Development of an adolescent alcohol misuse intervention based on the Prototype Willingness Model: A Delphi study

Abstract

Purpose of the paper: The purpose of this paper is to report on the use of the Delphi method to gain expert feedback on the identification of behaviour change techniques (BCTs) and development of a novel intervention to reduce adolescent alcohol misuse, based on the Prototype Willingness Model (PWM) of health risk behaviour.

Methodology: Four BCTs based on the PWM were identified and incorporated into a draft intervention that aimed to change alcohol prototypes and enable adolescents to deal with social pressure. Using the Delphi process, successive questionnaires were distributed to 20 international experts to build consensus on the theoretical validity of the intervention.

Findings: Fifteen experts completed round one and eleven completed round two of the Delphi study. A high level of consensus was achieved. Four priority areas were identified to improve the intervention: 1) incorporating extra techniques to address social pressure, 2) increasing intensity, 3) providing incentives, and 4) addressing credibility.

Limitations: The sample of experts was self-selected and four participants were lost between the first and second round of the study.

Implications: The effectiveness of the identified BCTs will be evaluated within an intervention to reduce alcohol misuse in adolescents. Further work should build towards a more unified approach to developing interventions based on the PWM. The Delphi method is likely to be particularly useful when there is no existing consensus about which BCTs to use that reflect certain theoretical constructs or that best target a specific population or behaviour.

Originality/ value: This paper is the first to address the identification of specific BCTs based on the PWM and thus makes an important contribution to the application of this model to

interventions. This novel application of the Delphi method also makes a useful addition to the growing field of intervention development and design.

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Introduction

The consumption of alcohol by young people under the age of 18 is associated with a number of harmful consequences. These include difficulties with decision making and concentration, depression, accidents, and an increased likelihood of having unprotected sex (Newbury-Birch et al., 2009, Alcohol Concern, 2011). The United Kingdom (UK) has high levels of adolescent alcohol consumption in comparison to other European counties (Hibell et al., 2012). Although the legal age for purchasing alcohol is 18, by the age of 16 most UK adolescents have tried alcohol, and many drink regularly (Hibell et al., 2012, Newburn and Shiner, 2001). The number of adolescents in England aged between 11-15 who report ever having tried alcohol has fallen from 61% in 2003 to 39% in 2013 (Fuller and Hawkins, 2014). However, other evidence suggests that there has been rise in levels of consumption in those young people that do drink (Hibell et al., 2012, Fuller, 2013). This is particularly concerning in those aged 11-13 where average consumption has doubled over the same time period (Fuller, 2013, Smith and Foxcroft, 2009). Many adolescents also report that they are drinking with the intention of getting drunk, which is associated with long term harms, such as alcohol dependence (Kuntsche et al., 2013). This evidence points to a need for further research into the development of early and effective preventive intervention measures to reduce alcohol misuse and associated harms in this population.

Prototype Willingness Model

The Prototype Willingness Model (PWM) (Gerrard et al., 2008) may offer an appropriate basis for an intervention to reduce alcohol misuse adolescents in the UK (Davies et al., 2013, Davies et al., in press, Rivis et al., 2006) There are two assumed routes to risky behaviour within the PWM; the first via attitudes and intentions, similar to the Theory of Planned Behaviour (TPB) (Ajzen, 1991). The second route is a *social reaction* pathway to risk behaviour via *prototypes*

and *behavioural willingness.* This pathway takes into account that for young people risky behaviours tend to occur in a social context and are often unplanned (most adolescents, for example, are unlikely to report that they intend to get drunk, but may well do so if they find themselves in certain situations) (Gerrard, et al., 2008). Because of the social nature of risk-taking, adolescents often have clear ideas about the typical person their age that drinks. For example, adolescents in a focus group study described drinkers as sociable and cool (Davies et al., 2013). This image, or prototype, is assumed to be widely recognised and that most young people will tend to agree on what a particular drinker prototype is like (Gerrard et al., 2006). When drinker prototypes are more *favourable* and more *similar* to the self, young people will be more willing to drink (and therefore gain some of the associated prototype characteristics) (Gibbons et al., 2003). Prototypes are not only associated with those who engage in the target behaviour (actors) but also with those who do not (abstainers)(Gerrard et al., 2002).

