz, Ziegelmann, Lippke, & Schwarzer, 2008; Sniehotta, Scholz, & Schwarzer, 2005), parental sunscreen use (van Osch et al., 2008), dental flossing, fruit and vegetable consumption, and seat belt use (Schwarzer et al., 2007). In addition, moderation analyses have indicated that the effect of planning on behaviour increases as intentions become stronger (Conner et al., 2010; de Bruijn, Rhodes, & van Osch, 2012; Van Osch et al., 2008; Wiedemann, Schüz, Sniehotta, Scholz, & Schwarzer, 2009). These findings are consistent with the idea that planning helps to translate intentions into behaviour and is particularly important when individuals hold strong intentions.

In terms of changing behaviour, implementation intentions have been identified as a key technique that may help translate strong intentions into behaviour. In line with the model of action phases (Heckhausen & Gollwitzer, 1987), Gollwitzer (1999) made the distinction

between goal intentions that specify an intention to act (e.g., to avoid binge drinking) and implementation intentions that specify how the intention will be translated into behaviour (e.g., by alternating between soft and alcoholic drinks when at a nightclub). Implementation intentions are specific if-then plans that help translate goal intentions into behaviour through identifying a critical situation (in the "if" part of the plan) and linking it to an appropriate behavioural response (in the "then" part of the plan) (e.g., "If I am at a nightclub, then I will alternate between soft and alcoholic drinks). Gollwitzer and Sheeran (2006) reported that implementation intentions have, on average, a medium-to-large sized effect on health behaviour ($d_+ = 0.59$) and a number of studies have reported significant effects of forming implementation intentions on alcohol consumption in students (Hagger et al., 2012; Murgraff, Abraham, & McDermot, 2007; Murgraff, White, & Phillips, 1996; Norman & Wrona-Clarke, 2016). Furthermore, some studies have reported that implementation intentions are particularly effective for those who hold strong goal intentions (Lippke, Ziegelmann, & Schwarzer, 2004; Orbell, Hodgkins, & Sheeran, 1997; Sheeran, Webb, & Gollwitzer, 2005) in line with one of the central tenets of the model of action phases.

Taken together, the above findings suggest that both motivational interventions (to strengthen goal intentions) and volitional interventions (to help translate goal intentions into behaviour) may be needed to change behaviour. Thus, the effectiveness of forming implementation intentions should be increased when combined with a motivational intervention (and vice versa). However, studies testing this hypothesised interaction have produced mixed findings. For example, a number of studies have failed to find significant interaction effects on behaviour when combining mental simulations (Hagger et al., 2012, Hagger, Lonsdale, & Chatzisarantis, 2012; Koka & Hagger, 2017; Meslot, Gauchet, Allenet, Francois, & Hagger, 2016) and a decisional balance sheet (Prestwich, Lawton, & Conner, 2003) with implementation intentions. However, significant interactions have been reported for combining messages based on protection motivation theory (Rogers, 1983) with instructions to

form implementation intentions on saturated fat intake (Prestwich, Ayres, & Lawton, 2008; Zhang & Cooke, 2012), exercise (Gaston & Praparessis, 2014; Zhang & Cooke, 2012), and testicular self-examination (Sheeran, Milne, Webb, & Gollwitzer, 2005). Studies that have tested combining messages targeting TPB constructs with instructions to form implementation intentions have also produced mixed findings with a significant interaction being reported for organ donor registration (Hyde & White, 2013), but non-significant interactions being reported for attendance at workplace health and safety training (Sheeran & Silverman, 2003), unhealthy snacking (Karimi-Shahanjarini, Rashidian, Omidvar, & Majdzadeh, 2013), and alcohol consumption (Norman et al., 2018).

One possible explanation for these mixed findings is that many tests of the effects of combining motivation interventions with instructions to form implementation intentions have suffered from methodological limitations leading to less than optimal tests of the interaction hypothesis. First, some studies have employed non-factorial designs; for example comparing the effects of a control condition, a motivational intervention and a combined (motivational + volitional) intervention (Gaston & Praparessis, 2014; Karimi-Shahanjarini et al., 2013; Meslot et al., 2016). As a result, these studies were not able to directly assess the interaction hypothesis. Second, in some studies the effect of the motivational intervention on intention has either not been tested (Gaston & Praparessis, 2014; Prestwich et al., 2003; Meslot et al., 2016) or has been found to be non-significant (Hagger et al., 2012, Hagger, Lonsdale, & Chatzisarantis, 2012; Koka & Hagger, 2017; Sheeran & Silverman, 2003). In order to test whether a motivational intervention enhances the effectiveness of implementation intentions, it is first necessary to demonstrate that the motivational intervention has an impact on goal intentions. Third, the timing of the intervention may have diminished the potential effectiveness of forming implementation intentions in some studies. For example, Norman et al. (2018) instructed students to form implementation intentions to avoid binge drinking one month before they started university. However, before starting university, students may have

little knowledge of the high-risk situations they are likely to encounter at university or the protective strategies that they might use to deal with these situations (Sugarman & Carey, 2009).

The Current Study

The current study tests whether combining a motivation intervention (i.e., messages targeting TPB constructs) with a volitional intervention (i.e., instructions to form implementation intentions) reduces the frequency of binge drinking in new university students. The study builds on previous research by testing the effect of the combined intervention in a 2 (messages: present vs. absent) × 2 (implementation intentions: present vs. absent) factorial design and by delivering the interventions one month *after* students have started university. It was hypothesised that (i) receiving messages targeting TPB constructs would reduce students' intentions to engage in binge drinking, would lead to less favourable cognitions about binge drinking, and would reduce the frequency of binge drinking at one-month follow-up, (ii) receiving instructions to form implementation intentions to avoid binge drinking would reduce the frequency of binge drinking at one-month follow-up, (iii) there would be a significant interaction between receiving messages and instructions to form implementation intention such that the effect of implementation intentions on the frequency of binge drinking would be greater when combined with the messages than when not, and (iv) intention strength would moderate the effect of implementation intentions on the frequency of binge drinking such that the effect of implementation intentions would be greater when intentions not to engage in binge drinking are strong (i.e., when binge drinking intentions are weak).

Method

Power analysis

Webb at al. (2010) reported that the average effect size for online interventions based on the TPB on health behaviour was $d_+ = 0.36$, whereas Gollwitzer and Sheeran (2006) reported that the average effect size for implementation intentions on health behaviour was d_+

= 0.59. An a priori power analysis was conducted to estimate the sample size required to detect similar sized effects in the present study. The power analysis indicated that 246 participants would be required to provide 80% power to detect an effect size of $d = 0.36$, with alpha set at .05. In contrast, only 94 participants would be required to detect an effect size of $d = 0.59$, at 80% power, with alpha set at .05.

