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Reducing Alcohol Consumption during Pre-Drinking Sessions: Testing an Integrated Behaviour-Change Model

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Abstract

Objective: Pre-drinking, the practice of consuming alcohol prior to attending a subsequent event, increases the risk of alcohol-related harm, and is common in undergraduate student populations. The current study tested an integrated behaviour change model to identify the motivational, social-cognitive, and implicit predictors of pre-drinking.

Design: University students (N = 289) completed an online questionnaire comprising measures of motivational and social-cognitive constructs related to reducing pre-drinking alcohol consumption and past behaviour, and an implicit association test for drinking identity. Participants reported their pre-drinking alcohol consumption at follow-up, four weeks from baseline.

Main Outcome Measures: Self-reported pre-drinking alcohol consumption.

Results: A variance-based structural equation model revealed that few model hypotheses were supported. Although the effects of past behaviour, perceived behavioural control, and implicit drinking identity, on follow-up pre-drinking alcohol consumption were statistically significant, the effect of intention was not.

Conclusion: Current findings indicate pre-drinking alcohol consumption is associated with past behaviour, perceived behavioural control, and implicit drinking identity, and not intentions to reduce pre-drinking alcohol consumption. Finding raise questions over the validity of applying the integrated model in this context. Interventions should consider these factors and attempt to facilitate the formation of intentions that lead to subsequent behaviour.

Keywords: pre-drinking; alcohol; self-determination theory; theory of planned behaviour; dual-systems model

Introduction

Pre-drinking is defined as the consumption of alcohol prior to attending a subsequent event, where alcohol consumption often continues (Pedersen & LaBrie, 2007), and has been linked to greater risk of alcohol-related harm. Pre-drinkers have higher blood alcohol concentrations than those who do not pre-drink (Barry, Stellefson, Piazza-Gardner, Chaney, & Dodd, 2013). Further, approximately 25% of pre-drinkers report becoming unconscious during a pre-drinking session within the previous month (LaBrie, Hummer, Kenney, Lac, & Pedersen, 2011) and are also more likely to report experiencing violent incidents within the previous twelve months (Miller et al., 2015). Pre-drinking is prevalent in university student populations, which also have higher overall rates of excessive alcohol consumption compared to non-student populations (Burns et al., 2015; Hallett, McManus, Maycock, Smith, & Howat, 2014; Kypri, Cronin, & Wright, 2005). Research related to pre-drinking has generally focused on its prevalence, and relationship to alcohol-related harm (Miller et al., 2015; Wells, Graham, & Purcell, 2009), as well as understanding pre-drinkers' motives that reflect perceived practical and social benefits of engaging in pre-drinking (LaBrie, Hummer, Pedersen, Lac, & Chithambo, 2012). However, there appears to be a relative dearth of pre-drinking research that incorporates psychological theories of motivation and social cognition (Foster & Ferguson, 2013). For example, the theory of planned behaviour (Ajzen, 1991, 2015) has been widely applied to investigate excessive patterns of alcohol consumption in a wide range of settings (Cooke, Dahdah, Norman, & French, 2014). Research applying social psychological theories to predict health behaviour provide an evidence base of the factors and mechanisms that may inform the development of effective behaviour change interventions (Hamilton & Hagger, 2014).

Recently, Hagger and Chatzisarantis (2014) have proposed an integrated behaviour change model which represents recent developments in synthesising research findings from

two psychological theories: self-determination theory (Deci & Ryan, 1985), and the theory of planned behaviour (Ajzen, 1991). Self-determination theory concerns the quality of motivation in influencing behavioural engagement, whereby motivation exists on a continuum from more *controlled* (less self-determined) to *autonomous* (more self-determined) forms. Where controlled motivation refers to external regulations for engaging in behaviour (e.g., because of some extrinsic reward, or to avoid feelings of guilt or shame), autonomous motivation refers to more internal regulations (e.g., because of some intrinsically meaningful reward, or for enjoyment). The theory of planned behaviour states that *intention*, which reflects motivation to participate in future behavioural, is a direct predictor of behaviour, and is a function of three sets of belief-based evaluations – *attitude* towards engaging in the behaviour; the *subjective norm,* or perceived social influence related to behavioural engagement, and *perceived behavioural control*. Integration of these theories is based on their complementary explanations of behaviour and maximisation of parsimony (Hagger, 2014; Hagger & Chatzisarantis, 2009). Self-determination theory presents the motivational basis for behavioural engagement but does not clarify how motivation leads to action, whereas the theory of planned behaviour presents belief-based evaluations that influence intention (i.e., attitude, subjective norm, perceived behavioural control) but is not concerned with how these beliefs are formed. The result of integration is a framework where autonomous motivation influences attitude, subjective norm, and perceived behavioural control, which in turn influences intention. For example, an individual may consider reducing pre-drinking alcohol consumption for its valued benefits (e.g., health outcomes), then forming positive attitudes towards reducing future reductions in pre-drinking alcohol consumption (e.g., that doing so would be beneficial, or good), influencing their intentions accordingly. However, it is important to note that controlled motivation may be especially relevant to the formation of belief-based evaluations that underlie intentions to consume

alcohol (Chawla, Neighbors, Logan, Lewis, & Fossos, 2009; Knee & Neighbors, 2002). Similarly, an individual may have an external rationale for reducing pre-drinking alcohol consumption (e.g., a friend or family member wanting them to), which is associated with feelings of guilt or shame at the thought of failure to do so. The individual is, therefore, more likely to form beliefs consistent with this external rationale, which is consistent with the conceptualization of subjective norm as comprising external influences to act (e.g., people who are important to me would want me to reduce my pre-drinking alcohol consumption) and intention.

An important advancement of Hagger and Chatzisarantis' (2014) integrated behaviour change model is the incorporation of reflective and impulsive components from dual-systems theories (Hofmann, Friese, & Wiers, 2008; Strack & Deutsch, 2004). While a reflective, deliberative route incorporates an individual's motivation and social cognitions (e.g., autonomous motivation, attitude, intentions, subjective norms), an impulsive, non-conscious route to behaviour incorporates learned cue-response associations, typically measured using reaction-time-based tasks that infer associations beyond conscious awareness (Strack & Deutsch, 2004). Increasing evidence has shown that the impulsive system plays an important role in determining health behaviour, as more reflective psychological constructs, (e.g., from motivational and social cognition theories) are not ubiquitously influential (Hagger, 2016). A noted limitation of reflective constructs is demonstrated by research concerning intention-behaviour "gap", and issues with *inclined abstainers* (Orbell & Sheeran, 1998) – individuals who intend to act, yet do not do so. When intention is low, or shows modest prediction of behaviour, impulsive processes may override these intentions, or showing stronger prediction of behaviour (Hofmann, Friese, & Strack, 2009; Hofmann et al., 2008).