According to the PWM, the effect of prototype perceptions on behaviour is mediated by *behavioural willingness*; the extent to which someone is prepared to engage in a risk behaviour in a given risk-conducive situation (Gibbons and Gerrard, 1995). Willingness can also be described as openness to risk opportunity and rests on the assumption that although someone may have no intention or expectation of undertaking certain behaviours they do have an idea about how they might react in certain situations (Gibbons et al., 2003). In contrast with intention, willingness is assumed to operate in a subconscious way with little thought about any consequences of engaging in a behaviour (Gibbons et al., 2000). Social comparison and peer influence are thought to mediate the relationship between prototypes and willingness in adolescents because this is an important time for identity development (Gerrard et al., 1999, Gibbons et al., 2009).

While evidence in support of the PWM is increasing (Spijkerman et al., 2010, Zimmermann and Sieverding, 2011, Gerrard et al., 2002, Todd et al., 2014, van Lettow et al., 2014), there are few existing interventions based upon this, and other, dual process theories. In contrast, there is a

wealth of intervention research based on theories such as the TPB, that assume behaviour is rational and under conscious control (Hardeman et al., 2002). However, these models have often been found lacking in their explanation for risk behaviours such as drinking (Armitage and Conner, 2001), and some researchers have called recently for this approach to be 'retired' (Sniehotta et al., 2014). There is a large body of literature demonstrating the influence of unconscious cognitive processes on the development and maintenance of risk behaviour (Wiers et al., 2007, Thush and Wiers, 2007). Therefore it is timely to investigate the application of reactive constructs (such as prototypes and willingness), to understanding and preventing alcohol misuse. Reactive constructs may be better able to account for adolescent drinking as this period is characterised by high levels of impulsivity (Arnett, 2007, Powell, 2006) and drinking tends to occur in social situations where peer influences are strong (Kelly et al., 2012, Gibbons et al., 2003).

Prototype Willingness Model Interventions

Previous interventions in a range of behavioural domains that are based on the social reaction pathway of the PWM have shown some evidence of the potential to alter prototypes and subsequent behaviour (Blanton et al., 2001, Ouellette et al., 2005). Blanton et al. (2001), reported that willingness to have unprotected sex was reduced by presenting participants with a newspaper article purporting to report the results of a survey indicating that other people of the same age held negative views of non-condom users. In another intervention, pupils aged 10-11 completed activities that highlighted a negative image of young people who smoke and this was effective in reducing willingness to smoke in recipients when compared to a control group (Andrews et al., 2011). However, there are other interventions based on the PWM that have been less successful in reducing risk behaviours. For example in targeting binge drinking in female university students (Todd and Mullan, 2011). Because evidence for the effectiveness of PWM interventions is mixed, it is important to determine exactly which behavior change techniques (BCTs) should be applied in order to target alcohol prototype perceptions.

According to the assumptions within the PWM, an intervention should aim to target alcohol prototypes to reduce young people's willingness to drink and subsequent episodes of spontaneous drinking. At present there is no unifying set of BCTs that are clearly linked to the PWM. In order to illustrate which BCTs might reflect the social reaction pathway in the model we looked to the existing PWM literature and selected eight studies that targeted young people (adolescents and students, or those of student age; under 25). Descriptions of the content of the interventions were extracted from the methods section of each paper. In order to identify the BCTs used in these existing interventions, we compared the descriptions to a 40 item taxonomy of BCTs (Abraham, 2012) to determine if they would map onto defined BCTs. If they did not then we described them by summarising the authors' descriptions. We then compared these techniques to the objectives identified in a logic model developed to chart the assumed change processes in the PWM to determine if the BCTs targeted prototypes and peer pressure to drink (Table 1)

[Insert table 1]

The literature review and extraction of techniques showed that an intervention to target the social reaction pathway in the PWM could apply some existing BCTs. However, some of the BCTs should be more clearly specified to ensure they address the assumptions in the pathway. For example, changing prototypes does relate to the BCT of 'providing a positive or negative group identity', but does not clearly imply the need to focus on descriptions of those who drink or do not drink. A logic model was constructed to demonstrate the link between the change processes in the social reaction pathway, existing BCTs and BCTs that relate more clearly to the model (Table 2).

