



When abuse primes addiction – Automatic activation of alcohol concepts by child maltreatment related cues in emotionally abused alcoholics



Nadine Potthast*, Frank Neuner, Claudia Catani

Department of Psychology, Bielefeld University, Postbox 100 131, 33501 Bielefeld, Germany

HIGHLIGHTS

- Maltreatment related cues primed alcohol concepts in emotionally abused alcoholics.
- Maltreatment related cues automatically activate the associative memory network.
- Mechanisms underlying the link between AD and emotional maltreatment are clarified.

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ABSTRACT

Introduction: Recent research indicates that there is a link between emotional maltreatment and alcohol dependence (AD), but the underlying mechanisms still need to be clarified. There is reason to assume that maltreatment related cues automatically activate an associative memory network comprising cues eliciting craving as well as alcohol-related responses. The current study aimed to examine this network in AD patients who experienced emotional abuse using a priming paradigm.

Methods: A specific priming effect in emotionally abused AD subjects was hypothesized for maltreatment related words that preceded alcohol related words. 49 AD subjects ($n = 14$ with emotional abuse vs. $n = 35$ without emotional abuse) and 34 control subjects performed a priming task with maltreatment related and neutral prime words combined with alcohol related and neutral target words. Maltreatment related words consisted of socially and physically threatening words.

Results: As hypothesized, a specific priming effect for socially threatening and physically threatening cues was found only in AD subjects with emotional abuse.

Conclusions: The present data are the first to provide evidence that child maltreatment related cues automatically activate an associative memory network in alcoholics with emotional abuse experiences.

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1. Introduction

Numerous studies have shown a frequent co-occurrence of traumatic experiences and alcohol dependence (AD) as well as an increased comorbidity of posttraumatic stress disorder (PTSD) and AD (Potthast & Catani, 2012). There is growing evidence that it is not only typical trauma experiences (e.g., natural disaster, accidents, experiences of physical and sexual violence or combat events) as defined by the DSM-IV (American Psychiatric Association, 2000), DSM-V (American Psychiatric Association, 2013) and the ICD-10 (World Health Organization, 1992) that are associated with AD, but also a broader range of traumatic life experiences. Particularly, child maltreatment has been linked with AD both in samples of alcohol abusing individuals

(Magnusson et al., 2012; Simpson & Miller, 2002; Young-Wolff, Kendler, Ericson, & Prescott, 2011) and in samples of traumatized subjects (Kilpatrick et al., 2000; Simpson & Miller, 2002; Singh, Thornton, & Tonmyr, 2011). The co-occurrence of child maltreatment experiences and AD has considerable clinical relevance, given that child maltreatment is associated with more severe negative AD outcomes, including an earlier age of drinking onset (Rothman, Edwards, Heeren, & Hingson, 2008), an earlier age of AD onset (Potthast, Neuner, & Catani, 2014), a multiple (Harrison, Fulkerson, & Beebe, 1997) and more frequent (Brems & Namyniuk, 2002) substance use as well as a greater risk of treatment dropout (Chapman, Dube, & Anda, 2007). Moreover, recent research indicates that emotional maltreatment has a predominant role regarding the development of AD and is even more relevant than physical or sexual maltreatment (Potthast et al., 2014; Rosenkranz, Muller, & Henderson, 2012; Schwandt, Heilig, Hommer, George, & Ramchandani, 2013). Additionally, there is evidence for a high co-occurrence of different types of child maltreatment in

* Corresponding author. Tel.: +49 521 106 12790; fax: +49 521 106 89012.

E-mail addresses: nadine.pothast@uni-bielefeld.de (N. Potthast), frank.neuner@uni-bielefeld.de (F. Neuner), claudia.catani@uni-bielefeld.de (C. Catani).

representative samples (Edwards, Holden, Felitti, & Anda, 2003; Iffland, Brähler, Neuner, Häuser, & Glaesmer, 2013; Wingenfeld et al., 2010) as well as in AD samples (Arata, Langhinrichsen-Rohling, Bowers, & O'Farrill-Swails, 2005; Potthast et al., 2014; Rosenkranz et al., 2012).

