Implicit alcohol attitudes predict drinking behaviour over and above intentions and willingness in young adults but willingness is more important in adolescents: implications for the Prototype Willingness Model.

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Abstract

Objectives: Dual process models, such as the Prototype Willingness Model (PWM), propose to account for both intentional and reactive drinking behaviour. Current methods of measuring constructs in the PWM rely on self-report, thus require a level of conscious deliberation. Implicit measures of attitudes may overcome this limitation and contribute to our understanding of how prototypes and willingness influence alcohol consumption in young people. This study aimed to explore whether implicit alcohol attitudes were related to PWM constructs and if they would add to the prediction of risky drinking.

Design: The study involved a cross-sectional design. The sample included 501 participants from the United Kingdom (*Mean* age 18.92; range 11-51; 63% female); 230 school pupils and 271 university students.

Methods: Participants completed explicit measures of alcohol prototype perceptions, willingness, drunkenness, harms, and intentions. They also completed an implicit measure of alcohol attitudes, using the Implicit Association Test.

Results: Implicit alcohol attitudes were only weakly related to the explicit measures. When looking at the whole sample, implicit alcohol attitudes did not add to the prediction of willingness over and above prototype perceptions. However, for university students implicit attitudes added to the prediction of behaviour, over and above intentions and willingness. For school pupils, willingness was a stronger predictor of behaviour than intentions or implicit attitudes.

Conclusions: Adding implicit measures to the PWM may contribute to our understanding of the development of alcohol behaviours in young people. Further research could explore how implicit attitudes develop alongside the shift from reactive to planned behaviour.

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Introduction

Alcohol is one of the leading preventable causes of ill health worldwide (WHO, 2014). In the United Kingdom (UK), 2.5 million people consume in excess of low risk weekly guidelines (14 units) on their heaviest drinking occasion; the majority of whom are aged 16-24 (Office for National Statistics, 2016). The UK is one of the heaviest drinking countries in Europe; by the age of 16, 90% of adolescents have tried alcohol (Hibell et al., 2012), and many drink with the intention of getting drunk (Currie, 2012). By the time young people get to University, alcohol often plays a significant role in their lives (Craigs, Bewick, Gill, O'May, & Radley, 2012) and studies show that students tend to drink more than their same-age peers who do not attend university (Kypri, Cronin, & Wright, 2005).

Health education programmes that teach young people about harmful long term consequences of drinking (e.g. liver disease) have been shown to be largely ineffective (Foxcroft & Tsertsvadze, 2011). While they may have an impact on young people's attitudes and knowledge about alcohol, they often do not have an impact on behaviour (Stockings et al., 2016). This may be because young people view the future in an abstract sense, and so long term health consequences may not seem meaningful (McKay, Cole, Sumnall, & Goudie, 2012), or because they do not believe that they are personally vulnerable to harms, and these things happen to 'other people' (Wickman, Anderson, & Smith Greenberg, 2008). Furthermore, many young people see their alcohol consumption as a pleasurable part of their social lives and therefore actively ignore health messages (Hutton, 2012). Because alcohol is usually consumed during social occasions, even those with good intentions may well still be tempted to drink more than they planned, due to peer influence (Jamison & Myers, 2008). This means that preventing risky drinking presents a huge challenge. Increasingly, research has begun to focus on understanding

the influence of the social context and the automaticity of health behaviours such as alcohol consumption (Avishai-Yitshak & Sheeran, 2016; Hollands, Marteau, & Fletcher, 2016).

One theory that acknowledges the social context of drinking for young people is The Prototype Willingness Model (PWM) (Gerrard, Gibbons, Houlihan, Stock, & Pomery, 2008; Gibbons & Gerrard, 1995). This theory assumes that risk taking is partly driven by social reactions to risk-conducive situations. The PWM is a modified 'dual process' model, thus there are two assumed routes to behaviour; the reasoned action pathway and the social reaction pathway. The reasoned action pathway is a planned route via attitudes, subjective norms, and intentions (in accordance with The Theory of Planned Behaviour (TBP) (Ajzen, 1991)) and is characterised by some consideration of the consequences of risky behaviours (Gerrard et al., 2008). The social reaction pathway accounts for volitional, but unintentional risk behaviours and takes into that young people's risky behaviours tend to occur in social contexts and are often unplanned (Gerrard et al., 2008). In this pathway, the images or 'prototypes' that young people have about typical people their age that drink or abstain from drinking are influential for their own 'willingness' to consume alcohol, due to the importance of self-image and social comparison (Gibbons & Gerrard, 1995). Adolescents tend to have less favourable prototypes of drinkers, than of non-drinkers, and these positive abstainer prototypes may be seen as goal-states (Gerrard et al., 2002). When prototypes for drinkers are less negative, then adolescents have higher levels of willingness (Davies, Martin, & Foxcroft, 2016; Gerrard et al., 2002).

