



Clinical effectiveness of attentional bias modification training in abstinent alcoholic patients

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ABSTRACT

A new training to decrease attentional bias (attentional bias modification training, ABM) was tested in a randomized controlled experimental study with alcohol-dependent patients as an addition to cognitive behavioral therapy. In alcohol dependence, attentional bias has been associated with severity of alcoholism, craving, treatment outcome, and relapse. Forty-three patients with DSM-IV diagnosis of alcohol dependence were randomly assigned to an ABM intervention or control training. The procedure consisted of five sessions in which patients were trained to disengage attention from alcohol-related stimuli (ABM condition) or in which they were trained on an irrelevant reaction-time test (control condition). We measured the effects of ABM on the visual-probe task, with stimuli that were presented in the ABM and with new stimuli. Craving was measured with the Desires for Alcohol Questionnaire. Follow-up data were gathered for overall treatment success, and relapse up to 3 months after the intervention. ABM was effective in increasing the ability to disengage from alcohol-related cues. This effect generalized to untrained, new stimuli. There were no significant effects on subjective craving. For other outcome measures there were indications of clinically relevant effects. Results indicate that ABM among alcohol-dependent patients was effective and that it may affect treatment progression. Large-scale trials are warranted to further investigate this new field.

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1. Introduction

Cognitive behavioral treatment programs primarily target voluntary information processing, ignoring the potential significance of any disadvantageous involuntary processes (McNally, 1995; Öhman, 1996). However, there is accumulating evidence that involuntary or uncontrolled cognitive mechanisms play an important role in psychopathology (Mobini and Grant, 2007; Wiers et al., 2007). New interventions directly targeting these processes may therefore be a valuable addition to existing cognitive behavioral treatment programs.

In alcohol and drug addiction, an extensively researched involuntary cognitive process is attentional bias (AB). AB is a selective

attention for drug cues, which is hypothesized to have causal effects on substance abuse, addiction development and maintenance (Field, 2005; Franken, 2003; Robinson and Berridge, 1993; Weinstein and Cox, 2006). According to the incentive sensitization theory, AB results from repeated pairing of alcohol cues with direct effects of alcohol, leading to a sensitized reaction to alcohol cues which causes them to become highly salient (Robinson and Berridge, 1993, 2001). AB has been studied in relation to alcohol dependence (e.g. Field and Cox, 2008; Jones et al., 2006; Stetter et al., 1995) and in relation to dependence on other illicit drugs, including heroin (Lubman et al., 2000) and cocaine (Vadhan et al., 2007).

AB has been theorized to share a reciprocal causal relationship with craving (Franken, 2003; Robinson and Berridge, 1993). This relationship however, is not evident under all circumstances (Lubman et al., 2000; Noel et al., 2006; Waters et al., 2003). A recent meta-analysis showed a significant, albeit weak relationship between self-reported craving and AB ($r = .19$; Field et al., 2009b). This moderate correlation may be explained by a direct effect of AB

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on behavior without craving as a mediating factor: either as a result of habit (Tiffany, 1990) or as a result of incentive salience (Robinson and Berridge, 2001). In addition to craving and drinking behavior, studies have shown associations between AB and the severity of addiction (Bearre et al., 2007; Fadardi and Cox, 2006; Jones et al., 2006; Noel et al., 2006), poor treatment outcome (Carpenter et al., 2006), and relapse following treatment (e.g. Cox et al., 2002; Marissen et al., 2006). Further, excessive drinkers with low compared to high AB have been found to be three times more successful in cutting down (Cox et al., 2007). Altogether, these data suggest that patients may benefit from interventions that help decrease their AB toward their drug of preference, and thus positively influence their recovery.

MacLeod et al. (2002) developed a computerized task to directly modify AB for negative stimuli in anxiety. This attentional bias modification training (ABM), was based on the visual-probe task which measures AB. ABM in anxiety has been found to modify relatively early attention processes, such as the speeded detection of disorder-related stimuli (words or pictures), as well as relatively late attentional processes, such as the difficulty to disengage from these stimuli. Typically, the effectiveness of this ABM procedure has been assessed by measuring effects on AB for new stimuli that have not been used in the training (generalization), and on other disorder-relevant cognitions and behaviors.

Previous studies applying this ABM were in anxiety (Amir et al., 2009; MacLeod et al., 2002, 2007; Mathews and MacLeod, 2002; Schmidt et al., 2009; See et al., 2009), smoking (Attwood et al., 2008; Field et al., 2009a), and non-clinical samples in alcohol abuse (Field et al., 2007; Field and Eastwood, 2005; Schoenmakers et al., 2007). The effectiveness of alcohol-ABM in decreasing AB and related symptoms in controlled studies with non-clinical samples has been limited. The effects did not generalize toward new stimuli, which is essential for the training to be useful outside the laboratory. Moreover, these studies did not show any decrease in craving or drinking behavior (Field et al., 2007; Field and Eastwood, 2005; Schoenmakers et al., 2007). Such generalization appears to be an essential prerequisite for a clinically useful application of ABM, a step recently taken in anxiety research (Schmidt et al., 2009). More positively, a recent study employing a different ABM technique (based on the alcohol-Stroop task) found that after repeated training sessions, ABM and alcohol use reduced compared with baseline (there was no control group; Fadardi and Cox, 2009). Here, we present results of a randomized controlled experimental study of repeated ABM in alcoholic patients.

