**Continuum beliefs are associated with higher problem recognition than binary beliefs among harmful drinkers without addiction experience**

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**Abstract**

Low problem recognition may be an important barrier to opportunities for self-change or help-seeking in harmful drinkers. Little is known about how the beliefs harmful drinkers hold about the nature and causes of alcohol problems affect problem recognition and subsequent behaviour change processes. Participants (n=597) recruited online were randomised to one of two conditions designed to promote beliefs according to (a) a continuum model of alcohol problems or (b) a binary disease model, or (c) a control condition. Participants completed measures of alcohol problem beliefs, problem recognition and other indices including the Alcohol Use Disorder Identification Test (AUDIT), addiction beliefs, addiction experience and demographics. Results showed that harmful drinkers without addiction experience exposed to the continuum condition had significantly higher problem recognition than those in binary disease model or control conditions. Continuum beliefs appear to offer self-evaluative benefits for harmful drinkers with low alcohol problem recognition, thus potentially facilitating help-seeking or self-change regarding alcohol use. Further research to understand the mechanisms by which continuum beliefs may promote more accurate drinking self-evaluation and its potential for behaviour change is warranted. The role of continuum beliefs may have important consequences for alcohol-related messaging and interventions seeking to promote self-change or help-seeking.

**Keywords:** alcohol misuse; problem recognition; stigma; continuum; addiction; recovery

**1. Introduction**

Alcohol use disorders (AUDs) represent a significant public health burden associated with an estimated 3 million global deaths each year (World Health Organization, 2018). By definition, harmful drinkers consume alcohol at levels which are already causing negative psychological or physiological consequences (WHO, 2018), though most do not have levels of alcohol dependence typically associated with alcohol treatment engagement or help-seeking (Khadjesari, Stevenson, Godfrey, & Murray, 2015; Pryce, Buykx, Gray, Stone, & Drummond, 2017). Harmful drinkers in particular show limited recognition of the potential or actual problems associated with their drinking, for example, underestimating their consumption when compared with other AUD groups (Garnett et al., 2015) or explicitly rating their drinking as non-problematic (Glass, Grant, Yoon, & Bucholz, 2015).

Some studies have identified a lack of explicit problem recognition as the primary reason for limited engagement with alcohol treatment services (Probst, Manthey, Martinez, & Rehm, 2015), whilst brief interventions may be insufficient to engender behaviour change amongst this group (Saitz, 2010). Other reasons for low treatment engagement have been proposed as inadequate identification by primary care physicians (Oyefeso et al., 2008), a preference to undertake change without help (Saunders, Zygowicz, & D’Angelo, 2006), a perception of low problem severity (Tucker, Vuchinich, & Rippens, 2004) and, in particular, the stigma associated with alcohol problems and treatment engagement (Mannarini & Boffo, 2015; Speerforck, Schomerus, Matschinger, & Angermeyer, 2017).

At present there is limited research exploring problem recognition among harmful drinkers, and it is unclear to what extent the beliefs they hold about the nature of problem drinking itself and its causation affect change processes (Young, 2011). For example, holding beliefs in line with a binary disease model (BDM) of addiction may impact problem recognition among harmful drinkers who, by implication, are required to position their own drinking as falling on one side of the implied addiction binary (Moore, Pienaar, Dilkes-Frayne, & Fraser, 2017).

Disease model interpretations of alcohol problems have long history in the alcohol field, dating from the early 19th Century (Levine, 1978). This way of conceptualizing alcohol problems was reinforced by the teachings of Alcohol Anonymous (AA) beginning in the USA in the 1930s and the subsequent influence of the AA model of alcoholism on medical views of alcohol problems (Heather & Robertson, 1997). Partly as a consequence of this medical endorsement, BDM aligned beliefs continue to permeate lay understandings of alcohol-related problems to the present (Meurk, Carter, Partridge, Lucke, & Hall, 2014; Pienaar et al., 2017), despite recent efforts to move towards a continuum model such as through the DSM-V (American Psychiatric Association, 2013).