There is a growing body of evidence to support the use of this theory in understanding risky drinking in young people (Davies et al., 2016; Litt et al., 2014; Zimmermann & Sieverding, 2011). Recent longitudinal research supports the theoretical assumptions within the PWM as applied to adolescents in the United States, where prototype favourability predicted willingness six months later, which predicted subsequent drinking behaviour after a further six months (Litt & Lewis, 2016). Research in the UK has also supported this relationship and found that

drinker prototypes are more positive in older adolescents than in younger adolescents (Davies et al., 2016).

However an important question remains unanswered regarding the PWM, and other dual process theories, which concerns measurement. Typically, prototype perceptions (favourability and similarity) and willingness are measured within questionnaires alongside other constructs such as attitudes, intentions and behaviour. There has been some debate around whether it is possible to adequately capture these 'spontaneous' constructs because the measures used appear to require explicit deliberation (Fishbein, 2008). For example, when asking young people how 'willing' they are to act in a certain way, questionnaire measures allow them to consider their response in a way that may not accurately capture their propensity to act without forethought.

Recent studies have attempted to address these issues by exploring the application of implicit measures, which may have to potential to capture the reactive nature of the PWM. The Implicit Associations Test (IAT) is a widely used measure of implicit attitudes that involves the pairing of words and categories (Greenwald, McGhee, & Schwartz, 1998) and has been recently applied to the PWM. Implicit attitudes are traces of past experience which form associations in memory and influence our current behaviour in an automatic way (Pieters, van der Vorst, Engels, & Wiers, 2010; Thush & Wiers, 2007). They are formed by repeated exposure to a stimuli and outcomes; for example alcohol being frequently associated with celebration may lead to positive implicit attitudes (Hofmann, Friese, & Strack, 2009). Implicit measures are used to determine the strength of implicit attitudes from the assessment of memory associations in reaction time tasks. In contrast to explicit attitudes it is proposed that measures of implicit attitudes are less susceptible to bias because they measure the strength of unconscious associations that are not easily overridden(Greenwald & Banaji, 1995). As willingness is hypothesised to operate spontaneously it is possible that measuring implicit attitudes might offer a way of assessing something more akin to this construct than a deliberative measure.

Ratliff and Howell (2015) used an IAT to explore how participants rated 'tanned' compared to 'light skinned' prototypes and contrasted this with ratings of explicit prototypes. In this study, the two different measures of prototype evaluation were correlated, but only weakly. They also found that implicit prototypes predicted more facets of harmful tanning behaviour than explicit prototypes, concluding that they may offer a better measure of the automatic aspects of this behaviour (Ratliff & Howell, 2015). A further study employed IATs to examine implicit prototypes of feminists, which were found to predict both willingness to engage in and actual feminist behaviours (Redford, Howell, Meijs, & Ratliff, 2016). In another study a combination of implicit and explicit measures were used to evaluate how athletes perceived performance enhancing substance (PES) user prototypes (Whitaker, Petroczi, Backhouse, Long, & Nepusz, 2016). While explicit measures suggested participants had more favourable images of non PES users, implicit measures revealed that PES users were associated more with 'good' than 'bad'. Again, the two measures were only weakly correlated (Whitaker et al., 2016).

While measures of implicit prototypes may offer an alternative to deliberative ratings of favourability and similarity, a key tenet of the PWM is the suggestion of unplanned, but not entirely 'unconscious' decision making. Adolescents are assumed to have clear images of those who engage in risky behaviours, and are able to describe them, thus they are not assumed to be necessarily outside of conscious awareness. Measuring implicit prototypes may allow researchers to determine the extent to which such evaluations occur automatically. There is, however, also a need to understand more about the heuristic nature of the social reaction pathway, and how the shift between reactive and intentional drinking behaviour develops, and it is here that implicit attitudes may play a role.

To date, we are not aware of any similar studies that have attempted to investigate implicit attitudes related to alcohol within the PWM framework. However, there is a substantial body of research which implicates a role for implicit attitudes in the prediction and explanation of alcohol use in young people (Goodall & Slater, 2010; Houben, Havermans, & Wiers, 2010;

Pieters et al., 2010; Thush & Wiers, 2007; Thush et al., 2007). Thush and Wiers (2007) for example measured implicit and explicit cognitions and alcohol use in young people aged 12 and 15. They found that young people who were heavier drinkers had stronger implicit positive alcohol-related cognitions and weaker implicit negative alcohol related cognitions. Moreover this study showed that implicit measures were able to predict binge drinking a year later.

Thush et al (2008) investigated how implicit attitudes interacted with working memory in young people aged 14-20. They showed that while implicit measures predicted alcohol consumption for individuals with low working memory capacity, explicit measures predicted alcohol consumption for individuals with high working memory capacity. Adolescents with high working memory capacity therefore seem to make more reasoned decisions regarding alcohol, while individuals with lower working memory capacity appear to make more impulsive decisions regarding drinking (Thush et al., 2008). These findings may have implications for the PWM as they suggest that implicit attitudes towards alcohol may play a role in understanding willingness based versus intentional drinking.