[Insert Table 2]

Intervention development

It is important to consider the most appropriate format for a new intervention. The prevalence of internet use and growing smartphone and tablet use means that an online method of delivery has the potential to be able to reach large numbers of young people (Abraham and Block, 2012). A recent report suggested that 95% of young people had access to a computer at home, and 94% of children aged 11-16 owned a mobile phone (Childwise, 2015). However, this still leaves a proportion of, perhaps the most vulnerable, children who cannot be reached. Nevertheless, using a web based mode of delivery within the classroom could reach large numbers of young people and ensures that intervention fidelity can be maintained compared to an instructor delivered programme (Teesson et al., 2012). Using a game is another way in which interventions may be potentially attractive to young people. This is sometimes referred to as 'gamification' and has been applied to interventions targeting sexual health in young people in the UK (Arnab et al., 2013). Questions and answers are used as part of the PR:EPARe sexual health intervention which has shown promise in helping young people to avoid sexual coercion (Arnab et al., 2013). 'Serious games' for use in educational settings have been suggested as a good way to engage with young people and a survey suggested that it was something that teachers would consider acceptable to use as well (Williamson, 2009). Furthermore, a recent study has demonstrated the effectiveness of targeting prototypes using an online intervention (van Lettow et al., 2015).

We developed a quiz made up of ten questions, each specifically linked to one of the four identified BCTs, with the objective of changing alcohol prototypes and reducing reactive drinking influenced by social pressure. The information in the quiz was presented as originating from a survey of other young people, in line with other studies (Teunissen et al., 2012, Blanton et al., 2001). For each question there were three possible choices provided and the correct answer was intended to be presented in the form of a video clip of a young person in the target age group explaining the answer. Prototype descriptions were taken from previous

development work (Davies et al., 2013). The quiz questions and answers can be seen in Table 3.

[Insert Table 3]

Method

Delphi study

A Delphi study seeks a consensus of expert opinion through a series of structured questionnaire rounds usually incorporating both quantitative and qualitative measures (van Teijlingen et al., 2006). Experts are selected for their knowledge and experience in the field of study and are consulted using a structured format. An advantage of using a Delphi approach is that it can be carried out without the panel of experts having to meet, saving time and expense (Powell, 2003). The current study used a modified or 'reactive' Delphi that set out a number of pre-defined areas for experts to respond to rather than an entirely open first round inviting experts to set their own priorities for development (Tonni and Oliver, 2013, McKenna, 1994).

Participants and procedure

An initial list of 37 experts were contacted and invited to take part. These experts were selected because they were identified in the literature as having relevant knowledge about alcohol and young people, the PWM or intervention development. On the study start date the 20 experts who had agreed to take part were sent an email with the study instructions, a summary of the intervention development process, a plan of the intervention and a link to the first round questionnaire. One week before the deadline they were sent an email reminder to ask them to complete the study. There were two weeks between the end of round one and the start of round two, after which the 15 experts who took part in round two were sent the second questionnaire. Experts were required to complete both questionnaires to record their feedback within three weeks of the start date of each round.

Completion of the questionnaire implied consent at each round and participants were free to withdraw at any time. The study was approved by Oxford Brookes University Research Ethics Committee (reference number 120618).

Measures and analysis

Structured questionnaires (available from the first author on request) were used to collect feedback from experts in both rounds. They were set out in three sections; 1) theory and technique, 2) format and mode of delivery and 3) overall comments, with statements and rating scales used to measure agreement to them. For example one statement in the 'theory and technique' section was 'the change processes targeted by this intervention are clear'. The questionnaires were piloted with two experts who had experience in alcohol misuse in young people and intervention development and were revised accordingly. For expert ratings of the statements in each round, consensus was defined using the median and interquartile deviation (IQD) in line with previous research (Brouwer et al., 2008, Schneider et al., 2012). The median score indicates the average level of agreement from 1 (lowest level of agreement) to 7 (highest level of agreement). The IQD is calculated as the difference between the 75th quartile (Q3) and the 25th quartile (Q1) divided by 2. An IQD of ≤ 1 is considered as a good indicator of consensus in a Delphi study that uses a 7 point scale (De Vet et al., 2005, Brouwer et al., 2008, Schneider et al., 2012). In this study we accepted that experts were positive about the rating statements if the median level of agreement was 5 or above in round one. In round two, statements were ranked in order of priority from 1 (most important) to 6 (least important) and we identified priorities as those with a median rank of 3 or above that also reached consensus (IQD of ≤ 1).