Caudwell and Hagger (2015) have previously applied a model based on the motivational sequence from the integration of self-determination theory and the theory of

planned behaviour premise, to predict students' intentions to engage in pre-drinking sessions. The authors found students' autonomous motivation towards engaging in pre-drinking were associated with their attitudes, and intentions, towards doing so in the next month. The integrated behaviour change model is broader in scope, in that it incorporates the influence of impulsive processes that are thought to operate outside the more reflective measures of motivational and social cognitive constructs. The aim of the present study was, therefore, to extend previous applications of the integrated behaviour change model to pre-drinking by incorporating implicit measures that capture impulsive processes to action in order to better understand reflective and impulsive constructs underlying individuals' pre-drinking alcohol consumption.

The present study will make a unique contribution to knowledge, as it is the first to apply a newly-proposed integrated model based on multiple theoretical perspectives on health behaviour to health behaviour, and is also the first to apply the model to pre-drinking behaviour, a pattern of alcohol consumption that has rarely been studied, particularly in studies adopting a theoretical approach. Given previous research which has revealed effects of explicit social cognitive, motivational and volitional constructs as well as implicit factors on alcohol consumption behaviour, application of an integrated behaviour change model may provide a more detailed account of the influence of these factors as they relate to pre-drinking. Specifically, the items for self-determination theory and the theory of planned behaviour constructs referred to reducing alcohol consumption behaviour over the following four-week period. This was to elucidate potential areas that might be targetable in health behavioural interventions in this population. A series of hypotheses were formulated based on the proposed relationships of the integrated behaviour change model and research from its component theories, presented in Figure 1.

We hypothesised that the paths between autonomous motivation and attitude, subjective norm, perceived behavioural control, and intention, would be statistically significant (H1). An individual that is autonomously motivated to reduce their pre-drinking alcohol consumption, will do so because the behaviour is consistent with their genuine sense of self, and something they would do out of their own choice or volition. They would likely to align their personal beliefs regarding future pre-drinking with these autonomous reasons. These beliefs are represented by the belief-based social cognitive constructs from the theory of planned behavior in the integrated behaviour change model. For example, the individual will likely hold positive attitudes consistent with their autonomous motives to reduce their pre-drinking alcohol consumption in the future (e.g., that it would be beneficial, useful, and positive). This relationship has been noted in previous research on binge drinking among university students (Hagger et al., 2012). Similarly, a relationship between autonomous motivation and subjective norm may reflect internalized support for reducing pre-drinking alcohol consumption stemming from important social referents (e.g., friends; Chawla et al., 2009). In addition, an individual that is autonomously motivated to reduce their pre-drinking alcohol consumption will tend to perceive a strong sense of agency to do so (Deci & Ryan, 1985), which may positively contribute to perceptions of behavioural control.

In relation to the effects of controlled motivation in the model, we proposed that paths from controlled motivation to attitude, subjective norm, perceived behavioural control, and intention, would be statistically significant (H2). Although controlled motives do not tend to be related to persistence with behavior over a long period of time, controlled motives can be effective in predicting behavior when external contingencies are present or salient. Previous research on controlled motivation and alcohol consumption has found individuals who exhibit controlled motives likely consume alcohol for reasons related to peer influence or self-esteem (Chawla, Neighbors, Logan, Lewis, & Fossos, 2009; Knee & Neighbors, 2002),

which may influence their intentions to do so in the future. We therefore predicted that controlled motivation would be related to subjective norms for reducing pre-drinking alcohol consumption (e.g., Knee & Neighbors, 2002). For example, an individual citing controlled motives for reducing pre-drinking would be motivated to avoid feelings of guilt or shame at the thought of failing to meet those expectations. The individual may therefore hold beliefs consistent with their controlled reasons for reducing their pre-drinking, such as beliefs that significant others expected them to reduce their pre-drinking, represented by the subjective norm construct (Ajzen, 1991). Similarly, these external rationales may lead the individual to perceive low levels of agency or control over their pre-drinking manifested in a negative relationship between controlled motivation and perceived behavioural control (i.e., high levels of controlled motivation would be associated with lower perceived control over the decision to pre-drink). this is consistent with research demonstrating that controlled forms of motivation may reflect a lack of satisfaction of the need for competence and, therefore, tend to be associated with lower perceived competence with respect to participating in the behaviour in future (Knee & Neighbors, 2002).

Consistent with the tenets of the theory of planned behaviour, we hypothesised significant paths between attitude, subjective norm, and perceived behavioural control, and intention (H_3), and between intention and perceived behavioural control, and pre-drinking alcohol consumption (H_4), where perceived behavioural control approximated actual control (Ajzen, 1991).

Finally, consistent with previous research demonstrating the influence of impulsive processes on health behaviour (Hofmann et al., 2008; Strack & Deutsch, 2004), we hypothesised that the path between implicit drinking identity and follow-up pre-drinking alcohol consumption would be statistically significant (H_5). The drinking identity implicit association test (IAT) (Lindgren et al., 2012) was selected as a measure of impulsive

processes. Scores on the test have been found to predict a range of alcohol-related outcomes (e.g., consumption, expenditure, and harm), an indication of the contribution of impulsive processes to alcohol consumption.

We also predicted a series of process-related mediation effects among constructs in our proposed model. We hypothesised that the effects of autonomous (H_6) and controlled (H_7) motivation on intention would be mediated by attitude, subjective norm, and perceived behavioural control. This would provide support for an integrated behaviour change model, in which individuals' beliefs with respect to future behavioral participation are aligned with their generalized motivational orientations from self-determination theory (Hagger & Chatisarantis, 2014). Consistent with previous research, we expected the indirect effects of controlled motivation on intention and behavior to be smaller relative to those of autonomous motivation (Hagger et al., 2011; Hagger. & Chatzisarantis, 2014).

Method

Participants

Participants were students recruited from two Australian universities. Students opting to participate in return for course credit and the study advertised on flyers displayed around campuses. Eligibility criteria were that participants had to be current drinkers, who had engaged in pre-drinking within the previous twelve months. The study was approved by respective university human research ethics committees. Participants were directed to a webpage providing information about the study, before proceeding to an electronic consent form that informed participants that clicking 'next' indicated they were providing consent to participate. The study was correlational in design, with participants completing theory-based and pre-drinking alcohol consumption measures at baseline, and invited via automated email

to complete the same pre-drinking alcohol consumption behavioural measures at follow-up, four weeks later.

Participants (total $N = 289$, 76.50% female, $M_{age} = 20.11$ years, $SD = 2.37$ years) were undergraduate students from Australian universities, in Western Australia ($n = 132$; 75.80% female; M age = 19.92, $SD_{age} = 2.74$ years) and Queensland ($n = 157$; 77.10% female; $M_{age} = 20.28$ years, $SD_{age} = 2.00$ years). Most of the participants identified as Caucasian Australian (Western Australian sample = 73.50%; Queensland sample = 79.00%) and the majority reporting consuming alcohol at least once a month (Western Australian sample = 87.10%; Queensland sample = 72.00%). Participants from Western Australia reported studying in the Faculty of Health Sciences (n = 117; 88.60%) with a small minority of participants studying on programmes from multiple faculties (n = 12; 9.10%), and other Faculties (n = 3; 3.10%). The majority of participants from Queensland reported studying in the Health Sciences faculty (n = 65; 41.40%), followed by students studying on programs in combined faculties (n = 36; 22.90%), the Arts, Education and Law faculty (26; 16.50%), and Sciences faculty (n = 16; 10.20%). There were no differences between the typical pre-drinking alcohol consumption of Western Australian ($M = 6.03$, $SD = 2.93$) and Queensland ($M = 5.80$, $SD = 4.35$) university students: $t(287) = .52$, $p = .605$, nor were there any differences between faculties in terms of the distributions of typical pre-drinking frequency (Western Australia: $\chi^2(3) = 4.01$, $p = .261$; Queensland: $\chi^2(6) = 3.97$, $p = .680$) or typical pre-drinking alcohol consumption (Western Australia: $\chi2(3) = 2.44$, p = .486; Queensland: $\chi2(7) = 3.01$, p = .798).

