

INTERNATIONAL PERSPECTIVE

## Cue Reactivity and Effects of Cue Exposure in Abstinent Posttreatment Drug Users

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**Abstract**—After 12 months of inpatient treatment, 16 opiate-addicted patients were exposed to drug-related stimuli. The results of this study indicate that cue reactivity in opiate-addicted subjects is still present after 12 months of intensive inpatient treatment. After exposing subjects to drug-related stimuli, there is an increase in craving, feelings of depression, and anger. Because posttreatment subjects are likely to be confronted with these stimuli following discharge, a reduction of this reactivity is desirable. In the present study, cue reactivity (feelings of depression, anger, tension, craving, and physical symptoms) reduced after protocolized cue exposure treatment. This effect maintained for at least 6 weeks after the last cue exposure session. © 1998 Elsevier Science Inc.

**Keywords**—addiction; cue exposure; cue reactivity; opiate dependence; craving.

### INTRODUCTION

CUE REACTIVITY TO drug related stimuli is a frequently observed phenomenon in drug-dependent subjects (Childress et al., 1993; Powell, Gray, & Bradley, 1993). Cue reactivity refers to a classical conditioned response (CR) that occurs when a (post)addicted subject is exposed to drug-related stimuli (CS). This response is presumed to consist of physiological and/or subjective reactions (Sie-

gel, 1983). Craving, a subjective desire to use the drug of choice, is believed to play an important role in the occurrence of relapse in abstinent drug-addicted persons in their natural setting (Childress, McLellan, & O'Brien, 1986). Besides craving, other subjective cue-elicited reactions have been reported, including subjective withdrawal symptoms, subjective drug-agonistic effects, mood swings, and anxiety (Glautier & Tiffany, 1995; Powell, Gray, & Bradley, 1993). Physiological reactions that have been investigated include skin conductance, heart rate, salivation, and body temperature (Glautier, Drummond, & Remington, 1992). The exact nature of the relation between subjective and physiological signs of reactivity is still subject to debate (Tiffany, 1990). Furthermore, whether the direction of the conditioned response is drug antagonistic (withdrawal) or drug agonistic (drug-like), is still unclear (Stewart, de Wit, & Eikelboom, 1984).

Conditioned reactivity to substance-related cues is believed to be an important factor within addictive use of

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alcohol (Glautier & Drummond, 1994; Staiger & White, 1991), opiates (Powell et al., 1990), nicotine (Niaura et al., 1988), and cocaine (Robbins, Ehrman, Childress, & O'Brien, 1992). These studies have shown an increase in reactivity when addicted subjects are exposed to drug-related cues, as compared with exposure to neutral cues. Albeit, individual differences in nature and extent of the cue-elicited response cannot be ignored (Rees & Heather, 1995).

Human experimental studies reveal that cue reactivity may still be present after detoxification (Powell et al., 1990). In addition, subjects who have repeatedly been exposed to drug-related cues during their treatment, showed a reduction in cue reactivity. Cue Exposure Treatment (CET) refers to a protocolized, repeated, exposure to drug-related cues, aimed at the reduction of cue reactivity by extinction, a behavior therapy technique.

The present study is designed to examine the occurrence and nature of cue reactivity in subjects who have been treated for drug dependence in an intensive, drug-free inpatient treatment program for a minimal period of 12 months. At time of the study, the subjects participated in an outpatient resocialization program. It was hypothesized that cue reactivity, if present, would decrease in this population after a protocolized nine-session CET. Enduring effects of CET were studied by evaluating cue reactivity of the study subjects 6 weeks after the last exposure session.

## Subjects

The study group consisted of 16 patients who, after clinical detoxification and intensive inpatient treatment for at least 12 months in the drug-free therapeutic community "Emiliehoeve," participated in the outpatient resocialization phase of the program. All subjects participated voluntarily and signed an informed consent. The inclusion criteria were: age 18–60, opiate dependency according *DSM-IV* criteria, inhalation ("chasing the dragon") as primary mode of heroin administration, successful completion of the clinical treatment program, abstinence from any drugs for at least 6 months preceding the study, and adequate understanding of the Dutch language.

The 16 persons in the study consisted of 7 female and 9 male subjects. The average number of clinical admissions for the treatment of drug-dependence was two (range 1–8). The mean age of these subjects was 29.5 years (range 20–42). The mean Addiction Severity Index (ASI; McLellan, Luborski, Woody, & O'Brien, 1980) score at intake was 3.3 ( $SD = 1.3$ ). The mean severity scores, ranging from no problems (0) to extreme problems (9), on the separate ASI areas were: medical problems 1.6 ( $SD = 2.2$ ), employment problems 2.9 ( $SD = 2.1$ ), alcohol problems 1.4 ( $SD = 2.3$ ), drug problems 5.5 ( $SD = 1.0$ ), legal problems 3.9 ( $SD = 2.3$ ), social problems 3.3 ( $SD = 2.3$ ), and psychiatric problems 4.3 ( $SD = 1.7$ ).

## Procedure and Assessments

At intake, before detoxification, the ASI (McLellan et al., 1980) was administered to assess the severity of drug-related problems. After detoxification, all subjects received intensive inpatient treatment for at least 12 months. In the subsequent outpatient resocialization phase of the treatment program, subjects were asked to participate in the CET program. CET consisted of a nine-session, protocolized exposure to drug-related cues. Twelve different stimuli (slides, video, drug-use material, simulation of drug-use ritual) were presented to the subjects during the study. The assessment sessions consisted of the presentation of four different cues (two slides and two videos). Every cue was presented for 5 minutes. The neutral cues consisted of a slide of a landscape and a film of natural scenery (video). The drug cues consisted of a slide of drug users who prepared smokeable heroin and inhaled heroin ("chasing the dragon") and a film of this ritual (video). The slide and video stimuli were presented to the subjects within the same session.

Assessments of reactivity to drug-related and neutral cues were conducted prior to the CET after nine CET sessions (posttreatment), and after 6 weeks following the last CET session (follow-up). These assessments consisted of a (single-item) craving scale, the Profile of Mood States (POMS) and the Physical Symptom Checklist (PSC). The CET and assessment procedure have been described by Powell, Gray, and Bradley (1993).

*Craving Scale.* A single-item self-rating scale was used to assess the intensity of craving each minute during the presentation of the stimuli. The scale ranged from 0 (no craving) to 10 (excessive craving). For each stimulus a mean craving score of the subject was calculated. For purposes of the study, craving was defined as the strength of the attraction to use drugs (Powell, 1995). It was explicitly communicated with the subjects that craving could also occur when they felt they were able to resist drug use.

*Profile of Mood States.* The abridged Dutch version of the POMS (McNair, Lorr, & Droppelman, 1971) has acceptable psychometric properties. Five subscales were used in this study (Depression, Anger, Fatigue, Vigor, and Tension). Furthermore, a total score is calculated by adding the scores of the subscales used (the subscale Vigor is recorded). The POMS consisted of 32 items that can be scored on a 5-point scale, from 0 (none) to 5 (extremely intense).

*Physical Symptoms Checklist.* This checklist was adopted from Powell, Bradley, and Gray (1992). The PSC measures physical symptoms that reflect characteristics of opiate withdrawal and drug-agonistic states. Furthermore, a residual category was used to report ambiguous physical signs. The subject could complete the PSC on a

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