Procedure and Design

Emails were sent to all new undergraduate students at a university in a large city in the UK one month after they had started university inviting them to take part in a study on alcohol use at university. The invitation email contained a link to an online (baseline) questionnaire hosted on Qualtrics. The first page of the baseline questionnaire contained further information about the study and included a question for participants to indicate their consent to participate. Participants then completed questions on demographics and typical alcohol consumption (during their first month at university). Participants who reported that they did not drink alcohol were excluded from the study. Participants were then randomly allocated to condition in a 2 (TPB messages: present vs. absent) by 2 (implementation intentions: present vs. absent) factorial design using the randomisation function on Qualtrics. Participants viewed (or did not view) the messages before they were instructed (or not instructed) to form if-then plans. All participants then completed measures of TPB variables in relation to binge drinking. The baseline experimental conditions and measures took approximately 7 minutes to complete ($M = 6.98$, $SD = 4.77$). Participants were contacted by email one month later with a link to a follow-up questionnaire to assess their alcohol consumption over the intervening month. Up to three reminder emails were sent. Participation in the study was voluntary, but was incentivised by the chance to win one of three £50 gift vouchers after completing each questionnaire. The study was approved by the Department of Psychology Research Ethics Committee in line with the University's Research Ethics Approval Procedure.

Measures

Frequency of binge drinking. Alcohol consumption was assessed using a modified version of the Alcohol Outcomes Record taken form the Treatment Outcomes Profile (Public Health England, 2017). At baseline, participants were asked to think about what they drank on each day of the week during a typical week since they had started university (i.e., during the previous month). They were presented with a table that contained a list (in rows) of 15 common drinks (e.g., pint of ordinary strength lager, beer or cider; large glass of wine (250ml), single measure (shot) of spirits (25ml); 1 litre bottle of strong cider) and spaces to type in how many of each type of drink they typically drank on each day of the week (that were listed as column headings). The table also contained three rows for participants to type in other drinks not listed in the table. The drinks were converted into units of alcohol using values listed on the Alcohol Outcomes Record form. Other drinks were coded and converted into units using an online unit calculator (Drinkaware, 2017). The number of units consumed on each day of the week was computed and the frequency of binge drinking was calculated by summing the numbers of days in a typical week when 6/8 or more units of alcohol were consumed for women/men. The same procedure was used to assess the frequency of binge drinking at one-month follow-up, except that participants were instructed to think about what they typically drank on each day of the week over the previous month.

TPB cognitions about binge drinking. After completing the experimental conditions, participants completed two-item measures of TPB constructs in relation to engaging in binge drinking at university. Spearman-Brown's coefficient (ρ) was used to assess the internal reliability of the two-item TPB measures, as recommended by Eisinga, Grotenhuis, and Pelzer (2013). Scores on the two items assessing each TPB construct were then averaged. The items were taken from Norman et al. (2018) and assessed participants' intentions (e.g., *Do you intend to engage in binge drinking at university? Definitely do not–Definitely do,* ρ = .89), affective attitudes (e.g., *Engaging in binge drinking at university would be… Unenjoyable–Enjoyable,* ρ = .92), cognitive attitudes (e.g., *Engaging in binge drinking at university would be… Foolish–*

Wise, ρ = .81), subjective norms (e.g., *People who are important to me think I should/should not engage in binge drinking at university, Think I should–Think I should not,* ρ = .73), descriptive norms (e.g., *How many students do you think engage in binge drinking at university? None– All,* ρ = .78), perceived control (e.g., *I feel in complete control over whether or not I engage in binge drinking at university, Disagree–Agree,* ρ = .75), and self-efficacy (e.g., *If I wanted to, I could easily engage in binge drinking at university, Unlikely–Likely,* ρ = .84). All items were rated on 7-point response scales and coded so that high scores indicated high levels on the variable of interest.

Experimental Conditions

Messages about binge drinking. Participants randomly allocated to the messages condition were presented with messages about binge drinking taken from Norman et al. (2018). In line with Ajzen's (1988) guidelines for developing interventions based on TPB, the messages were developed on basis of three stages of formative work which (i) identified the modal salient behavioural, normative and control beliefs of students about binge drinking, (ii) assessed the strength of associations between these beliefs and binge drinking intentions and behaviour, and (iii) developed messages to target the most important beliefs (Epton et al., 2015). The messages targeted three key beliefs; namely, that engaging in binge drinking at university is fun, that engaging in binge drinking at university has a negative impact on studies, and that having friends who binge drink increases the likelihood of binge drinking at university. Each message comprised between 200-250 words of text followed by a brief video (approximately 1 minute) of students talking about the issues covered in each message. The first message ("*You can have fun at university without binge drinking*") outlined different ways in which is possible to have fun and make friends at university without engaging in binge drinking (e.g., joining societies, going to the cinema). The second message ("*Binge drinking is not good for your studies*") outlined different ways in which engaging in binge drinking can have a negative impact on academic performance (e.g., missing lectures, impaired cognitive

functioning). The third message ("*Resisting social pressures to binge drink*") reminded participants that most students do not engage in binge drinking on a regular basis and outlined different reasons not to engage in binge drinking even if one's friends are (e.g., financial cost, being able to look after one's friends).

Implementation intentions. In line with Hagger et al. (2012), participants randomly allocated to the implementation intentions condition were instructed to form up to three if-then plans to avoid binge drinking at university. Participants were informed that they were more likely to avoid binge drinking if they planned how and where/when to do it. They were presented with an example plan (*"If I am in a bar/pub with my friends and I am likely to engage in binge drinking, then I will opt for a soft drink instead of an alcoholic drink"*) and asked to make their own plans using the same format, paying particular attention to the specific situations in which they would implement the plans. A table was presented with text boxes for participants to type the "if" and "then" components of up to three plans.

Results

Sample Characteristics

Figure 1 shows the flow of participants through the study. Of the 6,190 new students who were sent an email inviting them to participate in the study, 724 (12%) clicked on the link to the baseline (pre-intervention) questionnaire. Of these, 81 (11%) did not complete the questionnaire. In addition, 142 (20%) were excluded from the study as they reported that they did not drink alcohol and further 8 (1%) were excluded as they had extreme levels of alcohol consumption (i.e., more than 3 SDs above the mean weekly number of units). In total, 493 participants were randomised to condition, of whom 407 (83%) completed the experimental conditions and immediate post-intervention TPB measures.

The sample comprised 142 males and 262 females (other n = 3) with a mean age of 19.09 years (SD = 3.37). The majority of participants were from the UK (85%) and described their ethnicity as "White" (80%). They consumed an average of 19.45 units of alcohol per

week (*SD* = 19.05) and engaged in binge drinking an average of 1.12 times per week (*SD* = 1.23). One month later, 207 (51%) of these participants completed the measure of alcohol consumption over the intervening month. Two participants (1%) were excluded at this stage due to extreme levels of alcohol consumption (using the same criterion as at baseline), resulting in a sample of 205 participants at one-month follow-up. The follow-up sample reported consuming an average of 15.89 units of alcohol per week (*SD* = 15.44) and engaging in binge drinking an average of 0.96 times per week (*SD* = 1.01).