In contrast to BDM associated beliefs about alcohol problems, continuum beliefs may hold advantages for problem recognition, and have shown promise in the mental health field (Corrigan et al., 2016; Schomerus et al., 2016). Continuum beliefs may be summarised as a recognition of issues such as alcohol use and associated problems as existing across a broad spectrum, i.e., ‘symptom continuity’ (Schomerus, Matschinger, & Angermeyer, 2013), consistent with a dose-response relationship for alcohol consumption and harms (Rehm et al., 2013; Saha, Chou, & Grant, 2006). Continuum type beliefs, however, feature less prominently in lay understandings of alcohol problems and their perceived causes; for example, only 27% of respondents in a study in Germany endorsed them (Schomerus et al., 2013), whilst BDM consistent framings of ‘alcoholism’ appear more widely recognised (Parke et al., 2018; Pienaar et al., 2017).

Some studies indicate that psychosocial models similar to alcohol-related continuum beliefs may have important advantages with respect to alcohol-related self-efficacy (Schomerus, Corrigan, et al., 2011; Wiens & Walker, 2015), aspects of stigma (Lebowitz & Ahn, 2014; Schomerus, Matschinger, & Angermeyer, 2014) and treatment engagement (Glass, Mowbray, Link, Kristjansson, & Bucholz, 2013). Wiesjahn et al. (2016) proposed that continuum beliefs inherently challenge the idea of a dichotomous separation between those with illnesses or conditions and everyone else (Wiesjahn, Jung, Kremser, Rief, & Lincoln, 2016).

Calls have therefore been made for further research into the effect of ‘alcoholism’ beliefs on problem recognition (Young, 2011), the potential for continuum beliefs in attenuating alcohol-related stigma and help-seeking (Rehm et al., 2013; Schomerus et al., 2013), as well as for interventions to “reframe the widely recognised but poorly understood concept of alcoholism” (Wilson et al., 2013, p.8).

In seeking to develop understanding of the potential role of alcohol problem framing on problem recognition among harmful drinkers, the current study sought to test the effect of continuum and BDM beliefs on self-reported alcohol problem recognition within a general population sample of drinkers. The role of addiction experience was predicted to play a moderating role in problem recognition, such that the hypothesised effects would be seen only in harmful drinkers without self-identified addiction experience. Whilst harmful drinkers typically exhibit low problem recognition, this tendency is unlikely to be observed amongst those who self-identify past or present alcohol problems, essentially indicating high problem recognition. Addiction experience, whether personal or through other significant experience such as close friends or family (Glass et al., 2013), may also be associated with stronger beliefs about addiction and thus lower susceptibility to the effects of experiments seeking to manipulate related beliefs. For example, engagement or identification with addiction or recovery narratives may engender firmer BDM beliefs (Angermeyer, Matschinger, & Schomerus, 2013; Barnett, Hall, Fry, Dilkes-Frayne, & Carter, 2018). No effect amongst non-harmful drinkers was predicted owing to more accurate baseline problem appraisal. That is, non-harmful drinkers rate their drinking as less problematic than harmful drinkers, but are more objectively accurate in doing so. Thus, non-harmful drinkers may not have sufficient discrepancy between any drinking problems and recognition of these for any such manipulations to be perceived as self-relevant.

In summary, we hypothesised a three-way interaction between harmful versus non-harmful drinking, addiction experience and belief type:

1. Amongst harmful drinkers without addiction experience, continuum beliefs are associated with higher problem recognition;
2. Amongst harmful drinkers without addiction experience, BDM beliefs are associated with lower problem recognition.
3. Amongst non-harmful drinkers there is no effect of problem framing via either continuum or BDM beliefs (null hypothesis).