Open question responses were coded as; 1) positive/ supportive, 2) negative/ critique, 3) suggestions or 4) neutral/ explaining responses. In round one, comments which were coded as negative/ critique or suggestions were grouped into priority areas to be explored in the second round. Attention was also given to comments from experts that indicated a lack of consensus either by them explaining a response to a statement which did not achieve consensus or where

they did not agree with other comments. These were also included as areas to be explored in the second round. Coding was discussed between the authors until agreement was reached.

Results

Twenty experts (54% of those contacted) agreed to take part and were sent the round one questionnaire. Fifteen experts (75% of those agreeing to take part) completed round one and of those, 11 (69% of those who took part in round one) also completed round two. Response rates were in line with other Delphi studies that typically achieve a response rate of around 30-40% in the first round (Brouwer et al., 2008, Schneider et al., 2012). Details about the areas of expertise of those who took part compared to those who did not are shown in Table 4. Participants were not told the identity or the number of other experts taking part.

[Insert Table 4]

Delphi Survey Round 1

Theory and technique section: Table 5 shows the rating statements and the median and IQD for each statement. An acceptable consensus was achieved for five out of the six statements in the theory and technique section. Experts did not reach a consensus in response to the statement 'the behaviour change techniques have been applied appropriately in the intervention'.

[Insert Table 5]

There were 34 comments made under the individual statements in the 'theory and technique' section (an average of 5.6 per statement). In the comment boxes, positive/ supportive statements were received about the theory, the materials, the behaviour change process and process of development:

It is very clear which questions relate to which objectives (expert 4).

Negative/ critical comments were received about how well the BCTs targeted reactive decision making, the incorporation of norms and the source of the survey data presented in the quiz

questions. Suggestions were made as to how the intervention might better target the social reaction pathway:

> *Instruction on resisting social pressure does not seem very helpful - what about incorporating implementation intentions more explicitly? (expert 14)*

Format and mode of delivery: In this section consensus was achieved for all statements, and there were 52 comments (8.6 per statement). Positive / supportive comments were received about the game format and its appeal to young people:

> *I think the interactive quiz element will be of interest, and I find that young people are always ready to discuss their alcohol use, or at least hold an opinion on it (expert)*

Negative or critical comments were received about the use of survey information purporting to be from other young people, the credibility of the information and the concerns about creating a negative image of those who drink:

> *I would caution presenting a negative image of young drinkers, this in itself can be attractive to some and a wholly negative image may not resonate with a larger sample of young people (expert 1).*

Overall comments section: In the 'overall comments' section, experts said that strengths of the intervention were its theoretical basis, the format, and that the content would be engaging to young people. Weaknesses were that the quiz questions talked about social pressure in a vicarious way, that it may be too brief and there should be an incentive to complete the questions.

Delphi Survey Round 2

The second round of the Delphi study expanded and clarified the information from the first round, thus progressively building feedback between rounds. In the second structured feedback questionnaire, each section began with a statement to summarise the most common

positive or supportive comments made by the participants in round one (for example in the theory section, the summary told participants that group members were positive about the PWM as a basis for the intervention and the development process used). This was followed with six statements summarising the areas in round one where either consensus was not achieved or where critical feedback was received. The results of the ranking exercise are shown in Table 6. There were fewer comments received from the participants in round two than in round one.

[Insert Table 6]

Theory and technique section: Consensus was achieved on two of the six statements in this section. These statements were ranked in the top three and were about addressing social pressure in the intervention and incorporating implementation intentions. Comments suggests that a priority for further work is to use more techniques to help young people deal with social pressure

> *Consensus seems to be that more needs to be done to address social pressure and develop ways to resist social pressure (expert 13)*

Format and mode of delivery: Consensus was achieved for four of the six statements in this section including the three highest priority statements. Five additional comments were made; two concerned the statement about using survey data, for which consensus was not reached.