Randomisation Checks

A series of chi-square tests and ANOVAs indicated that there were no significant differences between the conditions in terms of demographics (i.e., age, gender, nationality, ethnicity) or baseline alcohol consumption (i.e., units consumed per week, frequency of binge drinking per week).

Attrition Analyses

Attrition between randomisation and completion of the experimental conditions and the post-intervention TPB measures was found to differ by condition, $\chi^2(3, N = 493) = 62.59$, $p < .001$; specifically, attrition was higher in the implementation intention (31%) versus the non-implementation intentions conditions (5%), $\chi^2(1, N = 493) = 58.01$, $p < .001$, and in the message (21%) versus the non-message conditions (14%), $\chi^2(1, N = 493) = 3.96$, $p = .046$. Attrition after randomisation was also higher among White (19%) than non-White (10%) participants, $\chi^2(1, N = 493) = 4.05$, $p = .04$. No other significant differences were found between participants who did versus did not complete the experimental conditions and the post-intervention TPB measures on other demographic measures (i.e., age, gender, nationality) or baseline alcohol consumption (i.e., units consumed, frequency of binge drinking).

In addition, no significant differences were found between participants who did versus did not complete the one-month follow-up questionnaire on the baseline measures, including alcohol consumption (i.e., units consumed, frequency of binge drinking), experimental

condition and post-intervention TPB measures. The only exception was that non-White participants (63%) were more likely to be lost to follow-up at one month than White participants (46%), $\chi^2(1, N = 407) = 7.11$, $p = .01$.

Main Analyses

A 2 (TPB messages: present vs. absent) × 2 (implementation intentions: present vs. absent) MANOVA was conducted to examine the effects of the experimental conditions on cognitions about binge drinking assessed immediately post-intervention. The messages condition had a significant multivariate main effect on cognitions about binge drinking, $F(7, 397) = 3.98$, $p < .001$, whereas the main effect for the implementation intentions condition, $F(7, 397) = 1.49$, $p = .17$, and the interaction between the message and implementation intentions conditions, $F(7, 397) = 0.59$, $p = .77$, were non-significant. Univariate F tests revealed that the messages condition had a significant main effect on measures of intention, $F(1,403) = 11.05$, $p = .001$, $d = 0.33$, affective attitudes, $F(1, 403) = 11.51$, $p = .001$, $d = 0.33$, descriptive norms, $F(1, 403) = 19.03$, $p < .001$, $d = 0.46$, and self-efficacy, $F(1, 403) = 13.47$, $p < .001$, $d = 0.37$. In each case, cognitions about binge drinking were more negative among participants who received the messages than among those who did not. The main effects of the message condition on measures of cognitive attitudes, $F(1, 403) = 2.69$, $p = .10$, $d = 0.17$, subjective norms, $F(1, 403) = 2.70$, $p = .10$, $d = 0.18$, and perceived control, $F(1, 403) = 1.65$, $p = .20$, $d = 0.13$, were non-significant. Descriptive statistics (means and standard deviations) for the TPB variables by message condition are presented in Table 1. [2,3]

A 2 (TPB messages: present vs. absent) × 2 (implementation intentions: present vs. absent) ANCOVA was conducted to examine the effects of the experimental conditions on the frequency of binge drinking at one-month follow-up, controlling for baseline levels of binge drinking. The main effect of the message condition was non-significant, $F(1, 200) = 0.38$, $p = .54$, $d = 0.02$, as was the main effect of instructions to form implementation intentions, $F(1, 200) = 3.07$, $p = .08$, $d = 0.15$, and the interaction between the message and implementation

intentions conditions, $F(1, 403) = 0.002$, $p = .97$. Descriptive statistics (adjusted means controlling for baseline binge drinking and standard errors) for the frequency of binge drinking at follow-up by condition are presented in Table 2. [4,5]

Per Protocol Analysis

Of the 76 participants in the implementation intentions condition who were followed-up at one month, 59 (78%) had formed an if-then plan to avoid binge drinking at baseline. A per protocol analysis was conducted that only included those participants in the implementation intentions condition who had followed the instructions to form an if-then plan. The ANCOVA revealed a significant main effect of the implementation intentions condition on the frequency of binge drinking at one-month follow-up, $F(1, 183) = 6.16$, $p = .01$, $d = 0.22$, such that those who formed an if-then plan engaged in binge drinking less frequently at follow-up ($M = 0.72$, $SE = 0.10$) than those not instructed to form an if-then plan ($M = 1.03$, $SE = 0.07$). Both the main effect of message condition, $F(1, 183) = 1.89$, $p = .17$, $d = 0.03$, and the interaction between the message and implementation intentions conditions, $F(1, 187) = 0.66$, $p = .42$, were non-significant in the per protocol analysis.

Moderation Analysis

In order to test whether the effect of the instructions to form implementation intentions on binge drinking at follow-up was moderated by the strength of participants' intentions to engage in binge drinking measured immediately post-intervention, a moderated regression analysis was conducted using the PROCESS macro (Hayes, 2013). In the analysis, implementation intentions condition was entered as the independent variable, intention strength as the moderator variable, frequency of binge drinking at one-month follow-up as the dependent variable, and frequency of binge drinking at baseline as a covariate. However, the interaction between the implementation intentions condition and intention strength was non-significant, $B = .08$, $SE = .06$, $p = .16$.

Discussion

The present study employed a factorial design to test the effect of combining messages targeting theory of planned behaviour (TPB; Ajzen, 1988) constructs and instructions to form if-then plans (or implementation intentions; Gollwitzer, 1999) on the frequency of binge drinking in new university students. In line with predictions, participants who received the messages were found to have weaker intentions to engage in binge drinking, as well as weaker affective attitudes, descriptive norms and self-efficacy in relation to binge drinking, than those who did not receive the messages. These findings are in line with the broader literature that has shown that interventions that successfully change attitudes, norms and self-efficacy have corresponding effects on intention (Sheeran et al., 2016), as well as individual studies that have shown that messages targeting TPB constructs can reduce intentions to engage in health-risk behaviour (Karimi-Shahanjarini et al., 2013; Norman et al., 2018). In contrast, the effect of the messages on the frequency of binge drinking at one-month follow-up was non-significant. This finding is line with previous research that has indicated that good intentions are not always translated into behaviour (Sheeran & Webb, 2016). Indeed, reviews have reported that interventions that successfully change attitudes, norms and self-efficacy have smaller effects on behaviour than on intention (Sheeran et al., 2016), and that interventions that have significant effects on intention only have small effects on behaviour (Webb & Sheeran, 2006). Taken together with the findings of the current study, it is clear that additional volitional techniques are needed to bridge the intention-behaviour gap.