Furthermore, there is evidence to suggest that the PWM may be better at predicting risk behaviours in adolescents than in young adults (Todd, Kothe, Mullan, & Monds, 2014). With age and experience alcohol use is hypothesised to become more planned and less reactive (Pomery, Gibbons, Reis-Bergan, & Gerrard, 2009), and implicit attitudes more positive as repeated exposure strengthens memory associations (Hofmann et al., 2009). Thus the current study compared school pupils with university students, two participant groups that may differ in their exposure and experience with alcohol.

Drawing together previous research on implicit measures and the use of IATs within the PWM framework, we sought to explore the addition of implicit alcohol attitudes and their relationship to PWM constructs. Our aims were to determine if adding implicit alcohol attitudes could improve the prediction of willingness or behaviour with the social reaction pathway of the

PWM. We also aimed to explore whether there were differences in such relationships between school pupils and university students.

Method

Participants

Participants were recruited in the UK. School teachers who agreed to do so asked their pupils if they would like to take part in a research project about young people's views on alcohol. They were told that responses would remain confidential and they did not have to answer all questions. On the day of testing the researcher checked that each pupil was happy to take part. University students were invited to take part during classes and via a participant panel. All participants were given an information sheet which clarified that the study was about young people's views about alcohol and that all responses were confidential, and they did not have to answer all questions. At the end of the study all participants received a debrief sheet explaining the purpose of the research and an explanations of the IAT, alongside age appropriate sources of support and information about alcohol. Parental consent was required for under 16s. Study procedures received approval from XXXXXXX Ethics Committee (reference XXXXXX).

Measures

Alcohol consumption

Participants were asked about their intentions to get drunk in the next month using a standard approach to designing theory of planned behaviour questionnaires (Francis et al., 2004).

> *Thinking about what might happen in the next week, to what extent do you intend to do the following? A) Have an alcoholic drink, B) get drunk on one occasion and c) get drunk on more than one occasion.*

Responses were recorded from 1 (definitely do not intend to) to 7 (definitely intend to). Frequency of drunkenness was assessed by asking how many times in the last month the

participant had been drunk using the following definition used in previous research with adolescents (Coleman, Ramm, & Cooke, 2010).

> *The following question will ask you about being 'drunk' as a result of drinking alcohol. By drunk we mean that you may not have remembered what you've been doing, or felt a bit dizzy, or may have been sick, or not been able to walk straight, or may have had a hangover. How many times in the* ***last month*** *have you been drunk?*

The response options ranged from 'none' to '15 or more'. To assess harms from drinking, a harm scale derived from a previous study was used (Davies et al., 2016). Participants were asked to tick a box next to each of the following 10 consequences if they had ever occurred when they had been drinking; vomiting, memory loss, embarrassment, trouble with police, injuries, hospital admission, fighting, lost something such as a phone, unprotected sex, embarrassing photos posted online, or to indicate if there was something else. The number of harms that occurred was summed to comprise a harm score.

Prototype Willingness Model

Prototype questions were posed by beginning the question with an introductory paragraph similar to that used in previous research, which explained that the questions were about images of members of different groups. The description stated that although not all members of groups were the same, many shared similar features (Gibbons, Gerrard, & McCoy, 1995). Participants were then asked to think about the typical person of the same age as them who drank alcohol (drinker prototype) and who did not drink alcohol (non-drinker prototype). To assess favourability participants were asked to rate their image of this person from 0 (extremely negative) to 100 (extremely positive) and then they rated their similarity to this person from 1 (not at all similar) to 7 (very similar), both in line with previous research (Rivis, Sheeran, & Armitage, 2006; Zimmermann & Sieverding, 2011).

Willingness to drink was measured in the same style as existing research using three hypothetical scenarios; a family wedding, a house party and at the park. Participants were asked how likely it was that they would a) take a drink and drink it, from 1 (unlikely) to 7 (highly likely) and b) say no thanks, from 1 (unlikely) to 7 (likely). We used the word 'likely' instead of 'willing' due to adolescents misunderstanding the meaning of 'willing' during piloting, and in line with another study using a UK sample (Rivis & Sheeran, 2013). In order to calculate a total willingness to drink score the responses to item b in each situation were reverse scored and then all six items were summed to produce a willingness variable where a high score indicated a high level of willingness to drink.

