



Effects of repetitive imagination of alcohol consumption on craving in alcohol-dependent patients: A pilot study



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ARTICLE INFO

Article history:

Received 26 May 2016

Received in revised form 15 July 2016

Accepted 5 August 2016

Available online 07 August 2016

Keywords:

Alcohol dependence

Alcohol use disorder

Craving

Repetitive imagination

Cue-exposure

Habituation

ABSTRACT

Background: In the majority of patients with alcohol use disorder (AUD), the clinical course is characterized by multiple relapses to drinking, frequently preceded by intense craving for alcohol. The present pilot study aimed to assess the effects of a repetitive imaginary cue-exposure protocol in reducing craving in recently abstinent alcohol-dependent patients.

Methods: Sixty-four patients were randomly assigned to six intervention groups and were instructed to repetitively imagine: i) drinking a glass of their preferred alcoholic drink (low vs. high number of repetitions); or ii) drinking a glass of water (low vs. high number of repetitions); or iii) performing an analogous movement or performed no imagination. Additionally, 10 healthy controls were instructed to repetitively imagine drinking a glass of their preferred alcoholic drink (high number of repetitions). The levels of craving before and after intervention were measured using the Alcohol Urge Questionnaire (AUQ) and the Visual Analogue Scale for Craving (VASC).

Results: Repetitive imagination of alcohol consumption did not lead to a significant decrease in craving in alcohol-dependent patients as measured by the AUQ and VASC. In contrast, healthy controls showed a nearly significant decrease of the urge to drink alcohol after applying the protocol with a high number of repetitions.

Conclusions: The findings of this pilot study might indicate an aberrant ability to habituate to alcohol-related stimuli in patients with AUD compared to healthy subjects. Future studies in larger samples are needed to further explore the effectiveness of imaginary cue-exposure interventions in alcohol dependence.

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1. Introduction

Alcohol dependence is a chronic disorder characterized by multiple relapses to drinking after detoxification treatment in the majority of patients (Bottlender, Spanagel, & Soyka, 2007). To improve mid- and long-term treatment outcome, several therapeutic approaches can be applied to support patients in reducing alcohol consumption or in maintaining alcohol abstinence. With regard to psychotherapy, particularly cognitive-behavioral therapy (CBT) has proven efficacy in alcohol dependence (Magill & Ray, 2009).

According to the theoretical framework of CBT, addictive disorders can be regarded as learned behavioral reactions based on conditioning processes (Kadden, 2001). CBT interventions for alcohol dependence commonly include strategies to reduce craving (Back, Gentilin, & Brady, 2007; Naqvi et al., 2015), a strong desire to consume a drug, which has been shown to be an important predictor for relapse in some alcohol-dependent patients (Carter & Tiffany, 1999; Niaura et al., 1988). Craving has been described as a conditioned reaction that might be elicited by stimuli (cues) that have previously been associated

with the consumption of drugs; thus, alcohol-associated stimuli can become conditioned cues that engender conditioned responses such as alcohol craving (Heinz, Beck, Grusser, Grace, & Wrase, 2009; Ludwig & Wikler, 1974). Besides conditioning models of craving, also cognitive models have been proposed assuming that responses to alcohol-associated stimuli involve cognitive processes (e.g., expectations regarding the positive effects of alcohol) (Anton, 1999). In this context, desire thinking has been described as a voluntary cognitive process including verbal and imaginary elaboration of a desired target (e.g., alcohol consumption) (Caselli & Spada, 2011; Caselli, Ferla, Mezzaluna, Rovetto, & Spada, 2012). It is based on the so-called Elaborated Intrusion theory of desire which suggests that the occurrence of craving might result from a combination of conditioned and voluntary cognitive processes (Caselli & Spada, 2015; Kavanagh, Andrade, & May, 2005). Desire thinking has been reported to contribute to the escalation of craving (Caselli, Soliani, & Spada, 2013).