Contrary to predictions, the effect of instructing students to form implementation intentions on the frequency of binge drinking at one-month follow-up was non-significant. This finding contrasts with previous studies that have found that instructing students to form implementation intentions has a significant effect on alcohol consumption (Hagger et al., 2012a; Murgraff et al., 2007; Murgraff et al., 1996; Norman & Wrona-Clarke, 2016), although it should be noted that these studies all recruited students when they were established at university. The current study recruited students soon after starting university and Norman et al.

(2018), who also reported a non-significant effect of implementation intentions on alcohol consumption, recruited students one month before they started university. Implementation intentions may be more effective when participants are aware of the kind of situations that they are likely to encounter (specified in the "if" component of an implementation intention) and the kind of responses that might be effective in dealing with them (specified in the "then" component of an implementation intention). Students are likely to acquire such knowledge during their time at university (Sugarman & Carey, 2009).

There are two additional potential explanations for the weak effect of implementation intentions in the current study. First, although the current study was adequately powered to detect a medium-sized effect size that is typically found for implementation intentions on health behaviour ($d_+ = 0.59$; Gollwitzer & Sheeran, 2006), the effect size found in the current study was substantially smaller ($d = 0.15$). This may reflect that the fact that it may be harder to change binge drinking, particularly among students, than other health-related behaviours. In support of this idea, previous meta-analyses have indicated that both online alcohol interventions ($d_+ = 0.07$; Black, Mullan, & Sharpe, 2016) and alcohol interventions in first year university students ($d_+ = 0.07$; Scott-Sheldon et al., 2014) have only small-sized effects on heavy episodic drinking. Second, not all of the participants in the implementation intentions condition formed an if-then plan to avoid binge drinking. Low levels of engagement are not uncommon in online interventions (Kelders, Kok, Ossebaard, & van Gemert-Pijnen, 2012) and may reduce their effectiveness (Donkin et al., 2011). Consistent with such an interpretation, the per protocol analysis revealed that participants who formed an if-then plan engaged in binge drinking significantly less frequently at follow-up than participants who were not instructed to form an if-then plan. As noted by van Dulmen et al. (2007), people may be less likely to comply with tasks in interventions that are time consuming and/or difficult. Consistent with this idea, attrition between randomisation and completion of the experimental procedures and post-intervention measures was significantly higher in the implementation intentions

conditions than other conditions. Further work is needed on how to increase engagement with online interventions.

Contrary to predictions, the provision of messages targeting TPB constructs and instructions to form implementation intentions did not have a significant interactive effect on the frequency of binge drinking. Thus, despite the fact the messages decreased the strength of students' intentions to engage in binge drinking, this did not augment the effectiveness of the implementation intention intervention. Similarly, intention strength was not found to moderate the effect of implementation intentions on binge drinking at follow-up, in contrast to other studies (Lippke et al., 2004; Orbell et al., 1997; Sheeran et al., 2005). Previous studies that have sought to combine messages targeting TPB constructs with implementation intentions have produced mixed findings (Hyde & White, 2013; Karimi-Shahanjarini et al., 2013; Norman et al., 2018; Sheeran & Silverman, 2003), although other studies have found that the effectiveness of implementation intentions is augmented when combined with messages based on protection motivation theory (Gaston & Praparessis, 2014; Prestwich et al., 2008; Sheeran et al., 2005; Zhang & Cooke, 2012). One explanation for the null finding in the current study is that participants already held relatively weak intentions to engage in binge drinking (i.e., the mean intention score for the message control condition was below the scale mid-point). This may have served to diminish any synergistic effect of combining motivational and volitional interventions.

Strengths and Limitations

The present study has a number of key strengths. In particular, the interventions had a strong theoretical basis, were based on an extensive programme of formative research, and were tested using a full-factorial design. These features provided a strong framework in which to test the hypothesis that combining a motivational intervention (i.e., messages targeting TPB constructs) and a volitional intervention (i.e., if-then plans to avoid binge drinking) would reduce the frequency of binge drinking in new university students. However, the present study

also has a number of limitations that should be noted. First, emails were sent to all new university students at the participating university, but only 12% clicked on the link to the study. The relatively low uptake rate may have introduced some selection biases which, in turn, may limit the generalisability of the current findings. Interestingly, Norman et al. (2018) reported that 55% of students clicked on the link to their study when the recruitment email was sent to students one month *before* they started university. This may therefore represent a "teachable moment" (Lawson & Flocke, 2009) when students are more receptive to receiving health-risk information about life at university. However, this point needs to be balanced against the possibility that delivering planning interventions at this time may be less effective as students will not have had experience of the high-risk situations that they are likely to encounter at university and how to deal with them.

Second, only approximately half of the baseline sample completed the one-month follow-up questionnaire, in line with other studies of online alcohol interventions with students (Hagger, Lonsdale, & Chatzisarantis, 2012; Norman et al., 2018). Nonetheless, attrition analyses revealed that there were no significant differences between those who were lost to follow-up versus those who completed the follow-up questionnaire in terms of baseline alcohol consumption, beliefs about binge drinking or experimental condition. In addition, an intention-to-treat analysis produced unchanged findings. Nonetheless, the low retention rate limits the generalizability of the findings highlighting the need for research on how to increase retention in online studies.

Third, the use of a self-report measure of alcohol consumption may have introduced self-presentation biases and the focus on typical alcohol consumption on each day of the week over the previous month may have increased recall biases. However, Del Boco and Noll's (2000) review concluded that self-report measures can provide accurate estimates of alcohol consumption, and the one-month time frame allowed for any anomalous fluctuations in weekly drinking. Moreover, objective measures of alcohol consumption, including biochemical

markers, have their own limitations including cost, time and invasiveness, which may reduce uptake and introduce other biases. For example, Cameron et al. (2015) reported that only 8% of participants agreed to provide a hair sample for biochemical analysis.

Finally, the current study tested the effectiveness of a single TPB intervention in which the messages targeted three key beliefs that had been identified in prior formative research (Epton et al., 2015). Ideally, separate manipulations of attitudes, subjective norms and perceived behavioural control should be tested for their effects on intention (Sniehotta, Presseau, & Araújo-Soares, 2014), although the development of such theoretically pure manipulations may be difficult given the strong correlations (i.e., overlap) between TPB constructs.