Implicit attitudes

Two measures of implicit alcohol attitudes were used in the study. The first was a computerized IAT programmed and delivered in PsychoPy software (Peirce, 2007). The target category 'alcohol' (wine, beer, vodka, cider, gin, cocktail, whisky, tequila) was paired with a 'soft drink category' (milk, juice, water, cola, tea, coffee, smoothie, lemonade) in line with a previous study with young people (Houben et al., 2010). Positive words (good, joy, wonderful, love, great, pleasure, happy, cheerful) were paired with negative words (bad, sad, unhappy, hate, pain, anger, sorrow, disgust). All words were matched by number of syllables. There were five blocks and stimulus words were presented in the centre of the screen with the target categories on the top left and right of the screen. In the first block, participants practiced pairing the attribute categories of positive or negative to the left or right of the screen using the 'e' key for left and the 'i' key for right. In the second block they practiced pairing the target categories. There were 16 trials in the first and second blocks. In the third block participants were required to classify the words in combination (e.g. alcohol positive vs soft drink negative) in 32 trials. In block four, the target words switched and participants practiced pairing them to the new side. In the fifth block, the attribute words and the target words were paired, but now in the opposite way to block three. The word 'wrong' was presented as feedback in the middle of

the screen when a word was classified incorrectly, and a time penalty was added to that trial. Half of the participants performed the alcohol + positive vs soft drink + negative combination task first and the other half performed the alcohol + negative vs soft drink +positive combination task first. The D-score was calculated using the standard IAT scoring procedure (Greenwald et al., 1998). A D-score >0 indicated a positive implicit attitude to alcohol, and a D-score of <0 indicated a negative implicit attitude to alcohol. The further away the D-score was from 0, the stronger the positive or negative attitude.

The second was a paper and pen version found to have similar test-retest reliability and validity to the computer based IAT (Lemm, Lane, Sattler, Khan, & Nosek, 2008). Participants viewed two lists of 24 items, half of which were drinks (alcoholic or non-alcoholic) and half of which were positive or negative words. In the first task, participants categorised positive and non-alcohol words together and negative and alcohol words together. In the second they categorised positive and alcohol together and negative and non-alcohol words together. Task order was counterbalanced and participants had 30 seconds to complete as many categorisations as possible. The total number of correct answers in each section was recorded. This measure was scored using the *product: square root of difference* method as recommended by Lemm et al (2008), which maximises the relationship between paper and pen and computerized implicit measures.

For those completing the paper and pen IAT, this was included in an online questionnaire and presentation was counterbalanced alongside the measures. For those completing the computerized IAT, presentation of this was counterbalanced to either before or after the online questionnaire. There was no effect of order of presentation for either version.

Data analysis

The data were analysed in IBM SPSS version 22. Pearson's correlations were conducted to determine the relationships between the study measures. T-tests were conducted to test for differences in IAT scores. Data met assumptions for regression to be carried out. Hierarchical

regression was employed to allow PWM measures to be entered into the models first and IAT scores in subsequent steps. Measures were mean centred before interaction terms were calculated and entered as moderators in the final regression analysis. Participants who did not complete either IAT were excluded from the analysis. Here, we report the findings from both measures of implicit attitudes combined. In order to check whether the two modes of delivering the IAT were measuring the same underlying construct we compared the paper and pen and computerized IAT scores of participants who reported having been drunk on zero, one, two, three, four, five and six occasions in the last month. There were no significant differences between the IAT scores of these groups of participants regardless of measure.

Results

The final study sample of 501 participants (*M* age =18.92; range 11-51; 63% female) included 230 school pupils aged 11-17 (*M*age =15.46; SD=1.89; 50.9 % female) and 271 university students aged18 -51 (*M* age=21.83; SD=6.07; 72.7% female).

[Insert table 1]

Means and standard deviations for all measures for the whole sample and separately for the school pupils and university students are shown in Table 1. Implicit attitudes were weakly correlated with intentions, drunkenness, harms, drinker similarity, and non-drinker favourability. There was no significant difference between the implicit attitudes of school pupils (*M*= -.389, *SD*=.792) and university students (*M*=-.287, *SD*=.753; *t* (499)=1.469, *p*=.142)

We then compared the participants who reported that they had not been drunk in the last month (*N*=127) with those who had been drunk on one or more occasion (*N*=270). There was a significant difference between the two groups; those who had been drunk at least once in the last month had significantly less negative implicit attitudes (*M*= -.254, *SD*=.783) towards alcohol than those who had not been drunk (*M*= -.466, *SD*= .681; *t*(281)= 2.74, *p*=.006).

Regression

Hierarchical regression analysis was performed to test if prototype perceptions (drinker and non-drinker; favourability and similarity) predicted willingness to drink. In the first step the resulting model accounted for 29.6% of the variance in willingness (R^2= .296, p<.001), with all four prototype perception measures contributing significantly to the model. This supported the assumptions within the social reaction pathway in the PWM that prototype evaluation predicts willingness to drink in our sample. However, adding implicit alcohol attitudes did not add significantly to the model; there was no significant change in the variance explained in willingness to drink (ΔR^2=.000; p=.744).