Measures

A complete list of measures in included in the Appendix (online supplementary materials).

Theory of planned behaviour constructs. Measures followed Ajzen's (2002) guidelines in relation to target, context, action and time (i.e., *reducing alcohol consumption during pre-drinking sessions over the next four weeks*), adapted from previous research (Caudwell & Hagger, 2015). Responses were made on six-point scales; scale anchors are provided in the Appendix. Five items were used to measure participants' attitudes towards reducing their pre-drinking over the next four weeks. Bipolar statements with a common stem (e.g., "*reducing my alcohol consumption during pre-drinking sessions over the next four weeks would be*…") were presented, with participants indicating their response (e.g., *bad – good*). Four items were used to measure subjective norm (e.g., "*People whose opinions I value would want me to reduce my alcohol consumption during pre-drinking sessions over the next four weeks*"). Four items were used to measure perceived behavioural control (e.g., "*Reducing my alcohol consumption during pre-drinking sessions over the next four weeks is up to me*"), and three items were used to measure intentions (e.g., "*I intend to reduce my pre-drinking alcohol consumption over the next four weeks*").

Self-determination theory constructs. Statements based on the perceived locus of causality scale and adapted for pre-drinking were used (see Caudwell & Hagger, 2015). Participants responded to a series of statements reflecting motivational regulations for reducing pre-drinking alcohol consumption. Statements reflecting identified regulation (e.g., "*I reduce my alcohol consumption during pre-drinking sessions because I value the benefits"*) and intrinsic motivation (e.g., "*It is enjoyable to reduce my alcohol consumption during pre-drinking sessions*") were used. Statements reflecting extrinsic motivation (e.g., "*I reduce my alcohol consumption during pre-drinking sessions because I will feel guilty or embarrassed if I do not*") and introjected regulation (e.g., "*I reduce my alcohol consumption during pre-drinking sessions because other people say I should*") were used to reflect

controlled motivation. Responses were provided on a four-point scales ranging from 1 (*not at all true*) to 4 (*very true*).

Implicit drinking identity. The drinking identity implicit association test (IAT) is a variation on the computerised implicit association test paradigm, which requires participants to sort word stimuli presented in the centre of the screen into corresponding categories, using specified keyboard commands corresponding to left (*e*) or right (*i*) sides of the screen. The task comprises seven blocks, each comprising twenty trials. Specifically, blocks comprise the categories *drinker* (i.e., *drink*, *drinker*, *drunk, partier*) and *non-drinker* (i.e., *abstain, abstainer*, *non-drinker*, *sober*); and/or the categories *me* (i.e., *me*, *mine*, *my*, *myself*) and *not me* (e.g., *theirs*, *them*, *they*, *others*). Blocks 1, 2, and 5 require the participant to sort word stimuli (e.g., *my*) into one of two categories (e.g., *me* or *not me*). Blocks 3 and 4, and 6 and 7, require the participant to sort word stimuli (e.g., *my* or *drunk*) into one of two paired categories (e.g., *drinker* + *me,* or *non-drinker* + *not me*). Blocks 6 and 7 differ from blocks 3 and 4, in that the side of the screen is switched for the *me* and *not me* categories. Response latencies for each trial are compared for blocks 3 and 4, and 6 and 7, revealing bias towards a certain category/attribute pairing (e.g., participants may take less time to sort words, and make fewer errors, in blocks where *drinker* + *me* and *non-drinker* and *not me* pairings are used). The resulting metric, termed a D-score (Greenwald, Nosek, & Banaji, 2003), is calculated based on a series of steps and established inclusion/exclusion criteria for trials and participants. Trials longer than 10,000*ms* are excluded from the calculation (i.e., they are too long to be considered accurate or implicit), and participants for whom more than 10% of trials exhibit a response latency *less* than 300*ms* are excluded (i.e., they are likely non-compliant). Positive D-scores indicate quicker associations with *drinker* + *me* pairings; negative scores indicate quicker associations to *drinker* + *not me* pairings. The IAT demonstrates strong internal consistency and test-retest reliability, and has been used in

university student samples (Lindgren, Foster, Westgate, & Neighbors, 2013; Lindgren, Neighbors, et al., 2016; Lindgren et al., 2012; Lindgren, Ramirez, Olin, & Neighbors, 2016; Ramirez, Dennhardt, Baldwin, Murphy, & Lindgren, 2016).

The IAT procedure was administered online, consistent with previous research (Caudwell & Hagger, 2014). Internal consistency reliability coefficients for the IAT were .42 for the Western Australian sample, and .50 for the Queensland sample, with the former coefficient slightly lower than those observed in previous research (Greenwald et al., 2003). [1]

Pre-drinking alcohol consumption. At baseline (past behaviour) and follow-up, participants reported the standard drinks[2] they had consumed during pre-drinking sessions per week, over the previous four weeks. Consistent with previous approaches, participants were shown a pictorial guide adapted from the National Health and Medical Research Council (NHMRC, 2009) to aid in their standard drink estimates (Black & Mullan, 2015; Caudwell & Hagger, 2015).

Analytic Method

We used partial least squares-based structural equation modelling (PLS-SEM) to test the hypothesised relationships in the integrated behaviour change model (see Figure 1). The PLS-SEM analysis comprises two models: a measurement, or outer model; and, a structural, or inner model (Hair, Hult, Ringle, & Sarstedt, 2013). The measurement model consists of the relationships between latent constructs (also termed latent variables) and their indicators – in this case, from the integrated theoretical model (i.e., questionnaire items), and is evaluated based on criteria associated with the reliability of indicators and their loadings on respective and other constructs. The structural model consists of relationships between variables (e.g.,

[1]Data on the number of participants whose IAT data was excluded due to not meeting the screening criteria is not available due to a software error.
[2]A 'standard drink' differs between countries. In Australia, a standard drink is a beverage that contains 10g of ethanol, compared to 14g in the United States, and 8g in the United Kingdom (Furtwaengler & Visser, 2013).

Figure 1), represented by standardised path coefficients (β), associated statistical significance values (p), and effect sizes (f^2), and is evaluated by observing a range of metrics related to the suitability of the model in predicting variance in endogenous, or dependent variables (Kock, 2015).