Conclusions

The present study demonstrates that a brief online intervention delivered to students as they enter university may help to reduce the frequency of heavy episodic drinking. Messages targeting TPB constructs were found to reduce students' intentions to engage in binge drinking and a per protocol analysis revealed that participants who formed an implementation intention engaged in binge drinking less frequently at follow-up than participants who were not instructed to form an implementation intention. The effect size for instructions to form implementation intentions on binge drinking (d = 0.15), though small, is larger than the average effect sizes on heavy episodic drinking reported for alcohol interventions in first year university students (d_+ = 0.07; Scott-Sheldon et al., 2014) and for online alcohol interventions (d_+ = 0.07; Black et al., 2016). Finally, future research could consider decoupling the timing of motivational and volitional interventions so that messages targeting TPB constructs are delivered to students before they start university, when they may be more receptive of health behaviour interventions, and instructions to form implementation intentions are delivered when students are established at university, when they may be more knowledgeable of high-risk drinking situations and how to deal with them.

Footnotes

1. In the UK, binge drinking is defined as consuming 6/8 or more units of alcohol in a single session for women/men. A unit of alcohol is equivalent to 8 grams of pure alcohol. In the USA, binge drinking is defined as consuming 4/5 or more standard drinks in a row for women/men. A standard drink is equivalent to 14 grams of pure alcohol.

2. Three additional items, rated on 7-point response scales, were included to assess the extent to which participants endorsed the three beliefs targeted by the messages. Participants who received the messages reported weaker beliefs that binge drinking would be fun, $F(1, 402) = 3.99$, $p = .047$, stronger beliefs that binge drinking would have a negative impact on their studies, $F(1, 402) = 10.46$, $p = .001$, and weaker beliefs that they would engage in binge drinking if their friends were, $F(1, 402) = 4.22$, $p = .04$, than participants who did not receive the messages.

3. Participants also completed the measures of cognitions about binge drinking at one-month follow-up. The multivariate main effect of the messages condition on cognitions about binge drinking was significant at one-month follow-up, $F(7,185) = 2.33$, $p = .03$. Univariate F tests revealed that the main effect of the messages condition on measures of affective attitudes, $F(1,191) = 3.94$, $p = .049$, descriptive norms, $F(1,191) = 8.20$, $p = .005$, and self-efficacy, $F(1,191) = 5.67$, $p = .02$, were significant, whereas the effect on intention was non-significant, $F(1,191) = 1.02$, $p = .31$. In addition, the effect of the messages condition on the belief that binge drinking would be fun was also significant, $F(1,191) = 3.24$, $p = .02$, whereas the effect on beliefs that binge drinking would have a negative impact on their studies, $F(1,191) = 1.46$, $p = .23$, and the likelihood that they would engage in binge drinking if their friends were, $F(1,191) = 1.20$, $p = .28$, were non-significant.

4. Given the relatively high level of attrition between baseline and one-month follow-up, an intention-to-treat analysis was also conducted using last observation carried forward from baseline. The findings were unchanged. The main effects of the message condition, $F(1, 400) =$

0.004, $p = .95$, $d = 0.01$, and the implementation intentions condition, $F(1, 400) = 2.96$, $p = .09$, $d = 0.06$, were non-significant, as was the interaction between the two conditions, $F(1, 400) = 0.03$, $p = .86$.

5. Participants were also followed-up after six months to complete the measures of alcohol consumption and cognitions again. Only 113 participants completed the six-month follow-up questionnaire (after the exclusion of three participants due to extreme levels of alcohol consumption), leading to small sample sizes in some cells (e.g., only 19 participants who received the messages and instructions to form implementation intentions completed the six-month follow-up measures). Analyses at this time point revealed that the multivariate main effect of the messages condition on cognitions about binge drinking was non-significant, as were the effects of the messages condition on the targeted beliefs. The main effects of the message and implementation intentions condition, as well as their interaction, on the frequency of binge drinking were also non-significant.

References

Ajzen, I. (1988). *Attitudes, personality and behavior.* Milton Keynes: Open University Press.

Balakrishnan, R., Allender, S., Scarborough, P., Webster, P., & Rayner M. (2009). The burden of alcohol-related ill health in the United Kingdom. *Journal of Public Health, 31*, 366–373. doi: 10.1093/pubmed/fdp051

Booth A., Meier, P, Shapland, J., Wong, R., & Paisley, S. (2010). Alcohol pricing and criminal harm: A rapid evidence assessment of the published research literature. http://www.homeoffice.gov.uk/publications/alcohol-drugs/alcohol/alcohol-pricing/rapid-evidence-assessment/ Accessed 24 August 2018.

Black, N., Mullan, B., & Sharpe, L. (2016). Computer-delivered interventions for reducing alcohol consumption: Meta-analysis and meta-regression using behaviour change techniques and theory. *Health Psychology Review, 10*, 341-357. doi: 10.1080/17437199.2016.1168268

Cameron, D., Epton, T., Norman, P., Sheeran, P., Harris, P. R., Webb, T. L., … & Shah, I. (2015). A theory-based online health behaviour intervention for new university students (U@Uni:LifeGuide): Results from a repeat randomised controlled trial. *BMC Trials, 16*, 555. doi: 10.1186/s13063-015-1092-4

Carpenter, R., Fishlock, A., Mulroy, A., Oxley, B., Russell, K., Salter, C., et al. (2008). After 'Unit 1421': An exploratory study into female students' attitudes and behaviours towards binge drinking at Leeds University. *Journal of Public Health, 30*, 8-13. doi:10.1093/pubmed/fdm083

Colby, S.M., Colby, J.J., & Raymond, G.A. (2009). College versus the real world: Student perceptions and implications for understanding heavy drinking among college students. *Addictive Behaviors, 34*, 17-27. doi:10.1016/j.addbeh.2008.07.023

Conner, M., & Sparks. P. (2015). Theory of planned behaviour and the reasoned action approach. In M. Conner & P. Norman (Eds.), *Predicting and changing health*

behaviour: Research and practice with social cognition models (3rd ed.) (pp. 142-188). Buckingham: Open University Press.

Conner, M. T., Sandberg, T, & Norman, P. (2010). Using action planning to promote exercise behavior. *Annals of Behavioral Medicine, 40*, 65-76.

Cooke, R., Dahdah, M., Norman, P., & French, D. (2016). How well does the theory of planned behaviour predict alcohol consumption? A systematic review and meta-analysis. *Health Psychology Review, 10*, 128-167. doi: 10.1080/17437199.2014.947547

Cooke, R., Sniehotta, F., & Schüz, B. (2007). Predicting binge-drinking behaviour using an extended TPB: Examining the impact of anticipated regret and descriptive norms. *Alcohol and Alcoholism, 42*, 84-91. doi: 10.1093/alcalc/agl115

de Bruijn, G-J., Rhodes, R. E., & van Osch, L. (2012). Does action planning moderate the intention-habit interaction in the exercise domain? A three-way interaction analysis investigation. *Journal of Behavioral Medicine, 35*, 509–519. doi: 10.1007/s10865-011-9380-2

Del Boca, F. K., & Noll, J. A. (2000). Truth or consequences: The validity of self-report data in health services research on addictions. *Addiction, 95(Suppl. 3)*, S347-S360.