**2. Method**

*2.1 Participants*

Participants were invited to complete an online study using Qualtrics software via Facebook advertisments targeting people in England over the age of 18 and via the lead researcher’s Twitter account. In total, 703 participants accessed the link, 614 of whom completed the questionnaire. Fifteen cases were removed where participants clicked through the manipulation page in less time than required to complete its viewing (detailed in 2.2). Two cases were removed where participants had identified both ‘no addiction experience’ and one addiction experience option. Therefore 597 participants completed the study and were included in the analyses.

Participants provided demographic information that identified the sample as 52.9% (n=316) men, 46.4% (n=277) women and <1% other (n=4). The mean age of participants was 37.21 (SD=13.58). Regarding nationality, 89% (n=532) self-identified as British, 2.5% as American (n=15), 2.3% as Irish (n=14), with the remaining responses (n=36) indicating other nationalities.

*2.2 Design and Procedure*

The design of the study is shown in Figure 1. An experimental design with three conditions involving short video vignettes was utilised. After accessing the study link, participants were directed to an information page and asked to provide informed consent. Optional demographic information was collected followed by AUD measures (see 2.3.1). Participants were primed to watch a short video and to ensure they would be able to hear the audio or make use of the subtitles. Participants were then randomised by the survey platform to one of the three manipulation conditions (continuum, BDM or control; see Supplementary Material for scripts) which contained a fictionalised first-person vignette in audio-visual format. Following the video vignette participants were required to correctly answer two questions about its content before being able to continue. Eight participants answered both questions incorrectly and were excluded. Next, beliefs about alcohol problems were assessed, followed by presentation of a health risk infographic. Participants completed further measures (not discussed in this paper) relating to defensive processing of the health risk infographic, past drinking changes, self-relevance, self-efficacy and unrealistic optimism. Addiction experience was assessed before participants were directed to the debriefing page and invited to leave optional contact details to be eligible to win one of two £50 Amazon vouchers.

Insert Figure 1 about here

 The video vignettes were designed to manipulate beliefs based on narrative persuasion methods (Hamby, Brinberg, & Daniloski, 2017). Narrative accounts are viewed as an important mechanism for persuasion and have been used in health behaviour change (Shen, Sheer, & Li, 2015) and other domains (Hamby et al., 2017). The control vignette contained an actor describing his first-person experience of alcohol problems lasting 30 seconds. Both continuum and BDM conditions also included the material presented in the control condition followed by an additional explanation of the narrator’s drinking and its perceived causes, either in accordance with a continuum or BDM, lasting approximately an additional 35 seconds. Participants were informed about the fictional nature of the vignettes at debriefing.

*2.3 Measures*

*2.3.1 Premanipulation.*

Participants completed demographic items including age, gender, nationality and employment status and completed self-reported alcohol consumption via the AUDIT-C (Khadjesari et al., 2017) to quantify harmful drinking. AUDIT-C has been found to be of comparable utility to the full AUDIT in detecting alcohol use disorders (Dawson, Smith, Saha, Rubinsky, & Grant, 2012) and to distinguish between levels of AUD at different cut-offs (Meneses-Gaya et al., 2010). Harmful drinking has been found to be suitably captured by the UK-adapted version of the AUDIT-C amongst a largely UK-based population (Khadjesari et al., 2017). Thus AUDIT-C scores of ≥8 for women or ≥9 for men were operationalised as harmful drinking with a possible score range of 0-12. The remaining AUDIT questions (questions 4-10), known as the AUDIT-P problem subscale of the AUDIT (Johnson et al., 2019), were gathered as a covariate with a possible score range of 0-28. In the present study, AUDIT-C was found to have internal reliability of α = .72 and the covariate AUDIT-P items α = .80.