Hierarchical regression analyses were then performed to determine if implicit attitudes would add to the prediction of behaviour (self-reported drunkenness) over and above intentions and willingness (table 2). When looking at the sample as a whole, in the first step, the resulting model predicted 19.7% of the variance in behaviour (R^2= .197, p<.001). Adding implicit attitudes at step two added a small (1.4%) but statistically significant amount to the variance explained (ΔR^2=.014, p=.009).

When comparing school pupils and university students, a different pattern of results was seen. Willingness contributed significantly to the prediction of behaviour for school pupils, but adding implicit attitudes did not. However for university students, intentions were significant but willingness did not add significantly to the prediction of behaviour, whereas implicit attitudes were a significant predictor (Table 2).

[Insert table 2].

Hierarchical regression was then performed to test if experience moderated the relationship between intentions, willingness and implicit attitudes and behaviour (drunkenness). The setting (school vs university) was used as a binary moderator that would account for experience with alcohol and exposure to alcohol within the university culture and environment as opposed to school. This variable was dummy coded to be entered into the regression so that school = 1 and university = 0. Experience was entered at step one, followed by intentions, willingness and

implicit attitudes (all standardised) at step two. The interactions between the moderator and the three predictors were entered at step three. Intentions and implicit attitudes were independent predictors of drunkenness as expected, with intentions as the strongest predictor (β= .344, t= 7.016 p<.001; Table 3).

[Insert table 3]

The interactions between intentions and experience, and implicit attitudes and experience were both significant and were plotted using simple slopes (Figures 1 and 2). For the interaction between intentions and experience (β=-.140, t=-2.072 p=.039) this indicated that stronger intentions were associated with a higher level of drunkenness for university students compared with school pupils (Figure 1). For the interaction between implicit attitudes and experience (β=-.166, t=-3.018 p=.003) the plot shows that more positive implicit attitudes were associated with higher levels of drunkenness for university students but with lower levels of drunkenness for school pupils. On the other hand, for those with more negative implicit attitudes, there were no differences in the levels of drunkenness between school pupils and university students (Figure 2).

[Insert figures 1 and 2].

Discussion

This paper aimed to explore if implicit attitudes would add to the prediction of willingness and behaviour within the social reaction pathway of the model. In line with other studies in different behavioural domains (Ratliff & Howell, 2015; Whitaker et al., 2016), implicit alcohol attitudes were only weakly related to some of the explicit measures in the study. Regression analysis revealed that implicit alcohol attitudes were not able to add to the prediction of willingness to drink over and above prototype perceptions. This is unsurprising given the weak relationships between prototype favourability and similarity and implicit attitudes. It may be useful to include implicit measures of alcohol prototypes as well as implicit attitudes to explore

the reactive nature of alcohol prototype evaluation, as in previous studies on tanning and feminist prototypes (Ratliff & Howell, 2015; Redford et al., 2016).

However, implicit alcohol attitudes were able to add to the prediction of behaviour, over and above intentions and willingness. Intentions are generally found to be a strong predictor of behaviour when using this framework. Some research has suggested that this is dependent on age; with younger adolescents for example being more 'willing' than intending, but older adolescent and young adult drinking being more intentional, as experience with the behaviour increases (Davies et al., 2016; Pomery et al., 2009). Our findings support a distinction between willingness and intentions, with willingness able to add to the prediction of behaviour for school pupils over and above intention, but not for university students. The university students, regardless of drinking experience, were likely to have more exposure to alcohol, and this may explain why adding implicit attitudes added to the prediction of behaviour for this sample and not the school pupils. This was also borne out in the subsequent analysis which showed that experience moderates the relationship between intentions and behaviour and implicit attitudes and behaviour. This raises an important issue about measurement of reactive constructs within the PWM. Perhaps for those with less experience of drinking alcohol, the usual measure of willingness is sufficient to capture their propensity to act in a social situation, supporting its utility and the assumptions of the PWM. However, for those with more experienced addition of implicit attitudes is able to capture something different.

The originators of the PWM argue that the social reaction pathway is not always necessarily automatic and that implicit measures are not sufficiently capable of measuring impulse (Gibbons, Kingsbury, Gerrard, & Wills, 2011). However, the findings of this study do show they are capable of adding to the model. It is possible that using a measure of implicit alcohol attitudes might be useful within an intervention to explore mechanisms of change within the social reaction pathway for example. Criticisms of the PWM have been due to the challenges in measurement of spontaneous constructs, such as prototype evaluation and willingness. This

has led researchers to attempt to use alternative measures of these constructs, such as reaction time measures of willingness (Comello & Slater, 2011) or implicit prototype evaluations (Ratliff & Howell, 2015). However, perhaps rather than attempting to re-design measures of prototypes or willingness this kind of measure may be used as an addition to the social reaction pathway, alongside prototypes and willingness, in the same way that explicit attitudes are measured in in the planned pathway, alongside norms and intentions. Future research is needed to explore this possibility within prospective studies.