Variance-based structural equation modelling was selected as it is a distribution-free modelling method (i.e., data need not meet distributional assumptions), making it adequate for use with alcohol consumption data (Hair, Ringle, & Sarstedt, 2011; Neal & Simons, 2007). Results of PLS-SEM analyses are similar to covariance-based approaches, and are considered well-suited to theory testing and applications in psychological research (Hair et al., 2013; Willaby, Costa, Burns, MacCann, & Roberts, 2015). Further, mediation analyses can be conducted in PLS-SEM by isolating the path of interest, and comparing the indirect and total effects (Kock, 2015). Using this method, a significant indirect and total effect is indicative of partial mediation, and a significant indirect and total effect in the absence of a significant direct effect is indicative of complete mediation (Kock, 2011).

A series of criteria have been recommended to evaluate PLS-SEM analyses, related to the convergent and discriminant validity of the outer model, and the predictive relationships between latent variables in the inner model (Kock, 2015; Vinzi, Chin, Henseler, & Wang, 2010). To satisfy convergent validity, both Cronbach's alpha and composite reliability coefficients for each factor must exceed .70, and the average variance extracted (AVE) in each factor must exceed .50. To satisfy discriminant validity, the square root of the average variance extracted (√AVE) for each factor must exceed its correlation with other factors in the model (Fornell & Larcker, 1981). A resampling algorithm is recommended to increase the stability of path coefficients between variables, and reduce standard errors when estimating the model (Kock, 2015). It is also necessary that both the average block variance inflation factor (AVIF) and average full collinearity variance inflation factor (AFVIF) are less than or

equal to 3.30, indicating little influence of variable collinearity and multicollinearity (Kock, 2015). Finally, a suitable inner model comprises a statistically significant average path coefficient (APC) and adjusted average R^2 (AAR^2). A Goodness of Fit statistic (Tenenhaus, Amato, & Vinzi, 2004) has been developed for PLS-SEM, however its use and interpretation is subject to debate (Hair et al., 2013). Individual model hypotheses were tested via the evaluation of standardised path coefficients (β) between proposed constructs in the model and their associated effect size, analogous to Cohen's (1988) f^2 statistic (Kock, 2015), whereby effect sizes of .02, .15, and .35 are interpreted as small, medium, and large, respectively.

In terms of model specification, we assigned items to indicate each respective latent factor underlying the integrated model (e.g., the latent variable 'attitude' was indicated by the five attitude items). Attitude, subjective norm, perceived behavioural control, and intention factors, were indicated by their respective items in this way. The autonomous motivation factor was indicated by items measuring intrinsic motivation and identified regulation to reduce pre-drinking alcohol consumption, whereas the controlled motivation factor was indicated by items measuring extrinsic and introjected regulation to reduce pre-drinking alcohol consumption (Vansteenkiste, Simons, Lens, Sheldon, & Deci, 2004). Gender (coded as 1 = male, 2 = female), sample (coded as 1 = Western Australia, 2 = Queensland), age, and IAT D-score were estimated as single-item latent factors. The past behaviour (i.e., baseline pre-drinking alcohol consumption) and follow-up pre-drinking alcohol consumption factors were each indicated by four items representing pre-drinking alcohol consumption for the four weeks prior to baseline and follow-up. We controlled for baseline pre-drinking alcohol consumption, age, gender, and sample, by drawing paths from these factors to all other latent

factors in the model, consistent with previous approaches (Caudwell & Hagger, 2015; Kock, 2011)[3].

Results

Preliminary analyses

We conducted a preliminary analysis to detect the extent of bias across University samples in demographic and psychological measures. A one-way MANOVA revealed a statistically significant main effect for state on model variables, F (10, 265) = 5.325, $p < .001$; $\eta^2_p = .17$. Statistically significant differences were observed between averaged item means for autonomous motivation (Western Australia sample: $M = 1.81$, $SD = .61$; Queensland sample: $M = 2.00$, $SD = .76$; $F(1,274) = 4.72$, $p = .031$, $\eta^2_p = .02$), perceived behavioural control (Western Australia sample: $M = 5.19$, $SD = .73$; Queensland sample: $M = 5.62$, $SD = .51$; $F(1,274) = 33.24$, $p < .001$, $\eta^2_p = .11$), follow-up pre-drinking alcohol consumption (Western Australia sample: $M = 3.89$, $SD = 9.29$; Queensland sample: $M = 2.03$, $SD = 4.23$; $F(1,274) = 4.82$, $p = .029$, $\eta^2_p = .02$), and implicit drinking identity (Western Australia sample: $M = .36$, $SD = .44$; Queensland sample: $M = .24$, $SD = .45$, $F(1,274) = 5.03$, $p = .026$, $\eta^2_p = .02$), although the effect sizes for the differences were small. No significant gender differences between samples were observed, χ^2 (1) = .07; $p = .793$, nor were there differences in age between samples: $t(287) = -1.30$, $p = .194$.. Attrition analyses using averaged item scores from model variables indicated no difference between participants who dropped out (WA = 162, Qld = 81) or remained (WA = 132, Qld = 157) in the study: Western Australia sample: F (9,284) = 1.90, $p = .052$, $\eta^2_p = .06$; Queensland sample: F (9,228) = .95, $p = .487$, $\eta^2_p = .04$). The samples were combined for analyses with PLS-SEM; descriptive statistics for the pooled sample are included in Table 1.

[3]Relationships between control and model variables are available in the online supplementary materials

Model evaluation

Internal reliability and discriminant validity indices met the established criteria (see Table 1). Regarding internal reliability, Cronbach's alpha scores ranged from .74 to .98, composite reliability scores, based on the factor loadings, ranged from .84 to .99, and the AVE for each factor exceeded .50 (M_{AVE} = .68; SD_{AVE} = .14), indicating acceptable convergent validity. Regarding discriminant validity, √AVE for each factor exceeded that factor's correlation with other factors. The AVIF and AFVIF values were below the recommended cut-off value of 3.50 (Kock, 2015), indicating no issues with variable collinearity and multicolinearity. Both the APC (.11) and AAR^2 (.18) were statistically significant ($p < .001$), and the Tenenhaus Goodness of Fit (Tenenhaus et al., 2004) was .37 (large), indicating that the model represented good fit with these data. Overall, the model accounted for 47% of the variance in intention to reduce pre-drinking alcohol consumption, and 22% of the variance in pre-drinking alcohol consumption at follow-up.