*2.3.2 Postmanipulation.*

*Problem Drinking Belief Scale.* To directly assess whether exposure to each experimental condition led to a difference in problem framing as predicted, participants completed an adapted version of the 18-item Addiction Belief Scale (ABS) (Schaler, 1995). From here on, the adapted scale will be referred to as the Problem Drinking Belief Scale (PDBS) because ten references in the ABS to ‘addiction’, ‘alcoholism’ or ‘dependence’ were replaced with ‘problem drinking’ or ‘problem drinkers’. The PDBS compromises two subscales, with the assumption that the adaptation of the ABS subscales measuring ‘free will’ and ‘disease model’ would capture continuum and BDM beliefs. Participants responded to a 5-point Likert scale, rating each item from 1 (*strongly disagree*) to 5 (*strongly agree*), with lower scores indicating stronger degree of belief in the continuum model and higher scores indicating a stronger degree of belief in the binary model. The aim of the PDBS was therefore to more specifically assess participants’ beliefs about the nature and causes of alcohol problems and thus serve as a manipulation check.

Whilst the ABS was originally designed to assess addiction beliefs as aligned to either the free will/moral model or disease model of addiction, it was viewed as a suitable measure for adoption given its validity and use in previous studies (e.g Wiens & Walker, 2015). Other studies have successfully adopted non-alcohol specific scales to measure beliefs about ‘alcohol problems’ (Schomerus, Corrigan, et al., 2011). However, in the present study internal consistency for the PDBS was α = .53 for the continuum subscale and α = .73 for the BDM subscale. The continuum subscale’s relatively poor consistency may be due to its adaptation from a scale originally designed to test a ‘free will’ model of addiction rather than one seeking to measure continuum beliefs. Therefore, whilst the BDM subscale was largely analogous to the original ABS disease model scale, the continuum subscale referred to ‘problem drinking’ which in itself may still be more aligned to a more dichotomous idea of problem drinkers versus non-problem drinkers. Consistency of the continuum subscale could not be improved by removing any of the items.

To assess prior addiction experience, participants were asked to identify whether they had *“Personal experience of addiction”*, *“Work or have experience working in an addiction-related role”*, *“Close friends or family who have experienced addiction”* or *“None”*. Participants could select between zero and all four options. Two contradictory responses to the question were removed where ‘none’ and one other addiction experience option was selected.

To assess problem recognition, participants completed four items from the SOCRATES (Stages of Change Readiness and Treatment Eagerness Scale: (Miller & Tonigan, 1996) as used in other studies (e.g. Nye, Agostinelli, & Smith, 1999). Example items include *“There are times when I wonder if I drink too much”* and *“My drinking is causing a lot of harm*”. Participants responded on a 5-point Likert scale ranging from *“Strongly disagree”* to *“Strongly agree”*. In the analysis below, problem recognition was measured by the total of these 4 SOCRATES items with a possible score range of 4 – 20, with higher scores indicating a higher degree of problem recognition. An internal reliability of α = .90 was found in the present study.

*2.4 Analysis Plan*

To assess the intended effects of the manipulation on problem framing, two one-way ANOVAs with Condition (3 levels: control, continuum, BDM) as a between-participant independent variable and the two PDBS subscales (Continuum and BDM) as the dependent variables were conducted.

To assess Hypothesis 1 and 2 above regarding the effects of the experimental manipulation on problem recognition, a 3 (control vs. BDM vs. continuum) x 2 (addiction experience vs. no addiction experience) x 2 (harmful vs. non-harmful drinking) between participants factorial ANCOVA was conducted. The dependent variable was problem recognition and the covariate was the mean of the AUDIT-P. The covariate was selected on the basis of these questions asking participants’ self-reported experience of alcohol-related problems, with analysis confirming a significant correlation with the dependent variable of problem recognition (*r* = .73, *p*<.001). A Bonferroni adjusted simple effects analysis was conducted to test significant effects identified by the ANCOVA. The factorial ANCOVA was also used to test Hypothesis 3 above regarding the lack of effect of experimental manipulations amongst non-harmful drinkers.

