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Short Communication

Cue reactivity during treatment, and not impulsivity, predicts an initial lapse after treatment in alcohol use disorders

Harilaos Papachristou [a,b,*], Chantal Nederkoorn [a], Janneke C.A.H. Giesen [a], Anita Jansen [a]

[a] *Maastricht University, Faculty of Psychology and Neuroscience, P.O. Box 616, 6200 MD Maastricht, The Netherlands*
[b] *U-Center, Epen, The Netherlands*

HIGHLIGHTS

- We examined whether craving and impulsivity predict a lapse in problem drinkers.
- Lapse was defined as drinking alcohol once during the 3-month follow-up period.
- Higher cue-elicited craving is associated with a higher probability of a lapse.
- Higher impulsivity is associated with a lower probability of a lapse.

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ABSTRACT

Both cue-elicited craving and impulsivity have been involved in alcohol misuse. However, their role in relapse has not been very clear. In the present study, we ask whether cue-elicited craving, impulsivity, and their interaction term predict a lapse in problem drinkers. Participants (n = 20) were former patients of the clinic, U-Center, in the Netherlands, who had completed a six-week alcohol treatment program and had an abstinence goal. While in treatment, they underwent a cue exposure paradigm in a real alcohol-related setting and their trait impulsivity was measured with the Barratt Impulsiveness Scale version 11 (BIS-11). During the follow-up assessment, patients were contacted again and asked about their alcohol drinking behavior during the first three months after the end of the treatment program. It was found that higher craving and lower trait impulsivity levels are associated with a higher probability of a lapse.

1. Introduction

Cue reactivity is a robust phenomenon in alcohol misuse (Carter & Tiffany, 1999). According to the conditioned incentive model, stimuli paired with the reinforcing effects of alcohol acquire incentive properties via classical conditioning. Consequently, they elicit a motivational state that elicits subjective (e.g., craving), physiological (e.g., heart rate changes), and behavioral reactivity (e.g., alcohol drinking) (Carter & Tiffany, 1999; Stewart, de Wit, & Eikelboom, 1984). According to this model, there should be at least a modest correlation between craving and alcohol drinking because both responses have a common source: the motivational state elicited by the alcohol-related cues. This relationship could help both clinicians and researchers to predict relapse in former alcohol patients based on their level of cue-elicited craving. Although there is some evidence that cue-elicited craving is a predictor of relapse to heavy drinking (Drummond & Glautier, 1994), there are also findings that do not support this prediction (Drummond, 2000).

Drummond, Litten, Lowman, and Hunt (2000) argue that there may be other factors serving as mediators/moderators of craving that could affect the predictive validity of craving in relapse. The authors argue that relapse could also be associated with the moderators/mediators themselves (Drummond et al., 2000). In support of their assumption, studies with social and problem drinkers show that higher impulsivity is linked to stronger cue-elicited craving for alcohol (Franken, 2002; Kambouropoulos & Staiger, 2001; Papachristou, Nederkoorn, Havermans, van der Horst, & Jansen, 2012; Papachristou et al., 2013). However, none of these studies has examined the role of both cue-elicited craving and impulsivity as well as of their interaction in lapse and relapse after treatment.

The present study aims to answer the aforementioned question. Participants were former inpatients of the clinic U-Center, in the Netherlands, who had undertaken a six-week treatment program for problem drinking. While in the clinic they participated in a cue-reactivity study in which they were exposed in a single session to individualized alcohol cues in a real alcohol-related setting. Their cue-elicited craving and impulsivity were measured during that study

* Corresponding author at: Maastricht University, Faculty of Psychology and Neuroscience, P.O. Box 616, 6200 MD Maastricht, The Netherlands. Tel.: +31 43 388 1927; fax: +31 43 388 4196.
E-mail address: h.papachristou@maastrichtuniversity.nl (H. Papachristou).

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(Papachristou et al., 2013). In the present study, it was hypothesized that higher impulsivity and higher cue-elicited craving as well as their interaction term are associated with a higher probability of a lapse in this group of problem drinkers during the first three months after the end of their treatment program.

2. Methods

2.1. Participants

Participants were former patients of the clinic U-Center, in the Netherlands, who underwent a six-week inpatient alcohol treatment program with an abstinence goal. The clinic used evidence-based treatment protocols including cognitive-behavior therapy and motivational interviewing. Cue exposure with response prevention was not included in the treatment program. While in the first three weeks of their treatment, 47 problem drinkers (28 men and 19 women, 41 alcohol dependent and 6 alcohol abusers) underwent a cue exposure paradigm in which they were presented with their favorite alcoholic beverage in a bar-restaurant nearby the clinic (Papachristou et al., 2013). Of the 47 problem drinkers, 20 (12 men and 8 women; 19 alcohol dependent and 1 alcohol abuser) could be reached for the 3-month follow-up assessment. There were no significant gender differences between those patients who were reached for the follow-up assessment and the rest of the group (χ^2 (1) = 0.003, ns). Similarly, there were no differences in trait impulsiveness (t (45) = 0.66, ns), in cue-elicited craving (t (45) = −0.76, ns), and in age (t (45) = −1.93, ns) between these two groups. The mean age of the participating group was 53.25 years (SD = 10.15, min = 30, max = 67). Finally, among the 20 former patients who provided information about drinking, six (5 men and 1 woman, mean age = 49.83, SD = 13.93) had a lapse and 14 (7 men and 7 women, mean age = 54.71, SD = 8.25) remained abstinent within the first 3 months after the end of the treatment program (Table 1).