Donkin, L., Christensen, H., Naismith, S.L., Neal, B., Hickie, I.B., & Glozier, N. (2011). A systematic review of the impact of adherence on the effectiveness of e-therapies. *Journal of Medical Internet Research*, *13*, e52. doi: 10.2196/jmir.1772

Drinkaware. (2017). Unit & calorie calculator. https://www.drinkaware.co.uk/understand-your-drinking/unit-calculator/ Accessed 20 November 2017.

Eisinga, R., Grotenhuis, M., & Pelzer, B. (2013). The reliability of a two-item scale: Pearson, Cronbach, or Spearman-Brown? *International Journal of Public Health, 58*, 637–642. doi: 10.1007/s00038-012-0416-3

Epton, T., Norman, P., Harris, P., Webb, T. L., Snowsill, A., & Sheeran, P. (2015). Development of theory-based health messages: Three-phase programme of formative

research. *Health Promotion International*, *30,* 756-768. doi:10.1093/heapro/dau005

Fishbein, M., & Ajzen, I. (2010). *Predicting and changing behavior: The reasoned action approach.* New York, NY: Psychology Press.

Fromme, K., Corbin, W. R., & Kruse, M. I. (2008). Behavioral risks during the transition from high school to college. *Developmental Psychology, 44*, 1497–1504. doi:10.1037/a0012614

Gaston, A., & Prapavessis, H. (2014). Using a combined protection motivation theory and health action process approach intervention to promote exercise during pregnancy. *Journal of Behavioral Medicine, 37*, 173-184. doi: 10.1007/s10865-012-9477-2

Gill, J. S. (2002). Reported levels of alcohol consumption and binge drinking within the UK undergraduate student population over the last 25 years. *Alcohol and Alcoholism, 37*, 109-20.

Gollwizer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, *29*, 971-979. doi:10.1037/0003-066X.54.7.493

Gollwitzer, P. M., & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology, 38*. 69-119. doi:10.1013/S0065-2601(06)38002-1

Hagger, M., Anderson, M., Kyriakaki, M., & Darkings, S. (2007). Aspects of identity and their influence on intentional behavior: Comparing effects for three health behaviors. *Personality and Individual Differences, 42*, 355-367. doi: 10.1016/j.paid.2006.07.017

Hagger, M., Lonsdale, A., & Chatzisarantis, N .L. D. (2012). A theory-based intervention to reduce alcohol drinking in excess of guideline limits among undergraduate students. *British Journal of Health Psychology, 17*, 18-43. doi: 10.1111/j.2044-8287.2010.02011

Hagger, M.S., Lonsdale, A., Koka, A., Hein, V., Pasi, H., Lintunen, T., & Chatzisarantis, N. L. D. (2012). An intervention to reduce alcohol consumption in undergraduate students using implementation intentions and mental simulations: A cross-national study.

International Journal of Behavioral Medicine, 19, 82-96. doi:10.1007/s12529-011-9163-8

Hayes, A. F. (2013). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York: Guilford Press.

Heckhausen, H., & Gollwitzer, P. M. (1987). Thought contents and cognitive functioning in motivational versus volitional states of mind. *Motivation and Emotion, l1*, 101-120.

Hyde, M., & White, K. M. (2013). A test of three interventions to promote people's communication of their consent for organ donation. *Psychology & Health, 28,* 399-417. doi: 10.1080/08870446.2012.731060

Joffe, A., Radius, S., & Gall, M. (1988). Health counselling for adolescents. *Pediatrics, 82,* 481-485.

Johnston, K. L., & White, K. M. (2003). Binge drinking: A test of the role of group norms in the theory of planned behaviour. *Psychology and Health, 18*, 63-77. doi: 10.1080/0887044021000037835

Karimi-Shahanjarini, A., Rashidian, A., Omidvar, N., & Majdzadeh, R. (2013). Assessing and comparing the short-term effects of TPB only and TPB plus implementation intentions interventions on snacking behavior in Iranian adolescent girls: A cluster randomized trial. *American Journal of Health Promotion*, 27, 152-161. doi: 10.4278/ajhp.110311-QUAN-113

Kelders, S.M., Kok, R.N., Ossebaard, H.C., & van Gemert-Pijnen, J.E.W.C. (2012). Persuasive system design does matter: A systematic review of adherence to web-based interventions. *Journal of Medical Internet Research*, *14*, e152. doi: 10.2196/jmir.2104

Koka, A., & Hagger, M. S. (2017). A brief intervention to increase physical activity behavior among adolescents using mental simulations and action planning. *Psychology, Health & Medicine, 22*, 701-710. doi: 10.1080/13548506.2016.1211298

Kuntsche, E., Kuntsche, S., Thrul, J., & Gmel, G. (2017). Binge drinking: Health impact,

prevalence, correlates, and interventions. *Psychology & Health, 32,* 976-1017. doi: 10.1080/08870446.2017.1325889

Lawson, P. J., & Flocke, S. A. (2009). Teachable moments for health behavior change: A concept analysis. *Patient Education and Counseling, 76*, 25-30. doi: 10.1016/j.pec.2008.11.002

Lippke, S., Ziegelmann, J. P., & Schwarzer, R. (2004). Initiation and maintenance of physical exercise: Stage-specific effects of a planning intervention. *Research in Sports Medicine, 12*, 221-240. doi: 10.1080/15438620490497567

McEachan, R. R. C., Conner, M., Taylor, N. J., & Lawton, R. J. (2011). Prospective prediction of health-related behaviours with the Theory of Planned Behaviour: A meta-analysis. *Health Psychology Review, 5*, 97-144. doi: 10.1080/17437199.2010.521684

McEachan, R., Taylor, N., Harrison, R., Lawton, R., Gardner, P., & Conner. M. (2016). Meta-analysis of the reasoned action approach (RAA) to understanding health behaviors. *Annals of Behavioral Medicine. 50,* 592-612. doi: 10.1007/s12160-016-9798-4

Meslot, C., Gauchet, A., Allenet, B., Francois, O., & Hagger, M. S. (2016). Theory-based interventions combining mental simulation and planning techniques to improve physical activity: Null results from two randomized controlled trials. *Frontiers in Psychology, 7,* 1789. doi: 10.3389/fpsyg.2016.01789

Murgraff, V., Abraham, C., & McDermot, M. (2007). Reducing Friday alcohol consumption among moderate, women drinkers: Evaluation of a brief evidence-based intervention. *Alcohol and Alcoholism, 42*, 37-41. doi:10.1093/alcalc/ag1083

Murgraff, V., White, D., & Phillips, K. (1996). Moderating binge drinking: It is possible to change behaviour if you plan it in advance. *Alcohol and Alcoholism, 31*, 577-582.