**3. Results**

*3.1 Manipulation check: problem framing*

Analyses were conducted using IBM SPSS Statistics Version 21. Results showed a significant difference between Conditions on the continuum (*F* (2, 594) 8.91, *p*<.001, ηp2= .029) and BDM (*F* = (2, 594) 15.62, *p*<.001, ηp2= .050) PDBS subscales.

The first test examined whether the manipulation effectively influenced problem framing and results showed a significant difference between Conditions. Post-hoc analysis using Bonferroni showed that, for the BDM belief scale, control differed significantly from BDM (*p* =.001) and continuum differed significantly from BDM (*p* < .001) in the predicted directions. The difference between control and continuum was not significant (*p =*.140). For the continuum belief scale, control differed significantly from continuum (*p* = .003) and continuum differed significantly from the BDM (*p* < .001) in the predicted directions. The difference between control and BDM was not significant (*p* = .999). These results suggest that the intended manipulation effect on problem framing by condition had occurred and, despite a relatively low alpha for the continuum subscale, the PDBS was sufficient as a manipulation check. Thus, planned analysis of the effect of the manipulation on problem recognition as the dependent variable was conducted.

*3.2 Effect of problem framing on problem recognition*

It was hypothesized that alcohol problem framing would affect self-reported problem recognition amongst harmful drinkers without self-identified addiction experience, whereby BDM beliefs would be associated with lower problem recognition and continuum beliefs would be associated with higher problem recognition. Results showed a significant main effect of condition on problem recognition (*F* (2, 584) = 3.36, *p =* .035, ηp2 = .011), a significant main effect of harmful drinking (*F* (1, 584) = 11.14, *p* = .001, ηp2= .019), and a significant condition x harmful drinking interaction (*F* (2, 584) = 3.75, *p* = .024, ηp2 = .013). The predicted three-way interaction of condition, addiction experience and harmful drinking was significant (*F* (2, 584) = 3.10, *p* = .046, ηp2 = .011). Means and standard deviations are displayed in Table 1.

Insert Table 1 about here

To explore the significant interactions, simple main effects analysis was conducted. Results showed significant differences between conditions for harmful drinkers (*F* (2, 584) = 5.94, *p* = .003). Harmful drinkers in the continuum condition had significantly higher problem recognition scores than non-harmful drinkers (*F* (1, 584) = 17.15, *p* < .001). No significant difference between conditions for non-harmful drinkers (*F* (2, 584) = .027, *p* = .973) was found, thus failing to the reject the null hypothesis 3, as predicted.

To explore the three-way interaction effect, a simple main effects analysis was conducted. Amongst those with no addiction experience (n = 196), a significant main effect of condition was found (*F* (2,189) = 4.15, *p* = .017), such that problem recognition was significantly higher in the continuum condition compared to the BDM condition (*p* = .014). A significant difference between conditions for harmful drinkers was found (*F* (2,189) = 7.173, *p* = .001), with a significant difference between continuum and BDM conditions (*p* < .001) and continuum and control (*p* = .007). No significant difference was shown between control and BDM condition (*p* = .350). Within the continuum condition, harmful drinkers had significantly higher problem recognition versus non-harmful drinkers (*F* (1,189) = 12.63, *p* < .001), whilst no significant difference was found between harmful and non-harmful drinkers within the control (*F* (1,189) = .001, *p* < .973) or BDM (*F* (1,189) = .052, *p* < .820) conditions. Thus, support for hypothesis 1 was confirmed; continuum beliefs were associated with higher problem recognition amongst harmful drinkers with no addiction experience. However, hypothesis 2 of an effect of BDM beliefs amongst harmful drinkers with no addiction experience was not supported.

