



The relationship between perceived stress and cue sensitivity for alcohol



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HIGHLIGHTS

- Review shows a relationship between stress and alcohol-related cue sensitivity.
- Different effects of psychological and physiological stress on cue sensitivity.
- Stress-induced cue sensitivity may be explained by differences in coping drinking.

ARTICLE INFO

Available online 2 August 2014

Keywords:

Review

Stress

Cue sensitivity

Alcohol

ABSTRACT

Previous research has shown that cue sensitivity and stress affect the risk for relapse in alcohol-dependent patients. Theoretically, a link between the two can be expected. However, a clear overview of the interplay of these factors is not yet available. The purpose of this review was to examine the empirical evidence for the influence of stress on sensitivity for alcohol-related cues.

Empirical studies indexed in PubMed, EMBASE, PsycINFO, and Web of Knowledge that assessed the relation between stress and sensitivity for alcohol-related cues using subjective, behavioral and/or physiological measures were included in the review.

Of the 359 articles screened, 12 were included in the review. Nine articles supported the existence of the relationship between stress and heightened cue sensitivity for alcohol-related cues, whereas three articles did not support our hypothesis.

We conclude that the relationship between stress and sensitivity to alcohol cues appears to exist. In fact, there may be different factors at play: our review points toward (1) differences between the effect of psychological stress and physiological stress on cue-sensitivity, and (2) individual differences regarding coping drinking which may explain stress-induced cues sensitivity.

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1. Introduction

Despite years of research and great progress in developing treatments for alcohol dependence, rates of alcohol relapse remain high (Boothby & Doering, 2005; Finney, Hahn, & Moos, 1996). A number of theories regarding the reasons for relapse focus on the role of stress and sensitivity for alcohol-related cues or 'stimuli.' For example, according to the Affective Processing Model of Negative Reinforcement (Baker, Piper, McCarthy, Majeskie, & Fiore, 2004), stressors cause or increase negative affect, which in turn activates the learned rewarding properties of alcohol (or other addictive substances) that relieve negative affect, thereby motivating the individual to use again.

Another factor contributing to increased risks of relapse is cue sensitivity. Hereby we mean that the brain is sensitive to alcohol-related cues, leading to a strong reaction toward these cues, i.e., cue reactivity. According to the Incentive Sensitization Theory (Robinson & Berridge, 1993), specific cues (e.g., stimuli, situations) become associated with an addictive substance through repetitive use in the presence of these cues. The substance-related cues become attractive and therefore salient to the addict and activate a neurological hypersensitive reaction to a substance (Grüsser et al., 2004; Tapert et al., 2003). This hypersensitivity may remain even after long periods of abstinence (Robinson & Berridge, 2001, cf. Koob & Le Moal, 2001).

Combining the two aforementioned theories, we hypothesized that under stress, cues that have become associated with alcohol via previous experience become more salient, and the brain is more sensitive to these cues.

In experimental studies, stress has been induced by various types of stressors. Dickerson and Kemeny (2004) categorized acute psychological stressors into five types of stress induction procedures: performance of cognitive tasks; public speaking with verbal interaction; a combination of the aforementioned; noise exposure; and real (e.g., pictures, film) or mental (i.e., imagination, recall) exposure to emotion-eliciting material or situations. All five types of stress induction evoke psychological distress, and public speaking combined with a cognitive task also evokes physiological stress.

There are a number of methods to assess cue sensitivity: physiological measures, subjective measures, behavioral measures, or a combination of these measures. Physiological measures that are most often used include heart rate or heart rate variability (HRV) and skin conductance (Carter & Tiffany, 1999; Cooney, Litt, Morse, Bauer, & Gaupp, 1997; Waters et al., 2009).

Cue sensitivity may also be measured subjectively and is often defined as increases in craving or the desire for alcohol after encountering alcohol-related cues (e.g., Bohn, Krahn, & Staehler, 1995; Schulze & Jones, 2000). Finally, another indicator of cue sensitivity is attentional bias, i.e. a selective focus on alcohol-related cues. Attentional bias is assessed with a reaction time task assessing the extent to which alcohol-related cues are selectively attended to as compared to neutral cues (Field & Cox, 2008).