Exposure therapy is a common CBT technique regularly used in anxiety or obsessive-compulsive disorders (Abramowitz, 2013). Thereby, prolonged exposure to a specific stimulus is used to induce habituation and reduce anxiety-related reactions (Myers, 2008). Habituation is defined as the response occurring when a specific stimulus is repeatedly presented, leading to a decrease of previous reactions that were usually

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induced by that stimulus (Epstein, Temple, Roemmich, & Bouton, 2009; Myers, 2008). One of the substantial features of habituation is stimulus specificity, i.e., the decrease of responding is specific to the habituating stimulus whereas novel stimuli might evoke recovery of responding (Epstein et al., 2009; Myers, 2008). Other stimuli, so called dishabitators, might lead to a weakening of habituation as shown in behavioral experiments using taste or olfactory stimuli (Critchley & Rolls, 1996; Epstein, Rodefer, Wisniewski, & Caggiula, 1992; Wisniewski, Epstein, & Caggiula, 1992). Regarding food intake, a recent study reported a decrease in craving for chocolate in female participants repetitively exposed to chocolate cues (Coelho, Nederkoorn, & Jansen, 2014).

In substance use disorders, studies on the clinical efficacy of cue-exposure techniques reported mixed results; in cigarette smokers, one study found an abstinence rate of 36% after 8 cue-exposure sessions, but an abstinence rate of only 7% one month later (Corty & McFall, 1984). A laboratory study in smokers found an increase in craving for cigarettes after *in vivo* exposure to smoking cues on several days (Miranda, Rohsenow, Monti, Tidey, & Ray, 2008). In alcohol dependence, one study with a follow-up of up to 12 months showed a decrease in alcohol consumption in patients receiving cue-exposure treatment (Rohsenow et al., 2001) whereas a meta-analysis found no evidence for the efficacy of this treatment approach in addictive disorders (Conklin & Tiffany, 2002). On a neurobiological level, a recent functional Magnetic Resonance Imaging (fMRI) study showed that repeated sessions of cue-exposure therapy in alcohol-dependent patients lead to reduced cue-elicited brain activation during the presentation of alcohol-related stimuli (Vollstadt-Klein et al., 2011).

In CBT, cue-exposure therapy can be applied both *in vivo* and *in sensu* (imaginary cue-exposure). Imagination techniques are a well-known therapeutic approach in anxiety disorders (Myers, 2008). Imagination of specific, especially phobic stimuli can lead to anxiety-related reactions similar to real confrontations with the specific stimuli and therefore can be applied in exposure treatment (Lang, 1977; Myers, 2008). Regarding substance-related disorders, Tiffany & Drobos found an increase of craving for nicotine in smokers who imagined cigarette smoke (Tiffany & Drobos, 1990). Similarly, one study in smokers reported a craving induction by personalized as well as standardized imaginary smoking scenarios (Conklin & Tiffany, 2001). Recently, Morewedge et al. published a study on the effects of imaginary food consumption (Morewedge, Huh, & Vosgerau, 2010). In several experiments, the study investigated the effects of repetitive imagination of consumption of chocolate balls (up to 30 times) on the consecutive real consumption of chocolate. Control conditions included repetitive imagination of consumption of chocolate balls fewer times (3 times), consuming cheese balls, and performing an analogous movement (inserting a coin into a washing machine). The authors observed a significant decrease in real consumption of chocolate balls after frequent repetitive imagination (30 times). They hypothesized that repetitive imagination of consumption might lead to habituation and consequently to a reduction of real consumption (Morewedge et al., 2010). Consistently, several studies underline the ability of mental imagery to reduce cravings for food (Kemps & Tiggemann, 2014).

The objective of the present study was to examine the effects of repetitive imagination of alcohol consumption on craving in recently detoxified, abstinent alcohol-dependent patients. Based on positive findings in healthy subjects and positive results from *in vivo* cue-exposure studies in alcohol-dependent patients, we hypothesized that frequent repetitive imagination of alcohol consumption might lead to a reduction in craving for alcohol in patients with AUD.