Insert Figure 2 about here

**4. Discussion**

The results of this study show that the beliefs harmful drinkers hold about the nature of alcohol problems can have important implications for problem recognition. As hypothesised, harmful drinkers without addiction experience exposed to continuum beliefs assessed their drinking as more problematic than those exposed to BDM beliefs. This finding provides evidence supporting the use of continuum framing as a potential facilitator of behaviour change processes amongst harmful drinkers largely unreached by current treatment and intervention programmes.

 Results did not support the hypothesis that BDM beliefs would, in contrast, be associated with lower problem recognition among harmful drinkers without addiction experience. Notably, harmful drinkers not exposed to continuum beliefs (BDM and control) had levels of problem recognition not significantly different from non-harmful drinkers, adding to evidence that harmful drinkers in particular underestimate their drinking problems (Garnett et al., 2015; Khadjesari et al., 2018). There was also no evidence of an effect of experimental conditions on problem recognition among non-harmful drinkers. However, this null hypothesis cannot be confirmed, only rejected (i.e., absence of evidence does not mean evidence of absence). It may be that, in a larger sample or under different experimental conditions, such an effect might be found. All we can conclude here is that the null hypothesis of no effect of problem recognition was not rejected, suggesting that non-harmful drinkers may be more accurate in appraisal of their drinking harms as low, whilst harmful drinkers, who appraise their drinking similarly, are less accurate.

Continuum beliefs were associated with higher problem recognition only amongst harmful drinkers without self-identified addiction experience, consistent with the expected moderating role of addiction experience. A main effect of harmful drinking was found only amongst those with addiction experience, supporting the assumption that addiction experience is associated with higher problem recognition independent of problem framing. The main analysis compared those with any self-identified addiction experience (personal, professional, close friends or family) against those with no addiction experience.

There are several potential mechanisms by which continuum beliefs may increase problem recognition amongst harmful drinkers. One explanation is via stigma-related factors, such that continuum beliefs may reduce the perceived personal threat of alcohol problems (Schomerus, Lucht, et al., 2011). Lay accounts suggest harmful drinkers are acutely conscious of the stigmatising connotations of having an alcohol problem and fear being labelled an ‘alcoholic’ (Hasin et al., 2013; Wallhed Finn, Bakshi, & Andréasson, 2014), whilst implicit negative stigma effects have also been associated with ‘alcoholism’ labels (Ashford, Brown, & Curtis, 2018).

A reliance on binary frameworks amongst harmful drinkers seeking to distance their drinking from a stigmatising problem label may also be evidenced by accounts of ‘othering’ (Jensen, 2011; Thurnell-Read, 2017). Qualitative studies suggest harmful drinkers frequently describe ‘other’ drinking groups as constituting problem drinkers, a consistent theme amongst heavy drinking mid-life men (Parke et al., 2018). This process is akin to separation as a key stage of the stigma trajectory (Link & Phelan, 2001), also applied in the context of health and illness behaviours in which individuals seek to set apart distinct ‘unhealthy other’ outgroups and construct a ‘healthy self’ (Green, 2009).

Another potential mechanism by which continuum beliefs increase problem recognition is by facilitating a more objective appraisal of alcohol-related risk and harm, potentially creating a discrepancy conducive to greater problem recognition (Agostinelli, Floyd, Grube, Woodall, & Miller, 2004). That is, while a binary framework such as the disease model may logically enable a drinker to separate themselves from the othered problem drinker, continuum beliefs fundamentally challenge the legitimacy of a dichotomous separation (Pienaar et al., 2017; Schomerus et al., 2013). As such, irrespective of the potential role of stigma, accepting alcohol use and problems as a continuum inherently challenges the validity of a distinct group of problem drinkers, essentially undermining any ‘perceived fundamental difference’ (Schomerus et al., 2016), and instead ‘emphasizes similarity’ (Wiesjahn et al., 2016).