Path coefficients

Figure 2 shows the statistically-significant direct path coefficients in the integrated behaviour change model, controlling for gender[4], sample (i.e., 1 = Western Australia; 2 = Queensland), and past behaviour. The path between autonomous motivation and attitude was statistically significant, with a medium effect size (β = .42, p <.001, f^2 = .20). Consistent with our hypothesis (H_1), paths between autonomous motivation and subjective norm (β = .18, p = 001, f^2 = .05), perceived behavioural control (β = .12, p = .019, f^2 = .03), and intention (β = .23, p = < .001, f^2 = .12) were statistically significant, all with small effect sizes. Paths from controlled motivation to subjective norm (β = .29 p < .001, f^2 = .11), perceived behavioural

[4]We tested whether the model paths and pattern of relationships hypothesised in the integrated behaviour change model differed by gender. Using Satterthwaite Approximation and pooled standard error approaches to compare the path coefficients from each model (Kock, 2014), we found no statistically significant differences.

control (β = -.23 $p < .001, f^2 = .07$), and intention (β = .12, $p = .022, f^2 = .05$) were statistically significant with small effect sizes. However, the path between controlled motivation and attitude was not statistically significant (β = .10, $p = .052, f^2 = .03$)[5]. Therefore, H_2 was supported for the effect of perceived control but not attitude. The path between attitude and intention was statistically significant, (β = .43 $p < .001, f^2 = .27$) with a medium effect size. However, the path between subjective norm and intention (β = .07 $p = .124, f^2 = .03$), and between perceived behavioural control and intention (β < .01, $p = .496, f^2 < .01$) were not statistically significant, so we rejected our hypothesis (H_3). The path between intention and pre-drinking behaviour was also not statistically significant (β = .03 $p = .296, f^2 < .01$)[6]. However, the path between perceived behavioural control and pre-drinking alcohol consumption was statistically significant (β = -.18 $p = <.001, f^2 = .04$), with a small effect size. We only found support for the effect for perceived behavioral control specified in our hypothesis (H_4). The path between implicit drinking identity and pre-drinking alcohol consumption was statistically significant, with a small effect size (β = .11 $p = .026, f^2 = .01$), providing support for H_5. It should be noted that the path from past behaviour to pre-drinking alcohol consumption was statistically significant, (β =.35, $p < .001, f^2 = .14$), with a small effect size.

Mediation analyses

[5]We tested a model excluding the 61 participants who reported consuming alcohol less than once a month (n = 228). Results revealed similar patterns of effects to the overall sample, with slightly larger Beta values associated with the PBC – PDAC (β = -.26, p < .001, $f^2 = .06$) and D – PDAC (β = .16, p = .009, $f^2 = .02$) paths. The effect of controlled motivation on attitude was also statistically significant (β = .11, p = .049, $f^2 = .04$), when it was not significant in the overall sample.
We also tested a model excluding the 52 participants who reported did not report consuming alcohol during pre-drinking sessions at baseline (n = 237). Results revealed similar patterns of effects to the overall sample, with the following differences: the controlled motivation – intention path was statistically non-significant (β = .03, p = .301 $f^2 = .01$); the subjective norm to intention path was statistically significant (β = .11, p = .037, $f^2 = .05$); autonomous motivation to PBC was statistically non-significant (β = .08, p = .098, $f^2 = .01$); and the controlled motivation – attitude was statistically significant (β = .14, p = .017, $f^2 = 05$) in this sample.
[6]The zero-order correlation between intention and behaviour was also non-significant ($r < .01, p = .956$)

Support for only one of the proposed mediation effects was found. The effect of autonomous motivation on intention was partially mediated by autonomous motivation (direct effect = .23, Cohen's f^2 = .12; p < .001; indirect effect = .18, Cohen's f^2 = .09, p = < .001; total effect = .47, Cohen's f^2 = .24; p < .001), with small-to-medium effect sizes, providing support for out hypothesis H_6. The remainder of the proposed mediation effects were not supported, as evidenced by non-significant direct effects (i.e., there was no effect to mediate), and/or non-significant indirect effects (i.e., the effect was not mediated). These results are presented in the Appendix.

Discussion

The aim of the present study was to test the motivational, explicit social cognitive, and implicit factors that influence intentions to reduce pre-drinking alcohol consumption and subsequent behaviour. We found limited support for the proposed relationships between constructs with the exception of the partial mediation of the effect of autonomous motivation on intention through attitude, and the direct effects from perceived behavioural control and implicit drinking identity to behaviour. The lack of an intention-behaviour relationship provides limited support for the integrated behaviour change model in predicting pre-drinking alcohol consumption (Ogden, 2003; Weinstein, 2007). However, results offer an important contribution to the understanding of the predictors of pre-drinking alcohol consumption, particularly the prominent role for implicit drinking identity. It also justifies our decision to adopt a model incorporating dual processes. Had we selected an approach based solely on social cognitive and motivational factors we would have failed to explain variance in pre-drinking beyond the effects of past behavior.

Results indicated significant positive associations between autonomous motivation and attitudes, subjective norm, and perceived behavioural control; and between controlled

motivation and subjective norm, indicating that individuals form these belief-based evaluations of reducing pre-drinking alcohol consumption consistent with their motivational orientations. The negative path from controlled motivation to perceived behavioural control indicates that individuals who exhibit more external rationales for reducing pre-drinking (e.g., "*because I would feel guilty or embarrassed if I do not*") likely experience low perceptions of control over engaging in such behaviour in the future. The relationships between autonomous and controlled motivation and perceived behavioural control may be explained by considering perceived behavioural control as comprising *self-efficacy* (e.g., "if I wanted to do X, I could") and *perceived controllability* (e.g., "How much control do you have over doing X?"; Armitage & Conner, 1999; Fishbein & Ajzen, 2011)[7]. Similarly, Cooke et al. (2014) demonstrated that the self-efficacy and perceived control components of perceived behavioural control, had different effects on alcohol consumption intentions and behaviour (i.e., self-efficacy was strongly correlated with intentions and behaviour related to engaging in alcohol consumption; whereas perceived control had small negative correlations with intentions and behaviour). The effects of autonomous and controlled motivation on perceived behavioural control may therefore relate to different but related aspects of the superordinate construct. For example, an individual with more controlled motives for reducing pre-drinking alcohol consumption may feel they have low perceived controllability over doing so, as they express external rationales for behavioural engagement. Conversely, an individual who is more autonomously motivated to reduce pre-drinking alcohol consumption may form beliefs consistent with self-efficacy (i.e., "If I wanted to reduce my pre-drinking alcohol consumption, I could"). Future research could further test these relations using distinct measures of perceived controllability and self-efficacy (Cooke et al., 2014).

[7]Fishbein and Ajzen (2011) refer to these constructs as *capacity* and *autonomy*, respectively.

The finding regarding the effect of autonomous motivation and attitudes on intentions to reduce pre-drinking alcohol consumption is consistent with previous research (Cooke et al., 2014; McEachan, Conner, Taylor, & Lawton, 2011). That the effect of autonomous motivation on intention was mediated by attitudes suggests that individuals believe that reducing pre-drinking alcohol consumption carries meaningful benefits that may form the basis of their intentions. However, that there was no statistically significant effect of intention on pre-drinking behaviour warrants further examination. Given the substantial effect of past behaviour (i.e., baseline pre-drinking alcohol consumption) on follow-up pre-drinking alcohol consumption, the proposed constructs in the integrated behaviour change model had relatively trivial effects on behaviour. This means that even if students held autonomous orientations and positive attitudes toward reducing pre-drinking, such motives were only related to precipitating intentions to reduce their pre-drinking alcohol consumption and not actual behaviour. Intentions were, therefore, do not seem to be implicated in students' participation to in pre-drinking. . The large effect of past behaviour on follow-up pre-drinking alcohol consumption isconsistent with previous meta-analytic research on alcohol consumption (Hagger, Chan, Protogerou, & Chatzisarantis, 2016), and seems to indicate that this behaviour is more to be under control of habitual (Hamilton, Kirkpatrick, Rebar, & Hagger, 2017) or likely non-conscious determinants (Hagger, 2016; Sheeran, Gollwitzer, & Bargh, 2013).