Overall comments section: Consensus was achieved for the highest priority statement in this section which was that the intervention was too brief and may need a booster or additional session. Credibility and the need to include interaction between young people were rated highly but did not achieve consensus. The statement ranked the least important concerned the use of a mobile phone application to deliver the intervention. Consensus was achieved for the fifth most important statement about recruiting in the target age group.

Drawing together the findings, it was clear that there were some unifying features of the feedback from the expert participants that could be addressed in the next stage of intervention development. Firstly, it was seen that the participants highlighted a need to increase BCTs that address social pressure. Secondly, the intensity and length of the intervention should be considered. Thirdly, there were questions around how to motivate or incentivise young people to complete this type of intervention. Finally, they suggested that it would be important to address the believability of intervention messages.

Discussion

Evidence suggests that the PWM could provide a suitable basis for an intervention aimed at reducing alcohol misuse in adolescents in the UK (Rivis et al., 2006, Davies et al., 2013). However, at present there are no clearly defined BCTs linked to the PWM. A plan for a novel alcohol misuse intervention was developed incorporating four BCTs. This was reviewed by a group of experts in a two round Delphi study. The expert participants were supportive of the theoretical basis of the planned intervention and the application of BCTs on the whole. The consensus indicated four priority enhancements to improve the intervention: 1; social pressure BCTs, 2; intensity and length, 3; incentive and 4; believability of intervention messages. We now discuss these four elements in light of the literature in order to review the utility of the Delphi method in the intervention development process.

Firstly, to help young people anticipate the impact of social pressure and make plans for overcoming this pressure, a more specific application of implementation intentions could be utilised. Implementation intentions are plans which link situations to specific actions or behaviours, resulting in an automatic initiation of behaviour on encountering the pre-specified situation (Gollwitzer, 1999). This technique has been found to be effective across a wide range of health behaviours (Gollwitzer and Sheeran, 2006). In relation to our intervention, it is likely that making a plan in advance to overcome social pressure for excessive alcohol consumption arising in a specified situation may override a socially cued response based on the social

reaction pathway (e.g., "If I am at a party where I am offered alcohol, then I will only have one drink!"). A more recent study has shown that this technique could be effective in reducing the influence of binge drinker stereotypes on young people's drinking (Rivis and Sheeran, 2013).

Secondly, the experts thought that the intervention was too brief and made suggestions as to how it could be expanded. For example, by including a fact sheet, classroom activities, or delivering it as part of a package of measures. Text messaging was also suggested as a means of expansion; this has been shown to be an effective method of helping adults to give up smoking (Free et al., 2011). Text messages have the potential to intervene at the time of the behaviour and so potentially to interrupt reactive behaviours in situ. However they may be impractical to deliver and are often sent at intervals that have been predetermined by the research team. However, booster sessions, which remind participants of intervention messages, have been found to increase effect sizes in school delivered programmes (Cuijpers, 2002).

Thirdly, the experts in the Delphi study highlighted the importance of ensuring there was an incentive for young people to complete the intervention. Another Delphi study on internet interventions for this age group also indicates that they need to be rewarding in some way (Crutzen et al., 2008). It is important to address this priority with young people themselves to explore what might incentivise them. However, if delivered in a school setting as part of a lesson then this may not be as pressing as if young people were expected to complete the intervention in their own time.

Fourthly, the question of believability of intervention messages was raised in relation to the proposed negative prototype of a young person who drinks alcohol. It was suggested that if drinking alcohol is normative behaviour for older teenagers and adults then attributing *only* negative characteristics to that person may be ineffective and lack credibility. The concept of different categories of drinker prototypes (negative excessive drinkers, moderate responsible drinkers for example) has recently been explored in relation to young adults and drinker prototypes in the Netherlands (Van Lettow et al., 2012) and suggests that it may be important

to consider different kinds of prototypes and their characteristics. A more recent study has found that using different types of characteristics in prototype feedback is effective when delivered to adults (van Lettow et al., 2015). Although the use of survey data as a way of manipulating prototypes has been used previously (Blanton et al., 2001, Todd and Mullan, 2011), expert participants were divided on its use in the current study. Opponents argued that the source of the information in the quiz and any supporting materials must be seen as emanating from a credible source. In the next phase of development we will explore means of increasing believability of messages with young people themselves. It is clear that intervention developers still need to determine the most appropriate means of changing prototypes, whether this is by aiming to enhance a the similarity and favourability of a healthy prototype or by encouraging distancing from an unhealthy prototype (Lane et al., 2011).

