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Review

Ecological momentary assessment in the investigation of craving and substance use in daily life: A systematic review

Fuschia Serre[a,b,d], Melina Fatseas[a,b,c,d], Joel Swendsen[a,c,e], Marc Auriacombe[a,b,d,f,*]

[a] University of Bordeaux, PAC Carreire, 146 rue Léo Saignat, CS 61292, 33076 Bordeaux Cedex, France
[b] SANPSY (Addiction Psychiatry), CNRS USR 3413, University of Bordeaux, PAC Carreire, 146 rue Léo Saignat, CS 61292, 33076 Bordeaux Cedex, France
[c] INCIA, CNRS UMR 5287, University of Bordeaux, PAC Carreire, 146 rue Léo Saignat, CS 61292, 33076 Bordeaux Cedex, France
[d] Pôle Addictologie, CH Charles Perrens and CHU de Bordeaux, 121 rue de la Béchade, CS 81285, 33076 Bordeaux Cedex, France
[e] Ecole Pratique des Hautes Etudes, 75014 Paris, France
[f] Perelman School of Medicine, University of Pennsylvania, Philadelphia, PA, USA

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ABSTRACT

Background: Craving is viewed as a major determinant of relapse in persons with substance addiction, but this association remains poorly understood due to its time-limited nature and the biases associated with retrospective reporting. Ecological momentary assessment (EMA) offers new opportunities to examine both craving and substance use with strong ecological validity by collecting real-time data in daily life. This review examined all published studies using EMA to: (1) assess the link between craving and substance use; and (2) identify relevant moderators of craving among substance users.
Methods: We searched PubMed and PsycInfo databases up to October 31, 2013.
Results: Ninety-one studies were selected, involving mostly tobacco smokers (73%). A majority of studies (92%) reported a positive relationship between craving and substance use, concurrently and prospectively, and among users with different levels of use for both legal and illegal substances. Results suggest that craving is a stronger predictor of relapse episodes when assessed in close temporal proximity to substance use. EMA data also confirmed the influence of diverse within-person and between-person sources of variation in daily life craving reports.
Conclusions: This review provides strong support for the link between craving and substance use, and underscores the importance of the timing of assessments.

Contents

* Corresponding author at: Département d'Addictologie, CHCP, 121 rue de la Béchade, 33076 Bordeaux Cedex, France. Tel.: +33 556 561 738; fax: +33 556 561 727.
E-mail address: marc.auriacombe@u-bordeaux.fr (M. Auriacombe).

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1. Introduction

Individuals with substance use disorders present high rates of lapses and relapses when attempting to quit (Auriacombe, 1997; Auriacombe and Franques, 1994; Hughes et al., 2008; Hunt et al., 1971). Maintaining abstinence is, therefore, a major target in addiction treatment, and the precipitants of relapse have been widely examined (Fatseas et al., 2011; Marlatt and Gordon, 1985). Craving, often defined as the subjective, unwanted desire or urge to use a substance while attempting to abstain, is frequently experienced during abstinence periods and has been proposed as a major contributor to relapse (Weiss, 2005). However, the link between craving and relapse remains controversial (Rohsenow and Monti, 1999; Tiffany, 1990; Wray et al., 2013). The inconsistencies found in the literature concerning this association may be due to limitations of craving assessment in the laboratory such as restrained number of triggers that are far from real-life contexts, or to retrospective recall biases that are increased by assessments in clinical setting (Bradburn et al., 1987; Epstein and Preston, 2003; Hammersley, 1994). For these reasons, failure to find an association of craving with subsequent substance use could be partly explained in that craving is a momentary phenomenon that is difficult to reliably investigate using traditional methods.

Mobile technologies have permitted the collection of real-time data in natural environments and therefore offer a solution to many methodological barriers that characterize clinical research. In particular, ecological momentary assessment (EMA; Stone and Shiffman, 1994) constitutes a rapidly-expanding approach, notably in clinical psychology, behavioral neurosciences and addiction research (aan het Rot et al., 2012; Lukasiewicz et al., 2007; Shiffman et al., 2008; van den Bos et al., 2013). EMA also includes the experience sampling method (ESM; Csikszentmihalyi and Larson, 1987) but uses a broader range of sampling options. In EMA, there are three types of recording: signal-contingent (made in response to a signal); interval-contingent (made after a fixed period of time); event-contingent (made when a specific event occurs). Of these different methods, only signal-contingent recording (repeated over a short time frame) constitutes an experience sampling procedure. Nonetheless, the feasibility and validity of EMA has been demonstrated in individuals with many types of addiction (Freedman et al., 2006; Johnson et al., 2009; Serre et al., 2012), and it is particularly well-suited to explore craving as a function of a wide range of environmental determinants. Repeated within-day assessments capture the rapid fluctuations of these variables (Shiyko and Ram, 2011) and inform researchers about prospective (and potentially causal) relationships.

Craving expression is also influenced by a large range of factors, including both stable and fluctuating moderators that characterize the individual or the environment. Diverse paradigms have been developed in laboratory settings to explore craving (Sinha and O'Malley, 1999), of which the most widely used involves exposure to cues that were previously paired with substance use in dependent individuals (e.g., drug paraphernalia, smell of alcohol; Carter and Tiffany, 1999; Childress et al., 1993; Franques et al., 1999). Craving has also been evoked experimentally through manipulation of mood, stress, or negative affect (Childress et al., 1994; Cooney et al., 1997; Litt et al., 1990; Sinha et al., 1999, 2000) and, to a lesser extent, after "priming" involving acute exposure to the substance (de Wit, 1996; Mahoney et al., 2007). While some studies have found an association between craving or cue-reactivity assessed in the laboratory and relapse (al'Absi et al., 2005; Back et al., 2010; Fatseas et al., 2011; Sinha et al., 2006; Waters et al., 2004), other studies have failed to reveal such a link (Abrams et al., 1988; Rohsenow et al., 1994; Shadel et al., 1998). Moreover, a minority of participants failed to respond to cues or reported little craving in some studies (Avants et al., 1995; Childress et al., 1986). These discrepancies highlight the importance of individual variability in craving and relapse, as well as the necessity of interpreting findings as a function of these sources of variance. For example, men seem to experience lower craving than women in some studies (Elman et al., 2001; Robbins et al., 1999; Saladin et al., 2012; Yu et al., 2007), while individuals with higher impulsivity or novelty seeking traits tend to have higher craving levels (Franken, 2002; Papachristou et al., 2012; Powell et al., 1992; Zilberman et al., 2003). Craving ratings are also influenced by substance use characteristics such as levels of use, duration of abstinence, or dependence severity (Herd and Borland, 2009; Hughes, 1992; Watson et al., 2010), and by period of assessments relative to the target quit date (Hughes, 1992; McCarthy et al., 2006). Given the growing role of EMA in clinical research, but also important variation in findings, the objective of this systematic review was to: (1) assess the link between craving and substance use in all published studies using EMA; and (2) identify the relevant moderators of this relationship among substance users.

2. Methods

This review was based on a systematic examination of the literature based on the cochrane collaboration method (Chalmers and Altman, 1995; Denis et al., 2004) and Preferred Reporting items for systematic review and meta-analyses guidance for systematic reviews (Moher et al., 2009). Reviewers trained in systematic searches screened study references identified by the search strategy.