However, the underlying mechanisms of the association between child maltreatment and AD are currently unknown. According to recent investigations, comorbid psychiatric disorders, such as affective or anxiety disorders, are thought to play an important mediating role (Douglas et al., 2010; Schuck & Widom, 2001). To date, the strongest empirical evidence can be found for PTSD as a mediator (Wekerle, Leung, Goldstein, Thornton, & Tonmyr, 2009; White & Widom, 2008) with several hypotheses trying to explain the association between PTSD and AD. The self-medication theory (Khantzian, 1997) is the best-documented hypothesis, asserting that alcohol and other drugs are used to reduce trauma-related symptoms and resulting discomfort. As a consequence, alcohol intake is negatively reinforced thereby increasing the risk of developing AD over time. Evidence for the self-medication hypothesis is provided by retrospective (Ford, Hawke, Alessi, Ledgerwood, & Petry, 2007) as well as prospective (Taylor, Bobova, Zinbarg, Mineka, & Craske, 2012) self-report studies. Additional support comes from laboratory-based experimental investigations examining cue-elicited craving. The basis for cue reactivity research is provided by classical conditioning processes, which occur after repeated pairing of internal or external stimuli and drug administration. For example, Coffey and colleagues (Coffey, Dansky, & Brady, 2003; Coffey et al., 2002; Saladin et al., 2003) presented imaginal trauma cues, in vivo alcohol cues, and neutral comparison cues to AD subjects with comorbid PTSD and recorded self-reported craving. Participants reported higher levels of craving in response to both alcohol and trauma cues compared to neutral comparison cues. This outcome was replicated in a study with similar methodology that also included salivary response as a physiological measure of craving (Coffey et al., 2010). Furthermore, the reduction of trauma-associated negative emotions by means of exposure therapy results in a significant reduction of experimental induced craving (Coffey, Stasiewicz, Hughes, & Brimo, 2006). This finding suggests that trauma-related cues might increase craving especially by eliciting negative emotions. This compares well to numerous studies demonstrating that craving can be induced by negative emotions in AD regardless of a comorbid PTSD diagnosis (Cooney, Litt, Morse, Bauer, & Gaupp, 1997; Rubonis et al., 1994). Taking these lines of research together, one could assume that child maltreatment might be associated with AD by arousing negative emotions which in turn result in heightened craving, a key feature and maintaining factor of AD. Those negative emotions could just as well be a symptom of various psychiatric disorders and are presumably not limited to PTSD as the depicted empirical findings might suggest. For instance, literature shows that child maltreatment is linked to increased feelings of shame or guilt within depression (Danielson, de Arellano, Kilpatrick, Saunders, & Resnick, 2005; Stuewig & McCloskey, 2005) and increased feelings of anxiety in social phobia (Kuo, Goldin, Werner, Heimberg, & Gross, 2011). Nevertheless, empirical evidence for the association of maltreatment related negative affect and craving from a transdiagnostic perspective is lacking thus far.

There is reason to assume that the processes underlying the induction of craving by negative affective and trauma-related cues are very fast, automatic and largely unconscious. A framework is provided by memory network models (e.g., Baker, Morse, & Sherman, 1987). These models propose that craving is organized within an associative memory network, which comprises internal (e.g., physiological arousal) and external cues (e.g., trauma reminders) eliciting craving as well as drug-related responses in terms of verbal self-reports of craving (e.g., feeling the urge to drink) or drug-seeking behaviour (e.g., actually drinking alcohol). Stewart (1996) proposed an extension of this memory network suggesting that the associative memory structure of substance-abusing PTSD patients could also include trauma-related internal (e.g., intrusions, physical arousal) and external (e.g., trauma

reminders) cues. According to this assumption exposure to trauma reminders and PTSD symptoms might automatically activate the memory network thus stimulating craving (Stewart, Pihl, Conrod, & Dongier, 1998). In addition to cue reactivity research, further direct empirical support comes from studies using semantic priming procedures. Sherman (2007) found that trauma exposed smokers showed a significant priming effect within a modified Stroop task, when trauma related pictures preceded smoking related words. Additionally, the priming effect was linked to the severity of trauma related symptoms. To our knowledge, this is the only study so far examining the assumption that trauma-related cues automatically activate the associative memory network in traumatized subjects with substance dependence. Investigations using child maltreatment related cues are lacking as well as studies investigating AD subjects. However, there is evidence that negative affective cues (words and phrases) significantly reduced response time to alcohol targets in problem drinkers with high psychiatric distress (Zack, Toneatto, & MacLeod, 1999) as well as in young drinkers (Zack, Poulos, Fragopoulos, & MacLeod, 2003). Taken as a whole, further research is required to examine whether cues related to child maltreatment can also activate the associative memory network in AD subjects with experiences of childhood maltreatment. This would provide deeper insight into the underlying mechanisms of the association between child maltreatment and AD.

Hence, the purpose of the present study was to examine more closely the presumed associative memory network in maltreated AD subjects by means of a priming paradigm. Given the considerable clinical relevance of emotional maltreatment in the development of AD (Potthast et al., 2014; Rosenkranz et al., 2012; Schwandt et al., 2013), the focus was on emotionally abused individuals with AD. We hypothesized that maltreatment related words as opposed to neutral words would significantly reduce response times to alcohol related target words as opposed to neutral target words in emotionally abused AD patients. We supposed that this significant reduction in response time would not be found in non-maltreated AD patients as well as in control subjects having no alcohol abuse or AD. In order to differentiate between emotional and physical maltreatment, we used socially threatening cues as well as physically threatening cues. As we assume that stimuli associated with physical abuse are integrated in the same associative network as stimuli associated with emotional abuse, we expected to find the priming effect in emotionally abused subjects for words related to emotional abuse as well as for words related to physical abuse.

2. Method

2.1. Participants

The AD sample consisted of 60 individuals who were receiving alcohol rehabilitation treatment at one of three selected mental health facilities in Germany. For inclusion in the study, AD participants in both samples had to be aged over 18 and had to meet DSM-IV criteria for AD (American Psychiatric Association, 2000). Exclusion criteria were current comorbid substance use disorder, current or lifetime psychosis, and severe cognitive problems. Patients meeting inclusion criteria were asked to participate in the study at the beginning of their treatment. Interested patients received a complete description of the study and were invited to the clinical interview. All participants of the interview, who were native German speakers without neurological problems or dyslexia, were asked to participate additionally in the experimental study. Interested subjects received a description of the experimental design and an appointment was scheduled within seven days after the interview. Overall, eleven AD participants had to be excluded. Five participants did not reach the cut-off score in the *Alcohol Use Disorder Identification Test* (AUDIT; see below) measuring hazardous alcohol consumption within the last 12 months. Five participants turned

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