We used two measures of implicit attitudes and found no significant differences between them. There is some considerable debate on the validity and usefulness of the IAT. For example Blanton, Jaccard, Gonzales and Christie (2006) critique the test on the basis of the original IAT being based on relative measures. They argue that this is problematic because it assumes that people will be more favourable to one than the other (e.g. alcohol versus soft drinks) whereas they may actually be ambivalent. The same criticism has been made of the distinction between 'drinker' and 'non-drinker' prototypes, and young people are often ambivalent about alcohol(Cameron, Stritzke, & Durkin, 2003). Blanton et al., (2006) also point out that the IAT relies on the participant's ability to quickly respond to cognitive tasks. This might be influenced by their hand/ eye co-ordination, their dexterity or other factors such as substance use (Blanton et al., 2006). The paper and pen IAT is one means of reducing participant burden and overcoming some of these issues. For example one study looked at young children's snack food preferences using the paper and pen IAT, because the instructions are more straightforward (Jones, Kervin, Reis, & Gregory, 2012). Our findings support the use of this type of measure within questionnaires as a means of exploring implicit attitudes.

Limitations

Our study is cross-sectional and thus we make no claims for causality. It would be beneficial to undertake a prospective study to determine whether implicit alcohol attitudes are related to PWM constructs and behaviour and to explore how the shift from reactive to planned drinking

occurs in conjunction with changes in implicit attitudes. Further to this point, we did not include measures of explicit attitudes in this study, due to our focus on the relationship between implicit measures and constructs in the social reaction pathway. However, in order to fully test the PWM, and the role of implicit alcohol attitudes in relation to constructs in the reasoned pathway, a measure of explicit attitudes, alongside a measure of subjective norms could have been included.

Our study employed two IAT measures between two participant groups, and this should ideally be explored using a within participant design to fully understand any subtle differences. In this study we used the word 'likely' instead of 'willing' based on previous research, however this may capture behavioural expectations rather than behavioural willingness (Warshaw & Davis, 1985). It is possible that the findings from the school pupil sample would have been stronger if they had been asked how 'willing' rather than how 'likely' they were to engage in the risky scenarios.

We also acknowledge the ongoing issue of self-report and possible social desirability in alcohol research which may of course affect our findings. When self –reporting health risk behaviours, adolescents' responses may be affected by cognitive factors (such as memory) or situational factors (such as the environment in which the research takes place) (Brener, Billy, & Grady, 2003). Other studies suggest that university students may under-report their alcohol consumption in surveys, even when they are assured of confidentiality (Davis, Thake, & Vilhena, 2010). We assured the participants that responses were anonymous, and they completed them alone, but it is always possible that confidentiality will be doubted, perhaps in particular for those completing surveys in a classroom.

Conclusions

Despite the limitations, our study was the first to explore the addition of implicit alcohol attitudes to the PWM in young people. The addition of implicit attitudes was able to add a small but significant amount to the prediction of behaviour over and above intentions and willingness.

Adding implicit measures to the PWM may contribute to our understanding of the development of alcohol behaviours in young people and help to overcome criticisms about the measurement of PWM constructs. Further research should be conducted to explore how implicit attitudes develop alongside the shift from reactive to planned behaviour.

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Tables and figures

Table 1: *Mean and standard deviation for each study measure and correlation with IAT for the whole sample and for school pupils and university students separately*

	Whole sample M (SD)	Whole sample Correlation with IAT	School pupils M (SD)	School pupils Correlation with IAT	University students M (SD)	University students Correlation with IAT
Implicit attitudes	-.339 (.772)	-	-.389(.792)	-	-.287 (.753)	-
Intentions	4.92 (2.30)	.144*	3.86 (2.23)	.113	5.82 (1.83)	.157*
Drunkenness	2.79 (3.21)	.176*	1.47 (2.30)	-.012	3.59 (3.42)	.245*
Harms	2.97 (2.29)	.094*	2.40 (2.27)	.051	3.31 (2.23)	.103
Drinker prototype favourability	4.14 (1.28)	.069	3.79 (1.48)	.011	4.42 (1.02)	.114
Drinker prototype similarity	3.69 (1.58)	.108*	3.38 (1.66)	.046	3.95 (1.46)	.150*
Non-drinker favourability	4.92 (1.35)	-.114*	5.06 (1.40)	-.122	4.80 (1.30)	-.095
Non-drinker similarity	3.77(1.94)	-.054	4 (2.05)	.008	3.59 (1.84)	-.098
Willingness	4.48(1.47)	.085	4.29 (1.67)	.048	4.64 (1.26)	.114

Note * = p<.05

Table 2 Standardised betas and p values within hierarchical multiple regression models comparing the addition of IAT to willingness and intentions for the prediction of drunkenness between the whole sample, school and university students