2. Methods

This study was conducted at the outpatient unit of the Department of Psychiatry and Psychotherapy at the Campus Charité Mitte of the Charité – Universitätsmedizin Berlin. Patients were recruited from the

outpatient department between February 2012 and October 2014. Inclusion criteria for men and women were: (a) age of ≥ 18 and < 65 years; (b) diagnosis of alcohol dependence according to ICD-10 (WHO, 1994); (c) a completed in- or outpatient detoxification before randomization; and (d) sufficient German language skills. Exclusion criteria were significant internal, psychiatric (axis I diagnoses other than alcohol or nicotine dependence) or neurological conditions which require immediate treatment (as assessed by an experienced physician) as well as treatment mandated by a legal authority. Healthy controls were recruited at the Campus Charité Mitte. This study was conducted in accordance with the principles of the Declaration of Helsinki and Good Clinical Practice and approved by the local ethics committee. Written informed consent was obtained from all study participants.

2.1. Study design and procedures

Patients were recruited and assigned to six treatment groups by baseline adaptive randomization. All patients attended up to six imagination sessions (three times a week) planned for the two weeks following their alcohol detoxification treatment. The investigator was blinded to the treatment condition. In case of relapse, participants left the study subsequently. Relapse rate was not an outcome measure due to the short duration of the study. During the sessions, participants were seated in front of a monitor showing one picture of an alcoholic drink or water in a glass or a cup of cleaning agent. Each picture appeared for 3 s and was presented several times (depending on the treatment group, see below). Participants were instructed to repetitively imagine: i) drinking a glass of their preferred alcoholic drink (as assessed at baseline); or ii) drinking a glass of water; and/or iii) performing an analogous movement (i.e., filling a cup of cleaning agent into a washing machine; a control condition which includes a motor action similar to drinking) for several times (depending on the treatment group). In group 1, the presentation included a picture of a cup of cleaning agent for three times followed by a picture of the preferred alcoholic drink for 30 times. The same protocol was applied in group 2 except for a picture of a glass of water which was shown instead of the preferred alcoholic drink. In group 3, a picture of a cup of cleaning agent was presented for 30 times, followed by a picture of the preferred alcoholic drink for 3 times. The same protocol was applied in group 4 except for a picture of a glass of water which was shown instead of the preferred alcoholic drink. In group 5, a picture of a cup of cleaning agent was presented for 33 times, group 6 did not receive any of these interventions, but underwent an identical clinical procedure at the outpatient unit. Group 7 consisted of healthy subjects who received the same intervention as group 1 (a picture of a cup of cleaning agent for three times followed by a picture of the preferred alcoholic drink for 30 times). Healthy subjects performed only one session. This group was included to assess differences in the effects of repetitive imagination compared to alcohol-dependent patients. The number of imagined actions was the same in each intervention group (33 repetitions) to keep effort constant across groups.

Before and after this presentation which took approximately 2–3 min, study participants completed the Alcohol Urge Questionnaire (AUQ) (Bohn, Krahn, & Staehler, 1995) and the Visual Analogue Scale for Craving (VASC) (Mottola, 1993) to assess changes in craving. The AUQ consists of 8 items (item 1: “All I want to do now is have a drink”) rated on a 7-point Likert scale from “strong disagreement” to “strong agreement” with higher total scores reflecting a higher level of craving for alcohol. The AUQ has been shown to have a strong internal consistency ($\alpha = 0.91$) and has been validated for assessing craving in laboratory studies (Bohn et al., 1995). The VASC consists of a continuous horizontal line with 100 mm length and two endpoints [no desire (0) to very strong desire (100) for the question “How strong is your desire for alcohol right now?]. A high correlation ($r > 0.99$) between visual analogue scales and categorical 5-point scales for measuring pain has

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