Ethical approval was obtained from the Ethics Committee of the Psychology Faculty of Maastricht University. All participants were diagnosed with alcohol problems by the staff psychiatrists according to DSM-IV criteria. None of the patients had been diagnosed with either antisocial or borderline personality disorder or with attention deficit hyperactivity disorder. Additionally, none of the participants had a history of psychosis or suffered from serious brain impairment.

2.2. Measures

2.2.1. Trait impulsiveness (BIS-11)

Trait impulsiveness was measured with the Dutch version of the Barratt Impulsiveness Scale version 11 while the patients were in treatment and before their participation in the cue-exposure study (Patton, Stanford, & Barratt, 1995). The BIS-11 consists of 30 items and each item is reported on a 4-point scale. The total score ranges from 30 (low impulsivity) to 120 (high impulsivity). It is divided into three factors: motor, attentional, and non-planning impulsiveness. Previous research in a wide range of populations has confirmed the reliability of the questionnaire with Cronbach's alpha coefficient ranging from .79 to .83 (Patton et al., 1995). For the present sample of problem drinkers, the Cronbach's alpha coefficient was .8.

2.2.2. Craving

Craving was assessed with two 100-mm visual analog scales (VAS) ranging from 0 (not at all) to 100 (very much). Patients were asked (a) “How much do you feel like drinking alcohol right now?” and (b) “How strong is your urge to drink alcohol right now?” Craving levels were collected at baselines and during exposure to water and alcohol-related stimuli (in fixed order) (Papachristou et al., 2013). Based on peak intensity scores averaged across the two VAS, a difference score was calculated for each condition (water condition: exposure–baseline; alcohol condition: exposure–baseline) and finally an overall difference craving score was estimated for the whole cue exposure (alcohol difference–water difference). The overall difference craving score was used as a predictor of relapse. The same variable was also the criterion variable in the original cue exposure study with alcohol dependent patients (Papachristou et al., 2013). In the current study, the correlation coefficient r between the two craving items at each level of cue exposure was acceptable: i) water baseline: r = .9, p < .001, ii) water exposure: r = .91, p < .001, iii) alcohol baseline: r = .94, p < .001, and iv) alcohol exposure: r = .69, p = .001.

2.3. Lapse

The assessment of a lapse was part of a larger follow-up research program with the purpose to assess the effectiveness of treatment. All former patients of the clinic were contacted once by mail and email and asked to fill in an online survey. They were inquired whether they had used alcohol since they left the treatment program and if so when they used alcohol for the first time (lapse). In the present study, all patients who had an initial lapse repeated drinking thereafter and were considered to have relapsed. The patients of the current study were contacted at least three months[1] after the end of their treatment program.

3. Results

For the 6 people who lapsed, there was no significant correlation between the number of days till the lapse and impulsivity (r = −.475, p = .34, n = 6) or craving (r = −.26, p = .62, n = 6). Though non-significant, the correlation between impulsivity and days till the lapse is in the expected direction indicating that a longer amount of time to lapse is associated with lower impulsivity. Nevertheless, hierarchical logistic regression (Method: Enter) was conducted to assess whether trait impulsiveness (BIS-11), cue-elicited craving, and their interaction predict probability of a lapse in these problem drinkers. The two predictors did not correlate significantly with each other, r = .32, p = .17, ns. Both trait impulsiveness and craving scores were centered before being entered into the regression model. Both BIS-11 and cue-elicited craving were entered at Block 1 of the analysis and their interaction term, BIS-11 × cue-elicited craving, was entered at Block 2. The results suggest that higher trait impulsiveness is associated with a lower probability to lapse in this group of problem drinkers. Unlike trait impulsiveness, higher cue-elicited craving is associated with a higher probability to lapse within the first three months. Finally, the interaction between trait impulsiveness and cue-elicited craving does not predict a lapse in this group of problem drinkers. (See Table 2.)

4. Discussion

The present findings support our hypothesis that cue-elicited craving for alcohol predicts alcohol drinking. Our results show that higher cue-elicited craving for alcohol in a real alcohol-related setting is associated with an increased probability of a lapse in problem drinkers. Although our results are based on a small sample, they are in line with previous studies in which it was also found that cue reactivity predicts relapse during follow-up (Abrams, Monti, Carey, Pinto, & Jacobus, 1988; Drummond & Glautier, 1994; Rohsenow et al., 1994). Together, all these findings highlight the importance of including cue reactivity paradigms in clinical practice with the aim to reduce cue-elicited craving during treatment. Exposing problem drinkers to cues

[1] Only one patient was contacted 63 days after the end of the treatment program but since he had lapsed within the first 3 months (21 days after leaving the program) he was included in the analysis.