Implications

As yet there are no existing taxonomies of BCTs for use in preventive interventions to reduce alcohol misuse in adolescents. Moreover, there is a lack of agreement about the specific content of BCTs that target constructs in the PWM. This is the first paper that has attempted to identify specific BCTs for the PWM. Four BCTs relevant to the PWM were identified for use in an adolescent alcohol misuse intervention. Further work can now be undertaken to determine the effectiveness of these BCTs, and to build on a more unified approach to developing interventions based on this theory. This paper has also reported a novel application of the Delphi method to inform the development of an intervention. The Delphi method has been shown to be a useful means of gaining feedback, in a relatively short period of time, from a group of international experts on a novel intervention. This method may be useful to other intervention developers who wish to seek consensus on the application of theory to the design of a new programme. The method is likely to be particularly useful when there is no existing consensus about the most appropriate BCTs to us for a specific target population or behaviour.

For example, a recent meta-analysis demonstrates that using self-monitoring may be the most effective BCT to enable adults to reduce their alcohol consumption(Michie et al., 2012).

We have discussed the main findings of the study to illustrate the potential benefits of the approach for other intervention developers. For example, the Delphi study findings suggested that expert participants agreed that using implementation intentions could be a means of interrupting the spontaneous pathway to behaviour in the PWM. The literature relating to this specific technique appears to support its application, even though it has not been specifically linked to the PWM in previous studies, thus demonstrating the usefulness of the results of the Delphi method. Areas to improve the current intervention can be taken forward to the next phase of development. Expert feedback may be a useful addition to gaining input from the intended intervention recipients, or other stakeholders, in particular when the theoretical basis is less well established, or new BCTs are proposed.

Limitations

It is important to note that the literature search was not intended to comprise a systematic review of the PWM, but to provide information about existing interventions. Thus it is likely that some studies were not identified that were in existence at the time of the search. Subsequently, other PWM intervention papers have been published, for example targeting college student drinking in a bar lab by presenting positive or negative information about drinker prototypes (Teunissen et al., 2012), but none have been identified that specifically set out BCTs based on the PWM. Another recent study has aimed to target risk images by manipulating characteristics and the popularity of chat room participants (Teunissen et al., 2014). These studies appear to be attempting to alter prototype perceptions in a similar way to BCTs 1 and 2 in this study. Moreover, subsequent generic taxonomies of BCTs have been published in which a greater number of techniques are described (Michie et al., 2013). Further research should focus on exploring the effectiveness of PWM interventions in order to identify appropriate BCTs for a range of both risky and healthy behaviours.

Although care was taken in selecting the list of potential group members for the Delphi study, the voluntary, self-selected nature of participation means that the group may not be representative. Four participants were lost between round one and round two of the study; all from the UK. But overall, the geographical spread of contributors and their specific expertise in the field reflected a group with good credibility, giving strength to our findings. Moreover, this study showed that it may be important to look beyond quantitative consensus to free text comments that can indicate strength of feeling on particular points.

Finally, it is important to note that evidence of consensus does not imply that the 'right' set of priorities has been identified (Keeney et al., 2001). We have discussed our findings in relation to relevant literature, and it appears that current research lends support to the areas identified.

In conclusion, this study used a systematic approach to theory-based intervention development and design, identifying relevant BCTs to incorporate into an intervention and through feedback and consensus development establishing priorities for further development and refinement of the intervention. This approach to intervention development may be useful when undertaking projects using less well researched theories, new techniques or applying existing approaches in new target populations.