Naimi, T. S., Brewer, R. D., Mokdad, A., Denny, C., Sredula, M. K., & Marks, J.S. (2003). Binge drinking among U.S. adults. *Journal of the American Medical Association, 289*, 70-75. doi:10.1001/jama.289.1.70

National Health Service. (2014). *Binge drinking*. http://www.nhs.uk/Livewell/alcohol/Pages/Bingedrinking.aspx/ Accessed 20 November 2017.

Norman, P. (2011). The theory of planned behaviour and binge drinking among undergraduate students: Assessing the impact of habit strength. *Addictive Behaviors, 36*, 502-507. doi:10.1016/j.addbeh.2011.01.025

Norman, P., Armitage, C. J., & Quigley, C. (2007). The theory of planned behavior and binge drinking: Assessing the impact of binge drinker prototypes. *Addictive Behaviors, 32,* 1753-1768. doi:10.1016/j.addbeh.2006.12.009

Norman, P., & Conner, M. (2006). The theory of planned behaviour and binge drinking: Assessing the moderating role of past behaviour within the theory of planned behaviour. *British Journal of Health Psychology, 11*, 55-70.

Norman, P., Conner, M., & Stride, C.B. (2012). Reasons for binge drinking among undergraduate students: An application of behavioural reasoning theory. *British Journal of Health Psychology, 17*, 682-698. doi:10.1111/j.2044-8287.2012.02065.x

Norman, P., & Wrona-Clarke, A. (2016). Combining self-affirmation and implementation intentions to reduce heavy episodic drinking in university students. *Psychology of Addictive Behaviors, 30*, 434-441. doi: 10.1037/adb0000144

Norman, P., Cameron, D., Epton, T., Webb, T. L., Harris, P. R., Millings, A., & Sheeran, P. (2018). A randomised controlled trial of a brief online intervention to reduce alcohol consumption in new university students: Combining self-affirmation, theory of planned behaviour messages, and implementation intentions. *British Journal of Health Psychology, 23,* 108-127. doi: 10.1111/bjhp.12277

Orbell, S., Hodgkins, S., & Sheeran, P. (1997). Implementation intentions and the theory of planned behavior, *Personality and Social Psychology Bulletin, 23*, 945–54. doi: 10.1177/0146167297239004

Patrick, M. E., & Terry-McElrath, Y. M. (2017). High-intensity drinking by underage young

adults in the United States. *Addiction, 112*, 82–93. doi: 10.1111/add.13556

Prestwich, A., Ayres, K., & Lawton, R. (2008). Crossing two types of implementation intentions with a protection motivation intervention for the reduction of saturated fat intake: A randomized trial. *Social Science and Medicine, 67*, 1550-1558. doi:10.1016/j.socscimed.2008.07.019

Prestwich, A., Lawton, R., & Conner, M. (2003). Use of implementation intentions and the decision balance sheet in promoting exercise behaviour. *Psychology and Health, 18*, 707-721. doi: 10.1080/08870440310001594493

Public Health England. (2017). Treatment outcomes and effectiveness: Treatment outcomes profile (TOP). http://www.nta.nhs.uk/top-brief.aspx/ Accessed 20 November 2017.

Rogers, R. W. (1983). Cognitive and physiological processes in fear appeals and attitude change: a revised theory of protection motivation. In B. L. Cacioppo & L. L. Petty (Eds.), *Social psychophysiology: A sourcebook* (pp. 153-176). London: Guildford.

Scholz, U., Schüz, B., Ziegelmann, J. P., Lippke, S., & Schwarzer, R. (2008). Beyond behavioural intentions: Planning mediates between intentions and physical activity. *British Journal of Health Psychology, 13*, 479-494. doi: 10.1348/135910707X216062

Schwarzer, R. (1992). Self-efficacy in the adoption and maintenance of health behaviors: Theoretical approaches and a new model. In R. Schwarzer (Ed.), *Self-efficacy: Thought control of action* (pp. 217-243). Washington, DC: Hemisphere.

Schwarzer, R., Schuz, B., Ziegelmann, J. P., Lippke, S., Luszczynska, A., & Scholz, U. (2007). Adoption and maintenance of four health behaviors: Theory-guided longitudinal studies on dental flossing, seat belt use, dietary behavior, and physical activity. *Annals of Behavioral Medicine, 33*, 156-166. doi: 10.1080/08836610701308221

Scott-Sheldon, L. A. J., Carey, K. B., Elliot, J. C., Garey, L., & Carey, M. P. (2014). Efficacy of alcohol interventions for first-year college students: A meta-analytic review of randomized controlled trials. *Journal of Consulting and Clinical Psychology, 82,* 177-

188. doi: 10.1037/a0035192

Sheeran, P., & Silverman, M. (2003). Evaluation of three interventions to promote workplace health and safety: Evidence for the utility of implementation intentions. *Social Science and Medicine*, *56*, 2153-2163. doi: 10.1016/S0277-9536(02)00220-4

Sheeran, P., & Webb, T. L. (2016). The intention-behaviour gap. *Social and Personality Psychology Compass, 10*, 503-518. doi: 10.1111/spc3.12265

Sheeran, P., Maki, A., Montanaro, E., Avishai-Yitshak, A., Bryan, A., Klein, W. M. P., … & Rothman, A. J. (2016). The impact of changing attitudes, norms, and self-efficacy on health-related intentions and behavior: A meta-analysis. *Health Psychology, 35*, 1178-1188. doi: 10.1037/hea0000387

Sheeran, P., Milne, S., Webb, T. L., & Gollwitzer, P. M. (2005). Implementation intentions and health behaviour. In M. Conner & P. Norman (Eds.), *Predicting health behaviour: Research and practice with social cognition models* (2nd Ed.) (pp. 276-323). Buckingham: Open University Press.

Sheeran, P., Webb, T. L., & Gollwitzer, P. M. (2005). The interplay between goal intentions and implementation intentions. *Personality and Social Psychology Bulletin, 31*, 87–98. doi: 10.1177/0146167204271308

Sniehotta, F., Presseau, J., & Araújo-Soares, V. (2014). Time to retire the theory of planned behaviour. *Health Psychology Review, 8*, 1-7. doi: 10.1080/17437199.2013.869710

Sniehotta, F. F., Scholz, U., & Schwarzer, R. (2005). Bridging the intention–behaviour gap: Planning, self-efficacy, and action control in the adoption and maintenance of physical exercise. *Psychology & Health*, 20, 143-160. doi: 10.1080/08870440512331317670

Substance Abuse and Mental Health Services Administration. (2015). *National survey on drug use and health (NSDUH)*. https://www.samhsa.gov/data/sites/default/files/NSDUH-DetTabs-2015/NSDUH-DetTabs-2015/NSDUH-DetTabs-2015.htm#tab6-84b. Accessed 24 August 2018.