Table 1
Trait impulsiveness (BIS-11) and craving for alcohol (difference) scores in problem drinkers (lapse: n = 6; no lapse: n = 14).

	Lapse (n = 6)			No lapse (n = 14)			t test		
	Mean	SE	Range	Mean	SE	Range	t value	df	p value
Increase in craving for alcohol during cue exposure (100 mm)	23.42	9.17	55.5	7.68	3.52	44.5	1.6	6.53	.16
Trait impulsiveness (BIS-11)	59.83	5.21	34	67.87	2.32	33	−1.65	18	.12

in a naturalistic setting could become an integral component of alcohol treatment.

In contrast to our hypotheses, the analysis shows that higher impulsivity levels are associated with a lower probability of a lapse during the first three months after leaving the clinic. Additionally, the interaction between cue-elicited craving and impulsivity is not a significant predictor of a lapse in the present study. Our results are in contrast to the results of a recent study which shows that the Non-Planning BIS-11 scale is a significant predictor of relapse in alcohol-dependent patients but only indirectly via craving (Evren, Durkaya, Evren, Dalbudak, & Cetin, 2012). However, there is also evidence that trait impulsiveness does not always predict relapse in appetitive disorders (e.g., pathological gamblers, Goudriaan, Oosterlaan, De Beurs, & Van Den Brink, 2008). Nevertheless, we are not aware of any published study that shows a negative relationship between trait impulsiveness and relapse in appetitive disorders. Speculating on this finding, it could be that some other variable(s) interferes with the effect of impulsivity on relapse. Higher impulsivity could still predict a lapse for some problem drinkers but not for others. Additionally, there is some evidence from research on eating behavior showing that impulsive adolescents benefit more from weight-reduction therapy that contains behavior modification strategies (Pauli-Pott, Albayrak, Herebrand, & Pott, 2010). Similarly, it could be that some impulsive problem drinkers might benefit more from their therapeutic program. Evidently, this unexpected finding awaits replication from future research.

Our study has several limitations. Our analysis is based on a small and relatively old (mean = 53.25 years, min = 30, max = 67) sample and it is possible that a larger and younger sample would show a different relationship between impulsivity and relapse. Additionally, we have used only one self-report measure of impulsivity and future studies should also include behavioral measures such as the stop signal task (Christiansen, Cole, Goudie, & Field, 2012; Verdejo-Garcia, Lawrence, & Clark, 2008). Furthermore, the validity of the self-reported measures of abstinence was not confirmed by collateral reports and/or biological markers. Despite the limitations, our study is the first one which examines the role of cue-elicited craving, trait impulsivity, and their interrelationship in lapse and relapse in alcohol misuse. Our results are in line with those cue reactivity models that interpret cue-elicited craving as a motivational index of substance misuse and provide support to the clinical relevance of the cue exposure paradigm in alcohol misuse (Drummond et al., 2000). Finally, our findings highlight the importance of studying cue-elicited craving in the natural drinking environment where cue-elicited responses may have greater predictive value (Drummond et al., 2000). The role of context in cue-elicited craving may be even more important in alcohol cue reactivity studies as it has been found that alcohol-dependent drinkers experience lower levels of cue-elicited craving than other addicts (Carter & Tiffany, 1999). Overall, our findings suggest that cue reactivity is an important determinant of a lapse and relapse and it might be wise to reduce cue reactivity during treatment.

Table 2
Logistic regression model used to predict lapse in problem drinkers (lapse: n = 6; no lapse: n = 14).

	B (SE)	95% CI for odds ratio Lower	Odds ratio	Upper
Constant	−1.19			
Cue-elicited craving	0.11* (0.05)	1.005	1.116	1.238
Trait impulsiveness (BIS-11)	−0.17* (0.08)	0.724	0.848	0.992
BIS-11 × cue-elicited craving	−0.01 (0.01)	0.971	0.991	1.011

Note: Block 1 R^2 = .39 (Cox & Snell). Model χ^2 (2) = 10.02, p = .007; Block 2 R^2 = .43 (Cox & Snell). Model χ^2 (3) = 11.24, p = 0.01, ns. Block χ^2 (1) = 1.22, p = 0.27, ns.
* p < .05.

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Contributors
Harilaos Papachristou has written up the manuscript, conducted the statistical analysis, and designed the cue exposure. Dr. Janneke Giesen has designed the follow-up assessment and contacted former patients. Professor Anita Jansen and Dr. Chantal Nederkoorn have supervised the whole manuscript, including the statistical analysis, the design of the cue exposure and the follow-up. All authors contributed equally to the manuscript and have approved the final manuscript.

Conflict of interest
No conflict of interest by any author.

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