Individuals reporting high control over reducing pre-drinking alcohol consumption reported lower levels of pre-drinking alcohol consumption at follow-up. According to Ajzen (1991), this occurs when individuals have a high level of information regarding the behaviour, or when requirements or resources to perform the behaviour remain constant. In this case, individuals high in perceived behavioural control may be better able to access and use available information to form accurate control beliefs regarding reducing pre-drinking

alcohol consumption (e.g., the ability to refuse drinks, or plan reductions in advance; Hagger et al., 2012; Murgraff, White, & Phillips, 1996; Young, Connor, Ricciardelli, & Saunders, 2006). The effect of implicit drinking identity on follow-up pre-drinking alcohol consumption is consistent with Strack and Deutsch's (2004) proposal that impulsive processes activate previously-learned behavioural schemata – for example, seeing an alcoholic beverage activating the schema for pre-drinking. These processes influence behaviour independent of deliberative processes, such as intentions (Hofmann et al., 2008; Rebar et al., 2016). This suggests that pre-drinking alcohol consumption may be more related to impulsive processes (as represented by implicit drinking identity). A growing body of research in this area looks at evaluative conditioning and the impulsive system – utilising implicit constructs such as goals (Fishbach, Friedman, & Kruglanski, 2003), as well as attempts to correct and reduce the influence of these processes through training (Allom, Mullan, & Hagger, 2015; Bartsch, Mullan, & Houben, 2014; Black & Mullan, 2015; Houben, Havermans, & Wiers, 2010; Houben, Nederkoorn, Wiers, & Jansen, 2011). Given the results of this study, further research in this area is needed to develop interventions that target both the reflective and impulsive system. Such research should explore methods or strategies that would increase an individual's control over consuming alcohol within a pre-drinking environment, and, resist the contextual or environmental cues that trigger implicit associations that influence pre-drinking alcohol consumption (Hollands, Marteau, & Fletcher, 2016; Houben et al., 2011; Houben & Wiers, 2009; Ouellette & Wood, 1998; Papies, 2016).

Strengths, Limitations, and Future Research Directions

The present study has a number of strengths and limitations that warrant discussion. The application of the comprehensive integrated behaviour change model to an area of research that has tended to lack a theoretical approach, or focus on cognitive processes and mechanisms, represents a substantial contribution to the understanding of pre-drinking

behaviour. Although our correlational design does not provide strong evidence of causal links between variables, it highlights important relations between potentially manipulable psychological factors and pre-drinking behaviour that may provide some basic information to inform intervention development. For example, interventions may consider targeting both reflective and impulsive processes - by promoting control over pre-drinking, and reducing the influence of the impulsive system in determining behaviour (Hollands et al., 2016; Papies, 2016).

Results should also be interpreted in light of the accuracy of participant-reported alcohol consumption (White et al., 2005). Retrospective reports of alcohol consumption are often inaccurate, and tend to be underestimated (Monk, Heim, Qureshi, & Price, 2015). Although we attempted to facilitate participant reporting with a detailed, comprehensive pictorial guide (NHMRC, 2009), we cannot be certain that this increased participants' accuracy. In addition, a lack of correspondence between theory-based measures, and self-reported alcohol consumption may have attenuated the intention-behaviour relationship: the former referred to pre-drinking generally, and the latter to standard drinks consumed when pre-drinking. Future research may attempt to quantify pre-drinking alcohol consumption referred to in measures of psychological constructs to maximise correspondence, as has been done to some extent with binge or heavy episodic drinking studies previously (see Cooke et al., 2014). The context in which the theory of planned behaviour measures are completed should also be considered. Cooke and French (2011) demonstrated that completion location affected the relationship between social cognitive constructs and alcohol consumption. Research is increasingly looking towards measures of blood alcohol concentration and event-level assessment of alcohol consumption using smartphones (e.g., Barry et al., 2013; Kuntsche, Otten, & Labhart, 2015), and these approaches could benefit further research. It should also be noted that the internal consistency of the drinking identity implicit association

test was lower than typically observed (Greenwald et al., 2003), which may be the result of administering the test online. Research has found no differences in relations among drinking identity IAT, explicit measures of alcohol beliefs, and alcohol consumption for laboratory- and online-administered IAT measures (Houben & Wiers, 2008). However, the drinking identity IAT has yet to tested using these procedures.

While the association between the drinking identity IAT and pre-drinking behaviour within the integrated behaviour change model tested in the current study may serve to represent one component of the impulsive system – that is associations between alcohol consumption and personal identity likely constructed over repeated experiences with the behaviour over time – it does not capture the impulsive system explicitly. It may, therefore, be pertinent to test the effects of these associations in the context of other constructs that may represent the impulsive system. Such constructs may be behavioural prepotency or cue-behaviour associations. For example, an extension of temporal self-regulation theory (Hall & Fong, 2007) has been used to ascertain the influence of behavioural prepotency (i.e., past behaviour, habit, and cues to action) on excessive alcohol consumption (Black, Mullan, & Sharpe, 2017). In this augmented model, executive function was found to moderate the effect of intentions and behavioural prepotency on alcohol consumption behaviour. Further research that elucidates the conditions under which the impulsive system exerts its influence on behaviour is necessary to inform effective dual-systems interventions for reducing hazardous alcohol consumption behaviours.

Some discussion of the sample composition and demographic background in relation to study findings is warranted. The majority of the participants were female, studying mainly in health-related disciplines. Evidence for gender differences in relation to pre-drinking alcohol consumption is inconclusive, however may be influenced by context effects such as the absolute number of other pre-drinkers, the number of pre-drinkers from the opposite sex,

or the type of alcohol consumed (Hummer, Napper, Ehret, & LaBrie, 2013; Labhart, Wells, Graham, & Kuntsche, 2014; Ogeil et al., 2016). Differences in alcohol consumption behaviour between faculties of study have been noted, which may reduce the representativeness of the present sample to the university student population (Hallett, Howat, et al., 2014; Webb, Ashton, Kelly, & Kamali, 1997). Finally, the sample on average did not strongly intend to reduce their pre-drinking alcohol consumption, as indicated by the weak relationship between pre-drinking alcohol consumption and intention. Although we have no reason to believe that the low levels of intention and weak intention-behaviour relationship in the current study are not representative of the student population as a whole, it would be premature to reject the integrated model on the basis of these data alone. Replications of current findings in larger, more representative samples are warranted to corroborate current findings.