Binary framings of alcohol problems may also reflect a lack of a language or framework to describe the continuum of alcohol use or problems beyond ideas of alcoholism (Pienaar et al., 2017; Rehm et al., 2013). The absence of a publicly understood continuum framework for alcohol use and problems may stem from cognitive (Macrae, Milne, & Bodenhausen, 1994) tendencies towards reductionist or essentialist interpretations of illnesses (Dar-Nimrod & Heine, 2011), potentially resulting in an ‘explanatory vacuum’ (Oettingen, Grant, Smith, Skinner, & Gollwitzer, 2006). When facing difficulty explaining one’s behaviours, defensive reactions may be heightened (Oettingen et al., 2006). Thus, drinkers who feel unable to justify their alcohol use may feel increasingly motivated to create and separate themselves from a stigmatised problem drinking out-group (Schomerus, Corrigan, et al., 2011; Wilson et al., 2013). In contrast, continuum beliefs may act to facilitate a more nuanced and stigma-alleviating appraisal of one’s own drinking, with potential for increased problem recognition and subsequent behaviour change.

**5. Limitations**

Respondents to online questionnaires vary in the level of effort and engagement (DeSimone & Harms, 2017), though the survey included elements to maximise engagement, including overall brevity and items checking engagement with the manipulation video and infographic. Participants recruited via social media may not be representative of the general population, thus generalisability may be limited.

Harmful drinking was determined using the AUDIT-C which, though found to be a valid measure for this purpose (Khadjesari et al., 2017), still relies upon self-reporting of alcohol consumption, thus likely to result in underestimation (Boniface & Shelton, 2013). Owing to a desire for brevity and limitations such as sample size, harmful drinkers were not distinguished from those who may have had moderate or severe levels of alcohol dependence other than via self-identified addiction experience. As such, limited inferences can be drawn about the specificity of the effects to harmful drinkers only.

The manipulations were designed to reflect common interpretations of continuum and BDMs of alcohol problems in order to maximise engagement. However, in doing so, each model included different recovery responses (i.e., reduced drinking versus abstinence) and implications for self-regulation. As such, it is possible that these differences contributed to the results independent of the core continuum vs BDM framing implications. Future research should therefore seek to distinguish between potential framing effects and differing recovery or treatment beliefs.

Limited inferences concerning participants’ pre-existing beliefs can be drawn since these were not measured prior to the manipulation. Although the manipulation check supported the effects of the conditions in the predicted directions, a low alpha for the continuum subscale (α = .53) raises the question of its suitability. This may be due to the PDBS continuum subscale being adapted from a scale designed to assess belief in a free-will model of addiction (Schaler, 1995) rather than continuum beliefs.

**6. Conclusion**

This study provides new evidence supporting the potential for continuum beliefs to promote problem recognition amongst harmful drinkers without addiction experience. It provides further evidence that harmful drinkers in particular have low problem recognition, which appears an important early stage in behaviour change processes including self-change or help-seeking. Important factors for further investigation may include the role of stigma, addiction experience, processes of ‘othering’, and the availability of explanatory frameworks for lay interpretations of harmful drinking.

**Supplementary material: Vignette scripts**

**Control**

Hi, I’m Dan. Alcohol can cause some people problems so I wanted to talk to you about mine briefly. I’m 54 now and work part time. I’m divorced with two kids who I see as much as I can. In the past I’ve had problems with alcohol. I had high blood pressure which my doctor told me was a result of my drinking, and it was affecting my mood and relationship – alcohol probably played a role in my divorce if I’m honest.

**V1: Continuum**

Hi, I’m Dan. Alcohol can cause some people problems so I wanted to talk to you about mine briefly. I’m 54 now and work part time. I’m divorced with two kids who I see as much as I can. In the past I’ve had problems with alcohol. I had high blood pressure which my doctor told me was a result of my drinking, and it was affecting my mood and relationship – alcohol probably played a role in my divorce if I’m honest.