	Whole sample		*School pupils*		*University students*	
	β	*p*	*β*	*p*	*β*	*p*
Step 1						
Constant		*p*=.043		*p*=.005		
Intentions	.438	*p*<.001	.315	*p*<.001	.376	*p*<.001
Willingness	.016	*p*=.734	.203	*p*=.022	.050	*p*=.404
Step 2						
Constant		*p*=.160		*p*=.003		*p*=.465
Intentions	.422	*p*<.001	.325	*p*<.001	.349	*p*<.001
Willingness	.011	*p*=.819	.206	*p*=.021	.036	*p*=.533
IAT Score	.118	*p*=.009	-.077	*p*=.293	.201	*p*=.001

Notes: Whole sample R^2 = .193 for Step 1(*p*<.001); ΔR^2 =.014 for step 2 (*F* change 6.82, *p*=.009)

School pupils R^2 = .214 for Step 1 (*p*<.001); ΔR^2 =.006 for step 2 (*F* change 1.11, *p*=.293)

University students R^2 = .15 for Step 1(*p*<.001); ΔR^2 =.039 for step 2 (*F* change .691, *p*=.001)

Table 3 Standardised betas, t and p values within hierarchical multiple regression model testing whether experience (school vs university) moderates the relationship between intentions, willingness and implicit attitudes and risky drinking

	β	*t*	*p*
Step 1			
Constant		18.550	*p*<.001
Experience	-2.088	-6.682	*p*<.001
Step 2			
Constant		15.483	*p*<.001
Experience	-.212	-4.542	*p*<.001
Intentions	.344	7.016	*p*<.001
Willingness	.058	1.231	*p*=.219
Implicit attitudes	.114	2.584	*p*=.010
Step 3			
Constant		13.972	*p*<.001
Experience	-.215	-4.414	*p*<.001
Intentions	.427	6.670	*p*<.001
Willingness	.040	.702	*p*=.483
Implicit attitudes	.214	3.889	*p*<.001
Experience X Intentions	-.140	-2.072	*p*=.039
Experience X Willingness	.067	1.017	*p*=.310
Experience X Implicit attitudes	-.166	-3.018	*p*=.003

Notes: Tests the moderation of experience as a binary moderator (school vs university) on the dependent variable drunkenness. All predictors are standardised. R^2 = .100 for Step 1(p<.001); ΔR^2 =.49 for step 2 (*F* change =26.284, p<.001) ΔR^2 =..028 for step 3 (*F* change 5.018, p=.00