Conclusion

The present study tested an integrated behaviour change model in a pre-drinking context. Overall, we found little support for many of the relationships between motivational and social cognitive constructs, as well as their effects on pre-drinking alcohol consumption. Only the direct effects from perceived behavioural control and implicit drinking identity constructs on pre-drinking alcohol consumption at follow-up were significant, after controlling for past behaviour. This raises question over the applicability of the overall model in this behavioral context, although the non-conscious pathway yielded valuable data on the potential correlates of pre-drinking. We suggest that future research test relations between factors that might be related to non-conscious pathways including traits like self-control (Hagger et al., 2013), causality orientations (Deci & Ryan, 1985), habit (Hagger, Rebar, Mullan, Lipp, & Chatzisarantis, 2015), and affective components of attitudes (Lawton, Conner, & McEachan, 2009), and alongside drinking identity (Caudwell & Hagger, 2014).

Doing so may provide a better understanding of the psychological constructs that are influential in determining pre-drinking alcohol consumption, which may contribute to the development of behaviour change interventions to reduce pre-drinking behaviour that target both constructs of both the reflective and impulsive systems (e.g., Caudwell, Mullan, & Hagger, 2016).

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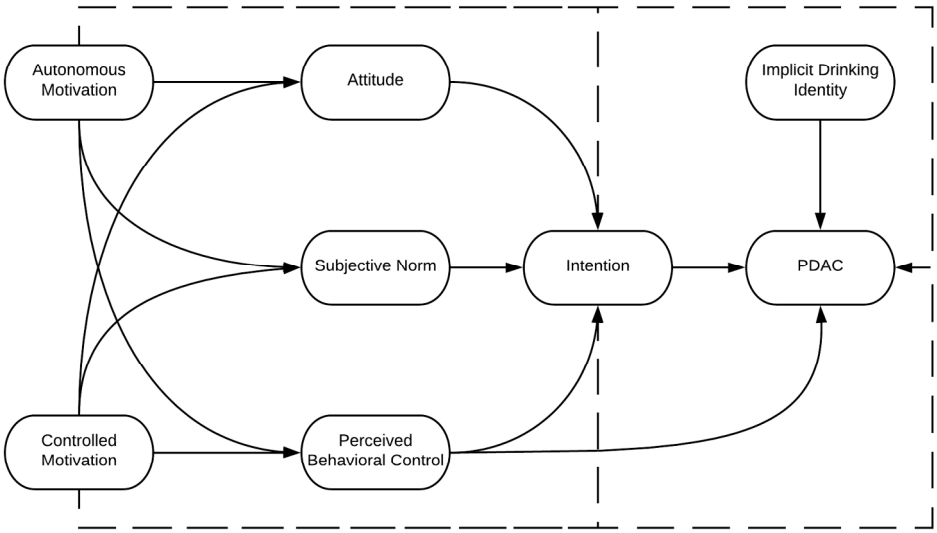

Figure 1. An integrated behaviour change model as applied to pre-drinking alcohol consumption (adapted from Hagger & Chatzisarantis, 2014). Dashed lines represent paths which are posited to be mediated by the hypothesised paths (e.g., autonomous motivation → attitude → intention). Past behaviour (i.e., baseline pre-drinking alcohol consumption) is omitted for clarity. *Note*. PDAC = follow-up pre-drinking alcohol consumption

Table 1. *Means, Standard Deviations, Model Evaluation Statistics, and Correlations between Latent Variables from in Integrated Behaviour Change Model*

	1. Sample	2. Gender	3. Age	4. PB	5. AM	6. CM	7. Att	8. SN	9. PBC	10. Int	11. D	12. PDAC
M	#	#	20.14	3.46	1.90	1.44	3.68	3.45	5.40	2.78	.29	2.67
SD	#	#	2.33	4.69	.70	.52	1.09	1.09	.64	1.43	.46	6.40
AVE	#	#	#	.60	.64	.50	.60	.75	.58	.96	#	.78
α	#	#	#	.77	.92	.86	.83	.89	.74	.98	#	.91
ρ	#	#	#	.85	.93	.89	.88	.92	.84	.99	#	.94
FCVIF	1.16	1.11	1.05	1.28	1.73	1.55	1.91	1.41	1.22	2.81	1.05	1.23
1.	#											
2.	.02	#										
3.	.08	#.02	#									
4.	#.08	#.10	#.12*	.77								
5.	.10	.03	.10	#.22**	.80							
6.	#.09	#.04	#.01	#.03	.44**	.71						
7.	#.05	.14*	.09	#.09	.46**	.30**	.78					
8.	#.10	#.01	#.02	.08	.26**	.38**	.44**	.87				
9.	.28**	.06	.09	#.13*	.01	#.26**	.04	#.05	.76			
10.	#.04	.14*	.02	#.01	.49**	.37**	.62**	.35**	<.01	.98		
11.	#.12*	#.04	#.08	.05	#.01	.11	.03	.10	#.02	.07	#	
12.	#.12*	#.16	#.10	.34**	#.08	.03	#.05	.02	#.18**	<#.01	.07	.89

Note. √AVE values are presented on the principal diagonal for variables with multiple indicators.
PB = past behaviour (i.e., baseline pre#drinking alcohol consumption); AM = autonomous motivation; CM = controlled motivation; Att = attitude; SN = subjective norm; PBC = perceived behavioural control; Int = intention; D = drinking identity implicit association test D#score; PDAC = follow#up pre#drinking alcohol consumption; α = Cronbach's alpha; ρ = composite reliability
*p <.05; **p < .01. For dichotomous variables Sample and Gender, 1 = Western Australia/male; 2 = Queensland/female.

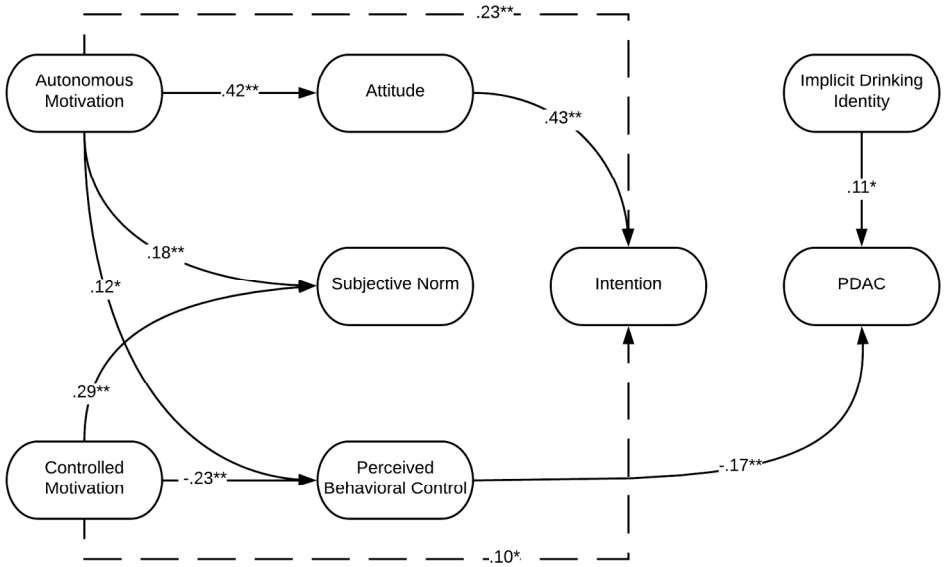

Figure 2. Path diagram showing statistically significant standardised path coefficients (β) between variables in the integrated behaviour change model, with variance explained (R^2) in intention and pre-drinking alcohol consumption.