My drinking had become a problem but I’m not so different from most people. There is no clear line between my experience and those who don’t have alcohol issues - anyone could develop a problem with alcohol if they drink heavily**.**

Once I realised it had become a problem I really cut down. I drink much less than I used to, I don’t drink most days and only have one or two when I do. It was tough to adapt at first but making the change was important for my future health and happiness. I’m in a good place now but everyone who drinks should keep an eye on it – problems can creep up on anyone.

**V2: Binary Disease Model**

Hi, I’m Dan. Alcohol can cause some people problems so I wanted to talk to you about mine briefly. I’m 54 now and work part time. I’m divorced with two kids who I see as much as I can. In the past I’ve had problems with alcohol. I had high blood pressure which my doctor told me was a result of my drinking, and it was affecting my mood and relationship – alcohol probably played a role in my divorce if I’m honest.

My drinking had become a problem but I’m different from most people. There is a clear line between my experience and those who don’t have alcohol issues - most people can control their drinking even if they drink heavily.

Once I realised I had a problem I stopped drinking altogether. I’m an alcoholic and that means I can’t touch a drop without relapsing. I attend support groups as part of my recovery. It was tough to adapt at first but making the change was important for my future health and happiness. I’m in a good place now but I must never drink again – alcoholism is a disease.

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Assessment of demographic data, alcohol consumption and use disorder (AUDIT)

First person audio-visual account of ‘Dan’ describing past alcohol problems, beginning: “Hi, I’m Dan. Alcohol can cause some people problems so I wanted to talk to you about mine briefly...”

First person audio-visual account of ‘Dan’ describing past alcohol problems as per control, plus continuum framed beliefs e.g. “I’m not so different from most people. There is no clear line between my experience and those who don’t have alcohol issues”

Control condition (n=205)

Continuum condition (n=199)

Binary disease model condition (n=193)

First person audio-visual account of ‘Dan’ describing past alcohol problems as per control, plus binary framed beliefs e.g. “I’m different from most people. There is a clear line between my experience and those who don’t have alcohol issues”

Video engagement check questions

Manipulation check (i.e. problem framing via PDBS)

Addiction experience (moderator variable) and problem recognition (dependent variable)

Debriefing

Note: AUDIT=Alcohol Use Disorders Identification Test, PDBS=Problem Drinking Belief Scale

**Fig.1** Design of the study



**Fig.2** Means of problem recognition score by condition (control, continuum, binary disease model) amongst harmful and non-harmful drinkers without self-identified addiction experience

**Table 1:** *Means and standard deviations (in parentheses) for Problem Recognition scores by Condition, Addiction Experience and Harmful Drinking status.*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Control condition(n = 205) | Continuum condition(n = 199) | Binary disease model condition(n = 193) | Main effect means |
|  | No addiction experience (n = 69) | Addiction experience(n = 136) | No addiction experience(n = 69) | Addiction experience(n = 130) | No addiction experience(n = 58) | Addiction experience(n = 135) |
| Harmful | 10.68 *(4.07)c* | 13.20 *(4.40)d* | 12.93 *(4.74)abc* | 12.55 *(4.21)e* | 9.33 *(4.05)b* | 12.30 *(4.56)* |  *12.28 (4.48)* |
| Non-harmful | 7.95 *(3.64)* | 8.10 *(4.16)d* | 6.95 *(3.22)a* | 7.74 *(4.06)e* | 7.35 *(3.27)* | 8.67 *(4.94)* | 7.89 *(4.06)* |
| Main effect means | 8.94 *(4.00)* | 10.88 *(4.98)* | 9.38 *(4.88)* | 9.70 *(4.74)* | 8.07 *(3.67)* | 10.42 *(5.08)* |  |

*Note 1:* The problem recognition subscale reflects a +1 (*strongly disagree*) to +5 (*strongly agree*) rating scale.

*Note 2*: Unadjusted means included

*a: a pairwise difference p <.001, b: a pairwise difference p <.001, c: a pairwise difference p <.05, d: a pairwise difference p <.05, e: a pairwise difference p <.05*