To the best of our knowledge, the present study is the first randomized controlled experimental study on the effectiveness of a visual probe based ABM in a clinical sample of (alcohol) dependent patients. Based on the literature, we identified three factors that appear to increase the effectiveness of ABM interventions. The first is motivating participants to improve training performance and control over their attention (Fadardi and Cox, 2009; Wiers et al., 2006). The second is the presentation of a large number of different stimuli in the training, since generalization toward new stimuli has only been found after trainings with more stimuli than used in previous alcohol-ABM studies (Amir et al., 2009; MacLeod et al., 2002, 2007; See et al., 2009; Smith et al., 2006). The final aspect is performing multiple training sessions, which have been shown to have more profound effects than single session trainings: single ABMs affected only state vulnerability for stress (MacLeod et al., 2002) whereas repeated ABM sessions affected trait anxiety (Amir et al., 2009; Mathews and MacLeod, 2002; Schmidt et al., 2009; See et al., 2009). In addition, effects on fast attentional processes were only found after multiple sessions, both in anxiety (Mathews and MacLeod, 2002), and in addiction (Fadardi and Cox, 2009).

The goal of the present randomized controlled experimental study was to test alcohol-ABM in a clinical sample of alcohol-

dependent patients. The objective of the training was to improve patients' ability to control their attention for alcohol cues. We modified our earlier ABM paradigm (Schoenmakers et al., 2007) based on the three aspects reviewed above: motivating participants, presenting many stimuli, and presenting multiple sessions. We expected the ABM to decrease the speeded detection of old and new alcohol stimuli and to decrease the difficulty to disengage from those stimuli. Additionally, we explored effects of ABM on craving, relapse and overall treatment success, as judged by patients' therapists.

2. Methods

2.1. Overview

The intervention consisted of five sessions in which half of the participants (the ABM group) performed the ABM and the other half of the participants (the control group) performed a control training task. Pre-test measurements of AB and craving took place in the first session prior to the ABM or control training, post-test measures took place in a sixth session, 3–4 days after the last ABM or control training. Three months after the last training session, follow-up data were gathered on treatment status and drinking behavior. All recruitment, testing and follow-up data collection took place between July 2006 and September 2007. The study complies with the current Dutch laws and is in accordance with the Medical Ethical Committee of the Clinical Trial Center Maastricht, The Netherlands.

The training program was completed within 3 weeks and consisted of five sessions (one training per session): sessions occurred every Monday and Thursday (for half of the patients) or Tuesday and Friday (for the other half of the patients), at a fixed time. All sessions took place in a quiet room inside one of the treatment centers and patients were trained and tested individually. In session 1, patient demographic information was initially measured. Second, craving was measured. Then, instructions were given for the training tasks (ABM or control training). After performing the ABM or control training, patients were given positively framed feedback on their training performance and goals were set for performance in the next session. Finally, a structured interview was used to determine alcohol dependency (i.e. the Composite International Diagnostic Interview 2.1; Robins et al., 1988) and patients were further interviewed about their alcohol consumption before treatment with the first part of Section III of the EuropASI (Kokkevi and Hartgers, 1995).

Sessions 2–5 started by recapitulating the training goals that were formulated in the previous sessions, after which participants performed another period of ABM or control training. Each session ended with positive feedback on training performance and the setting of new goals for the next session. In the post-test session (session 6), participants first filled out the DAQ and then performed the visual-probe post-test.

2.2. Participants

Participants were 33 male and 10 female alcohol-dependent patients from three treatment centers in the Netherlands. The regular treatment program was of approximately 3 months duration in one center (Heerlen), and 6 months duration in the other two centers (Maastricht and Arnhem). Three days prior to the first session therapists asked patients to participate in a training program on alcohol and attention. The researchers explained to the patients that their addiction is partly maintained by an uncontrolled attention for alcohol-related objects, and that this training program would test the effectiveness of two interventions to increase control over their attention for alcohol. Patients in both training groups were given the same information to prevent suspicion about being assigned to a non-training control group. Before commencing with the intervention, written informed consent was obtained. Patients received 30 Euros for participating.

The sample consisted of 33 inpatients (Heerlen: $N=23$; Arnhem: $N=10$) and 10 outpatients (Maastricht). To be included in the study, patients had to be abstinent and in treatment for no longer than 2 months, and had to meet DSM-IV criteria for alcohol dependence in the 12 months before hospitalization. Also, patients had completed a detoxification program and were receiving cognitive behavioral therapy. Patients were excluded if they received anti-craving medication during the intervention, if alcohol was not their primary addiction and if they had been diagnosed by trained therapists for mental disorders other than drug or alcohol dependence. Patients who lapsed during the intervention, as reported by a patient or therapist, were dismissed from the study.

Participants were randomly assigned to one of the two experimental groups: the ABM group and a control group, stratified by gender and treatment center. A randomization sequence that was generated by <http://www.randomization.com> was used for each stratum. Only the experimenter had access to this sequence. Therapists and patients were not informed about which group patients had been assigned to. To ensure an equal distribution of assignments to the ABM and control group, the maximum number of consecutive assignments to one group in this sequence was restricted to three. Patients in the ABM group did not differ from patients in the control group on baseline demographic and clinical characteristics (Table 1).

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