Table 1. *Questionnaire Items Measuring Self-Determination Theory, the Theory of Planned Behaviour, and Planning Constructs*

Construct	Item	Response scale
CM	I limit my alcohol consumption during pre-drinking sessions because other people say I should. I limit my alcohol consumption during pre-drinking sessions because my friends/peers/partner say I should. I limit my alcohol consumption during pre-drinking sessions because others will be disappointed if I don't. I get restless and uncomfortable if I don't limit my alcohol consumption during pre-drinking sessions. I feel bad about myself if I do not limit my alcohol consumption during pre-drinking sessions. I limit my alcohol consumption during pre-drinking sessions because I will feel guilty if I do not. I feel ashamed when I do not limit my alcohol consumption during pre-drinking sessions. I feel under pressure from my friends/peers/partner to limit my alcohol consumption during pre-drinking sessions.	1 (Not at all true) to 4 (Very true)
AM	I limit my alcohol consumption during pre-drinking sessions because I value the benefits. It is pleasurable to limit my alcohol consumption during pre-drinking sessions. It is important to me to limit my alcohol consumption during pre-drinking sessions. I enjoy limiting my alcohol consumption during pre-drinking sessions. I find limiting my alcohol consumption during pre-drinking sessions a pleasurable activity. I get pleasure and satisfaction from limiting my alcohol consumption during pre-drinking sessions.	1 (Not at all true) to 4 (Very true)

	I limit my alcohol consumption during pre-drinking sessions because it is an important part of my life.	
Attitude	For me, reducing my alcohol consumption during pre-drinking sessions over the next four weeks would be…	1 (Unimportant / Not Worthwhile / Harmful / Unenjoyable / Bad) to 6 (Important / Worthwhile / Beneficial / Enjoyable / Good)
SN	Most people who are important to me would want me to reduce my alcohol consumption during pre-drinking sessions over the next four weeks. Most people I know would approve of me reducing my alcohol consumption during pre-drinking sessions over the next four weeks. Most people whose opinions I value would approve of me reducing my alcohol consumption during pre-drinking sessions over the next four weeks. Most people who are relevant to me would approve of me reducing my alcohol consumption during pre-drinking sessions over the next four weeks	1 (Disagree very strongly) to 6 (Agree very strongly)
PBC	How much personal control do you have over reducing your alcohol consumption during pre-drinking sessions over the next four weeks?	1 (No control at all) to 6 (Complete control)
	It is mostly up to me whether or not I reduce my alcohol consumption during pre-drinking sessions over the next four weeks If I wanted to, I could reduce my alcohol consumption during pre-drinking sessions over the next four weeks. Reducing my alcohol consumption during pre-drinking sessions over the next four weeks is up to me.	1 (Disagree very strongly) to 6 (Agree very strongly)
Intention	I intend to reduce my alcohol consumption during pre-drinking sessions over the next four weeks.	1 (Disagree very strongly) to 6 (Agree

	I plan to reduce my alcohol consumption during pre-drinking sessions over the next four weeks. I will try to reduce my alcohol consumption during pre-drinking sessions over the next four weeks.	very strongly)
Planning*	I will figure out exactly how I can reduce my alcohol consumption during pre-drinking sessions over the next four weeks. I will make a plan to reduce my alcohol consumption during pre-drinking sessions over the next four weeks. I will come up with a strategy to reduce my alcohol consumption during pre-drinking sessions over the next four weeks.	1 (Disagree very strongly) to 6 (Agree very strongly)

Note. CM = controlled motivation; AM = autonomous motivation; SN = subjective norm; PBC = perceived behavioural control. Planning was measured but not included in the main analyses, due to a high correlation with intention (i.e., $r = .74$) and unsatisfactory crossloadings with intention items.

Table 2. *Path Coefficients Between Control and Model Variables in the Integrated Behaviour Change Model*

	Sample	Gender	Age	PB	AM	CM	Att	SN	PBC	Int	D	PDAC
Sample	-	.02	.08	-.08	.10	-.09	-.05	-.10	.28*	-.04	-.12*	-.12*
Gender		-	-.02	-.10	.03	-.04	.14*	-.01	.06	.14*	-.04	-.16**
Age			-	-.12*	.10	-.01	.10	-.02	.10	.02	-.08	-.10
PB				-	-.22**	-.03	-.09	.08	-.13	-.01	.05	-.36**

*$p < .05$; **$p < .01$;
PB = past behaviour; AM = autonomous motivation; CM = controlled motivation; Att = attitude; SN = subjective norm; PBC = perceived behavioural control; Int = intention; D = drinking identity implicit association test D-score; PDAC = pre-drinking alcohol consumption.
For dichotomous variables Sample and Gender, 1 = Western Australia/male; 2 = Queensland/female.

Supplementary Table 3. *Mediation Results for Paths in the Integrated Behaviour Change Model*

Path	Mediator	Direct (f^2)	*p*	Indirect (f^2)	*p*	Total (f^2)	*p*
AM-Int	Att	.23 (.12)	<.001	.18 (.09)	<.001	.41 (.21)	<.001
	SN			.01 (.01)	.388	.24 (.13)	<.001
	PBC			<.01 (<.01)	.499	.23 (.12)	<.001
CM-Int	Att	.12 (05)	.022	.04 (.02)	.162	.16 (.06)	.003
	SN			.02 (.01)	.320	.14 (.05)	.009
	PBC			<.01 (<.01)	.499	.12 (.05)	.022
AM-PDAC	Att	-.02 (<.01)	.369	.01 (<.01)	.403	`-.01 (<.01)	.456
	SN			<.01 (<.01)	.495	.02 (<.01)	.396
	PBC			<.01 (<.01)	.499	`-.02 (<.01)	.401
	Int			.01 (<.01)	.414	`-.01 (<.01)	.461
CM-PDAC	Att	-.06 (.01)	.153	<.01 (<.01)	.494	`-.06 (.01)	.162
	SN			`-.01 (<.01)	.409	`-.07 (.01)	.104
	PBC			.04 (.01)	.166	`-.02 (<.01)	.370
	Int			.01 (<.01)	.440	`-.06 (.01)	.163
Att-PDAC	Int	-.01 (<.01)	.440	.01 (<.01)	.383	<.01 (<.01)	.476
SN-PDAC	Int	-.03 (<.01)	.285	<.01 (<.01)	.482	`-.03 (<.01)	.297
PBC-PDAC	Int	-.17 (.03)	.002	<.01 (<.01)	.500	`-.17 (.03)	.002

Note. AM = autonomous motivation; Int = intention; Att = attitude; SN = subjective norm; PBC = perceived behavioural control; CM = controlled motivation; PDAC = follow-up pre-drinking alcohol consumption