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Tables

Table 1: *Behaviour change techniques identified in PWM literature. Numbers refer to techniques in 40 item taxonomy (Abraham, 2012)*

Behaviour Change Technique	Andrews et al. 2011	Lane et al. 2011	Litt & Stock 2011	Todd & Mullan 2011	Ouellette et al. 2005	Gibbons et al. 2005	Brody et al. 2004	Blanton et al. 2001
1) Provide information about behaviour - health link	✓					✓		
2) Describe likely material consequences of behaviour	✓					✓		
4) Prompt recipients to assess their own risks					✓	✓		
9) Provide information about others' behaviour		✓		✓				
10) Provide info about others' approval of the behaviour	✓	✓	✓	✓				✓
12) Provide positive / negative identity for actors/abstainers	✓	✓	✓	✓		✓	✓	✓
16) Provide instruction on how to perform a behaviour				✓				
Other: Mere measurement					✓	✓		
Other: Prompt to think about future self-image								

Table 2 *Objectives and linked behaviour change techniques identified as relevant for PWM intervention*

Objective	Existing BCTs identified as linked to objectives	Target in the PWM	Social reaction pathway BCT
Change prototypes	Provide a positive or negative group identity	Drinker prototypes negative non-drinker prototypes positive	1)Present a positive non-drinker and or negative drinker prototype and enhance similarity to non-drinker
Change prototypes	Provide information about others' behaviour	Corrects norm misperception that everyone drinks	2) Present information on other people's drinking to reduce perception of drinker prototype as the norm to enhance similarity to non-drinker
Reduce spontaneous social influences on behaviour	Prompt barrier identification	Awareness of social influence on drinking	3) Teach awareness of social/ environmental cues to behaviour (that reactive or unplanned is more risky)
Reduce spontaneous social influences on behaviour	Provide instruction on resisting social pressure	Show how others resist: present them in a positive light	4) Provide examples of how other young people resist social pressure in social situations

Table 3: PWM intervention quiz questions and answers presented to participants in the Delphi study and their links to the BCTS and processes in the PWM

BCT	Description of how it relates to process in the PWM	Question number and content	Answer (intended to be presented as a young person in video to explain answer)
1)	Images are often based on misperceptions: Correct misperceptions about the target behaviour	1) Over the last ten years the number of young people aged 11-15 who drink has.....?	Answer b) Decreased
1)	Young people often think that other young people have favourable risk images	2) Most people aged 11-15 don't drink alcohol at all What were the reasons given for not drinking?	Answer b)There has been a change in what young people think about drinking alcohol
2)	Young people often think that other young people have favourable risk images. Most young people do actually have negative risk images	3) We asked the young people in our survey how they would describe a typical teenager who drinks alcohol Which do you think were the three most popular words used?	Answer c) The three most popular words were anti-social, careless and unhealthy
2)	Enhancement of non-drinker image to reinforce positive characteristics – healthy images represent goal states	4) We asked young people in the survey how they would describe a typical teenager who does not drink alcohol Which do you think were the three most popular words used?	Answer a) The three most popular words were sociable, confident and independent.
2)	Similarity important due to social comparison. Enhance similarity to non-risk prototype	5) In the survey we asked people if they thought they were more similar to the typical drinker or the typical non-drinker their age	Answer b) Non-drinker
3)	Lack of intention = risk due to lack of preparedness. Teach awareness of cues to behaviour	6) We asked young people why they had tried alcohol for the first time. What do you think was the most common answer?	Answer a) Peer pressure

BCT	Description of how it relates to process in the PWM	Question number and content	Answer (intended to be presented as a young person in video to explain answer)
3)	Unplanned behaviour can be risky (Awareness of social cues)	7) Jade said she did not plan to drink when she went to the party. What did some people say had happened to them after drinking alcohol when they had not planned to?	Answer: b) They had too much to drink and they were ill
3)	We might act in an unplanned way because of peer pressure (Awareness of social cues)	8) What do you think was chosen in our survey as the best way to deal with pressure to drink?	Answer b) Young people made plans in advance to help them if they felt under pressure
4)	Examples of how other young people resist social pressure in social situations (demonstrating an if, then plan for an unplanned behaviour)	9) Knowing the facts about alcohol can help to make plans about what to say if you feel under pressure For example, do you know how many calories are in alcoholic drinks? Can you guess how many Calories are in a bottle of wine? a) 2 burgers b) 2 apples c) 2 cakes	Answer a) 2 burgers Nina: Two burgers is a lot of calories. Alcohol is so full of calories! If someone pressures me to drink then I tell them that fact, they might laugh, but it is true and no one bothers me about it
4)	Examples of how other young people resist social pressure in social situations (demonstrating an if, then plan for an unplanned behaviour)	10) There are many myths about alcohol. Harry's friend told him that if you get drunk then drinking black coffee can help you to sober up Is this true or false?	Answer b) False Harry: It is false. The only thing that can sober you up is time. I'm really into football so if someone is telling me to drink, then I tell them that I need to be fit and healthy to stay on the team