Sugarman, D. E., & Carey, K. B. (2009). Drink less or drink slower: The effects of instruction on alcohol consumption and drinking control strategy use. *Psychology of Addictive Behaviors, 23*, 577–585. doi:10.1037/a0016580

van Dulmen, S., Sluijs, E., van Dijk, L., de Ridder, D., Heerdink, R., & Bensing, J. (2007). Patient adherence to medical treatment: A review of reviews. *BMC Health Services Research, 7*, 55. doi:10.1186/1472-6963-7-55

van Osch, L., Reubsaet, A., Lechner, L., Candel, M., Mercken, L., & de Vries, H. (2008). Predicting parental sunscreen use: Disentangling the role of action planning in the intention–behavior relationship. *Psychology & Health, 23*, 829-847. doi: 10.1080/08870440701596577

Webb, T .L., & Sheeran, P. (2006) Does changing behavioural intentions engender behavior change? A meta-analysis of experimental evidence. *Psychological Bulletin, 132*, 249-268. doi: 10.1037/0033-2909.132.2.249

Webb, T. L., Joseph, J., Yardley, L., & Michie, S. (2010). Using the internet to promote health behavior change: A systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of Medical Internet Research, 12,* e4. doi:10.2196/jmir.1376

Wiedemann, A. U., Schüz, B., Sniehotta, F., Scholz, U., & Schwarzer, R. (2009). Disentangling the relation between intentions, planning, and behaviour: A moderated mediation analysis. *Psychology & Health, 24*, 67-79, doi: 10.1080/08870440801958214

Zhang, Y., & Cooke, R. (2012). Using a combined motivational and volitional intervention to promote exercise and healthy dietary behaviour among undergraduates. *Diabetes Research and Clinical Practice, 95*, 215-223. doi: 10.1016/j.diabres.2011.10.006

Table 1

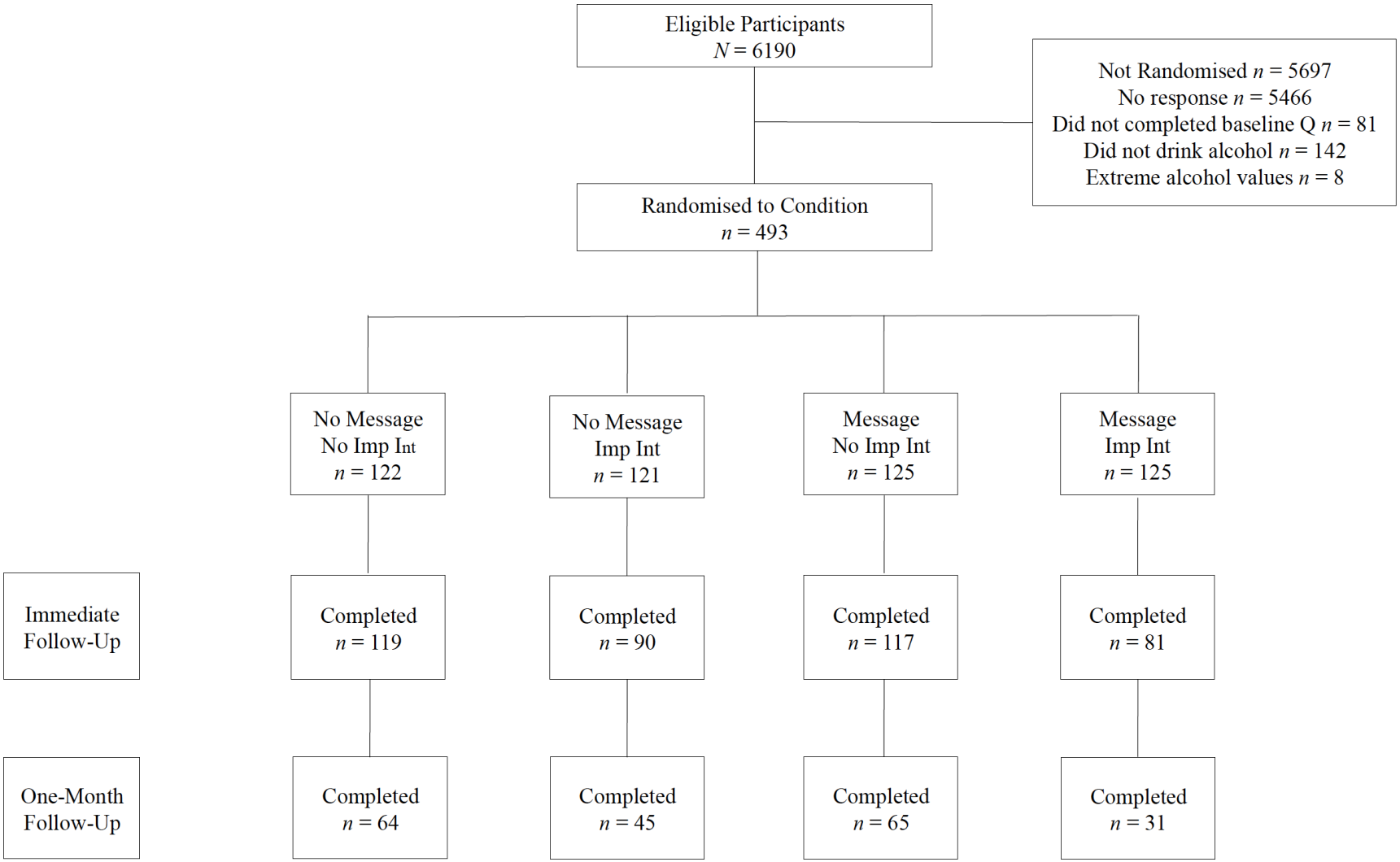
Cognitions about Binge Drinking Assessed Immediately Post-Intervention by Message Condition

	No Message *Mean (SD)*	Message *Mean (SD)*
Intention	3.95 (2.07)	3.30 (1.92)
Affective Attitude	3.80 (1.84)	3.22 (1.75)
Cognitive Attitude	2.63 (1.27)	2.42 (1.19)
Subjective Norm	3.42 (1.56)	3.14 (1.54)
Descriptive Norm	5.31 (0.98)	4.80 (1.25)
Self-Efficacy	6.13 (1.21)	5.61 (1.58)
Perceived Control	6.03 (1.24)	6.19 (1.15)

Table 2

Frequency of Binge Drinking at One-Month Follow-Up by Condition Controlling for Baseline Binge Drinking

	No Message *Mean (SE)*	Message *Mean (SE)*	Total *Mean (SE)*
No Implementation Intentions	1.06 (0.10)	1.00 (0.10)	1.03 (0.07)
Implementation Intentions	0.86 (0.12)	0.79 (0.14)	0.82 (0.09)
Total	0.96 (0.08)	0.89 (0.08)	0.93 (0.06)

Figure 1

Flow of Participants Through the Experiment