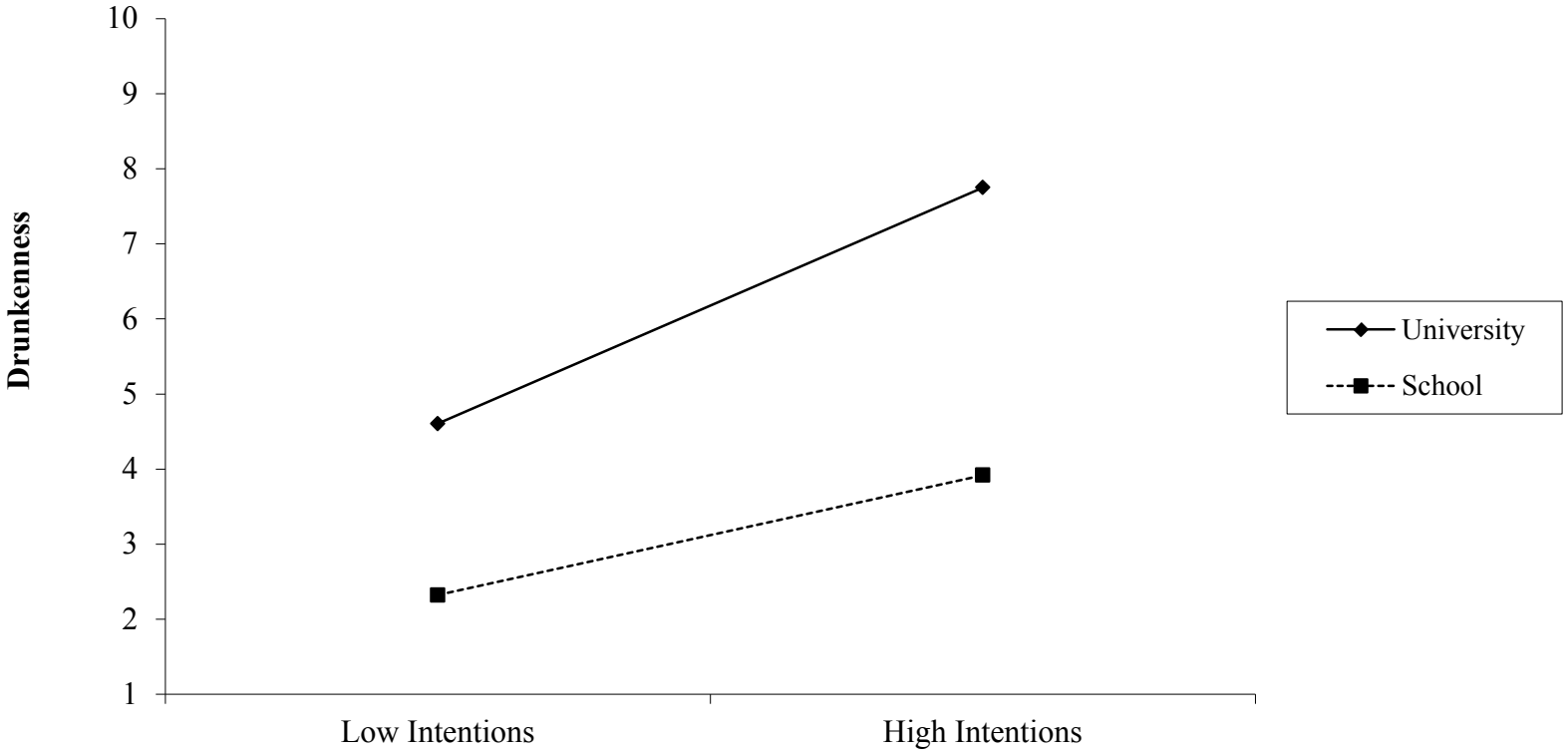

Figure 1: Plot of interaction between intentions and experience predicting drunkenness. Lower intentions means lower ratings of intentions to drink and get drunk in the next month and high intentions refers to greater levels of intentions to drink and get drunk in the next month. The plot shows that high intentions were associated with a relatively higher level of drunkenness for university students compared with school pupils.

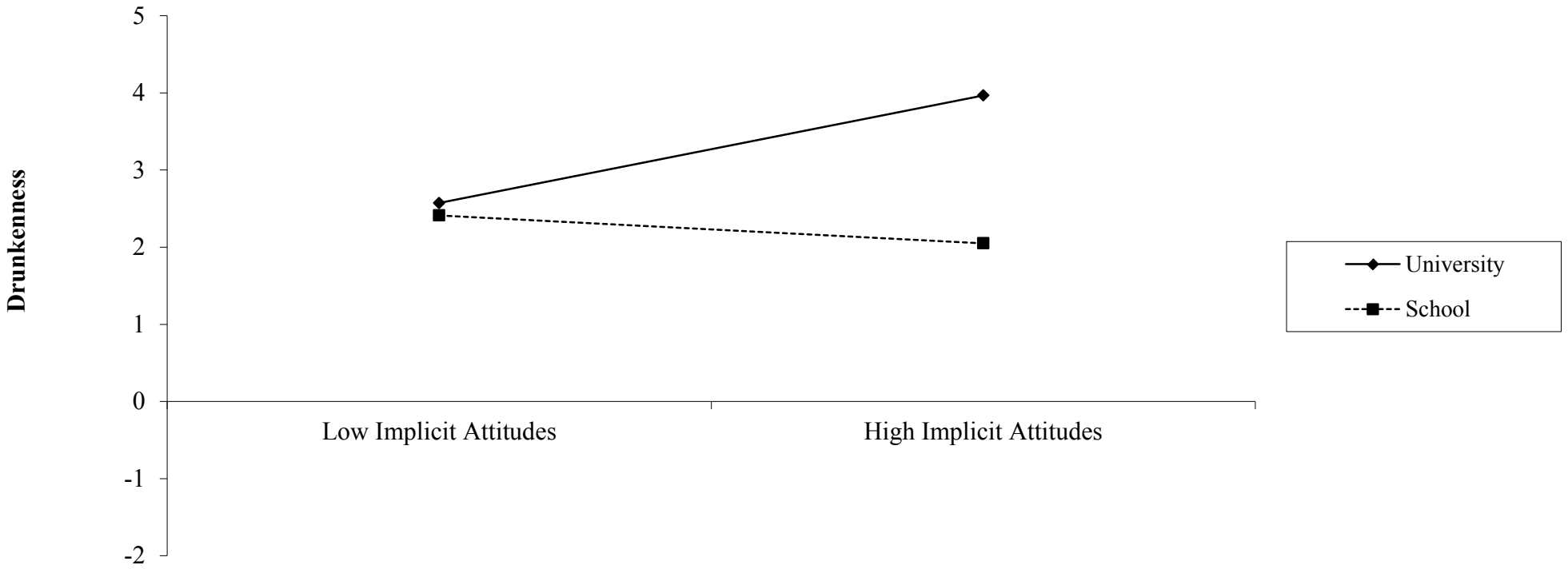

Figure 2: Plot of interaction between implicit attitudes and experience predicting drunkenness. Low implicit attitudes indicate more negative attitudes towards alcohol and high means more positive implicit attitudes towards alcohol. The plot shows that more positive implicit attitudes are associated with higher levels of drunkenness for university students, but with lower levels of drunkenness for school pupils. There are no differences in levels of drunkenness between the two groups when implicit attitudes are more negative.