Table 4 *Numbers and characteristics of Delphi study participants and non-participants who were invited to take part*

Characteristic	Refused to Participate (n=23)	Participant (round 1) (n=15)	Participant (round 2) (n=11)
Health Psychology	4	2	1
Work with PWM	5	3	3
Alcohol research	5	3	2
Young people	5	4	2
Intervention design	4	3	3
Male	15	8	5
Female	7	7	6
UK	12	7	3
Europe	4	2	2
USA	6	2	2
Australia	0	4	4

Table 5 *Rating statements from round one of the Delphi study with median rating and interquartile deviations (IQD).*

Round one statements	Median	IQD
Theory and technique statement		
1) This theory is a suitable basis for an intervention with young people aged 11-15	5	0.5*
2) The intervention materials reflect the theoretical basis of the intervention	6	0.5*
3) The change processes targeted by this intervention are clear	6	0.5*
4) The behaviour change techniques applied reflect the change processes specified by the theory	6	0.5*
5) The behaviour change techniques have been applied appropriately in the intervention	5.5	1.25
6) The process of intervention development from theory to proposed planned materials is clear	6	0*
Format and mode of delivery statement		
1) The use of a mobile phone application is a suitable mode of delivering the intervention	6	1*
2) The use of a game is a good way to engage with young people	6	1*
3) The use of survey information makes the information credible to young people	5	1*
4) This intervention will create a positive image of young people who do not drink alcohol	5	1*
5) This intervention will be effective in targeting peer influences on drinking	5	.5*
6) This intervention would be interesting for young people aged 11-15	5	.5*

Note * = consensus achieved

Table 6 *Results of ranking exercises in round two of Delphi study for theory and technique statements showing number of participants at each rank, median rank and IQD*

Section and statement	Rank						Median	IQD
Theory and technique	1	2	3	4	5	6		
Further work needed on addressing social pressure	0	6	2	2	0	1	2	1*
Incorporate implementation intentions	2	2	3	2	2	0	3	1*
Expand on reasons for alcohol refusal	3	0	3	2	1	2	3	2
Intervention does not sufficiently target reactive pathway	4	0	0	3	1	3	4	2.5
Make the distinction norms & prototypes clearer	1	2	2	0	5	1	5	1.5
Consider using insights from other theories	1	1	1	2	2	4	5	1.5
Format and mode of delivery	Rank						Median	IQD
	1	2	3	4	5	6		
Include of follow up prompts or fact sheets	5	3	2	0	0	1	2	1*
Needs to be more incentive for young people to complete quiz	2	3	2	2	2	0	3	1*
Believability of messages in the survey	1	1	6	1	2	0	3	0.5*
Issues with using fake survey data to be considered	1	0	1	5	2	2	4	0.5*
Concerns about context of intervention / behaviour	2	1	0	2	2	4	5	2
Caution about negative image of drinkers	0	3	0	1	3	4	5	2
Overall comments	Rank						Median	IQD
	1	2	3	4	5	6		
The intervention is too brief, needs booster session	1	4	5	0	1	0	3	0.5*
Credibility: May not be taken seriously	3	2	1	4	1	0	3	1.5
Need interaction between young people	2	2	2	1	3	1	3	1.5
Does not address contextual issues in alcohol consumption	3	1	0	3	2	2	4	2
It will be difficult to recruit in target age	2	0	2	3	2	2	4	1*

Note * = consensus achieved