2. Methods

A literature search was conducted using PubMed, EMBase/Medline, Web of Knowledge, and PsycINFO, covering all articles published until September 2013. We used the following key terms: alcohol* and ethanol*; cue*, trigger*, stimuli; stress*, ACTH, CRF, cortisol, HPA, and distress; reactivity, sensitivity, cognitive bias and implicit cognition. A total of 12 articles were selected (Fig. 1).

3. Results

The number of identified eligible studies for this review was relatively small and study samples were diverse. Therefore, we opted for a descriptive synthesis of the results including a calculation of effect

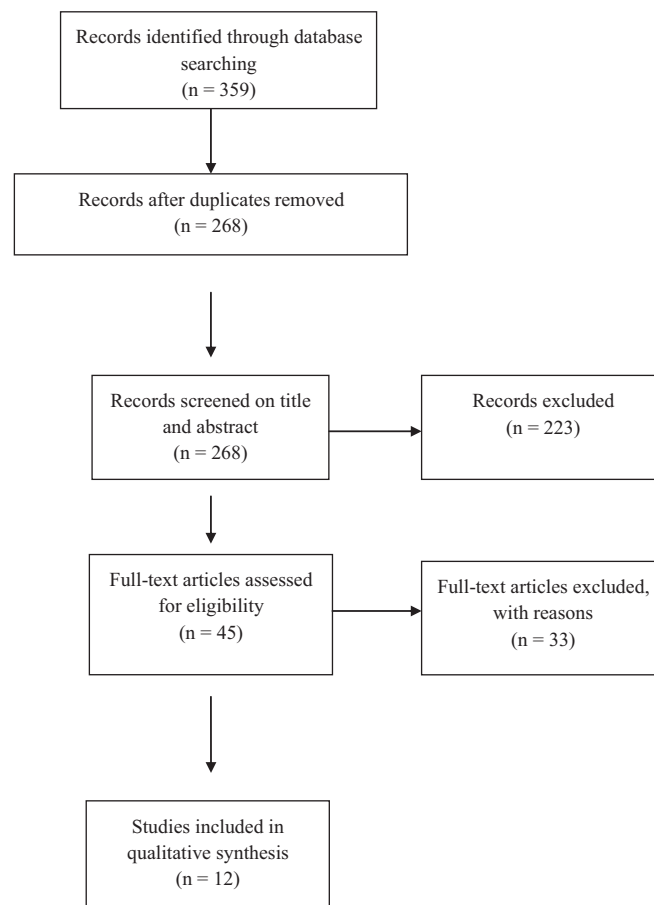


Fig. 1. Search strategy and selection process of articles in review.

sizes. Characteristics of the 12 included articles are presented in Table 1.

We found three global categories of studies based on their design. Studies in category one used experimental within-subjects designs. These designs are the best test of causal relationships and therefore provide the strongest evidence. The second strongest category includes experimental studies using between-subjects designs. These studies are considered to provide somewhat weaker evidence than category one, because participants are exposed to only one mood induction condition. The third category with the weakest evidence includes correlational studies from which no causal inferences can be made.

3.1. Category 1

In the first category ($N = 5$), participants were exposed to both a stress and a neutral mood induction. Stress was induced by either using imagery (exposure to emotion-eliciting material) or performing a high-speed task (cognitive task). Cues were presented in vivo by the sight and/or smell of the preferred beverage (Coffey et al., 2006; Jansma et al., 2000; Nosen et al., 2012; Pratt & Davidson, 2009; Ray, 2011).

Coffey et al. (2006) found that participants reported greater craving after trauma imagery followed by an alcohol cue than after trauma imagery followed by a water cue, or after neutral imagery followed by either an alcohol cue or a water cue. These results indicate that trauma-induced stress and exposure to alcohol cues increases craving as compared to neutral mood states and alcohol cues.

Similar results were obtained in another study (Nosen et al., 2012). The greatest increases in craving and salivary flow were observed

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