INTRODUCTION

Recent studies raised the possibility that emotional intelligence is impaired in patients with psychoactive substance addiction. Specifically, patients with alcoholism exhibited impaired processing of non-linguistic aspects of language during disclosure (Monnot et al., 2001) and deficient emotional facial expression recognition (Phillipot et al., 1999; Kornreich et al., 2001, 2003; Townshend and Duka, 2003). Interestingly, emotion recognition deficit was more severe in patients with alcoholism as compared with patients with opiate dependence (Kornreich et al., 2003) and was detected even after long-term abstinence (Kornreich et al., 2001). It has been proposed that facial emotion decoding problems could be present before the development of addiction and chronic alcohol consumption may have an additional detrimental effect on the decoding of social signals. The clinical significance of these findings is that altered social cognitive functions may contribute to the community adaptation failure of many patients, even after long-term abstinence.

The studies cited above investigated the perception of basic emotions such as happiness, anger, sadness, and disgust. However, social adaptation requires the decoding of more complex social emotions and mental states. We hypothesized that as a part of general social cognitive dysfunctions related to alcoholism, our patients would show impaired performances on the Eyes Test (Baron-Cohen et al., 2001). However, ToM dysfunctions, as measured with the Eyes Test, can be observed in several psychiatric disorders, including schizophrenia (Kelemen et al., 2005), euthymic bipolar disorder (Bora et al., 2005), unipolar major depressive disorder (Lee et al., 2005), and presumably certain personality disorders (for a review, see Kéri, 2006).

Results from functional neuroimaging studies revealed test-related activation in brain areas related to ToM (dorsomedial prefrontal cortex and superior temporal cortex) (Calder et al., 2002; Platek et al., 2004), which is consistent with data from patients with autism-spectrum disorders who perform poorly on the Eyes Test (Baron-Cohen et al., 2001). Shaw et al. (2005) demonstrated that damage to the amygdala and right prefrontal cortex resulted in an impaired recognition of complex mental states in the Eyes Test.

Our main question was whether patients with alcoholism who are abstinent for a long period of time display dysfunctions on the recognition of social emotions and complex mental states. We hypothesized that as a part of general social cognitive dysfunctions related to alcoholism, our patients would show impaired performances on the Eyes Test.

MATERIALS AND METHODS

Subjects

Participants were 30 patients with DSM-IV alcohol dependence (American Psychiatric Association, 1994) and 30 healthy control subjects who were social drinkers. Inclusion criteria were abstinence for >6 months and scores <10 on the...
Beck Depression Inventory (BDI) (Beck, 1987). General psychosocial functions were assessed with the Global Assessment of Functioning (GAF) scale (American Psychiatric Association, 1994). Patients also received the Addiction Severity Index (ASI) semi-structured interview (McLellan et al., 1980) and the International Neuropsychiatric Interview Plus (Sheehan et al., 1998). General intellectual functions (IQ) were assessed with the Wechsler-scale (Wechsler, 1981). Subjects with concurrent DSM-IV Axis I disorders and history of brain injury and neurological disorders were excluded from the study. The demographic details are shown in Table 1. After a full description, subjects gave their informed consent to participate in the study.

Eyes Test
Each participant received the revised version of the Eyes Test in a quiet room. The experimenter presented 29 photographs of the eye-region of faces of actors and actresses. Each stimulus was presented on separate cards. Participants were asked to choose which of the four words (one target and three foils) best described the complex mental state of the actor/actress (for example, interested, doubtful, flirtatious, and insisting). The four words were depicted on the cards, and the participant read aloud the chosen word. The experimenter signed the response on a separate sheet of paper. As a control task, each participant was asked to judge the gender of the person shown on the photograph. Before the test, subjects were asked to read through a glossary, which contained the meaning of the words describing each mental state. If necessary, participants were allowed to use the glossary during the test. The dependent measure was the number of correctly identified mental states from the 29 photographs (for a detailed description, see Baron-Cohen et al., 2001).

RESULTS
Patients with alcoholism and healthy control subjects displayed nearly identical performances on the Eyes Test (Table 1). Student’s t-tests revealed no significant differences between the two groups ($t(58) = 0.19, P = 0.85$).

Table 2 shows the percentage of patients with alcoholism (ALC) and healthy control participants (HC) who chose the correct mental state for each stimulus. Chi-square tests indicated that the distribution of patients and controls who chose the correct target word or one of the foils did not differ ($P > 0.2$).

DISCUSSION
Our results indicate intact recognition of social emotions and complex mental states in patients with alcoholism after long-term abstinence. These data do not support the assumption suggesting long-term adverse effects of alcohol on social cognition or supposing an inherent vulnerability of patients that may manifest before the development of alcohol dependence.

The main limitation of the present study is that only a single test was used, and, therefore, more general conclusions on the social cognitive abilities of patients with alcoholism cannot be drawn. Normative scores of healthy participants on the Eyes Test have been replicated and validated by several studies (Baron-Cohen et al., 2001; Lawrance et al., 2004; Kelemen et al., 2005; Shaw et al., 2005). Our previous analysis revealed that the reliability of the Eyes Test is sufficient (Cronbach’s alpha = 0.81).

Kornreich et al. (2001) investigated 25 patients with alcoholism who were abstinent at least for 2 months and found lower emotion decoding accuracy for anger and disgust. In 14 patients who were abstinent only for 2 weeks,
Townshend and Duka (2003) also demonstrated impaired emotion recognition for anger and disgust. Fear response was enhanced for all types of emotions. In contrast to these studies, which investigated a restricted range of basic emotions, we aimed to look at the recognition of a wide range of social emotions and complex mental states that contribute to the representation of others’ beliefs and intentions. In contrast to our expectations, patients with alcoholism showed intact performances. There are several possible explanations for these seemingly discrepant findings. First, it is possible that patients with alcoholism show selective recognition dysfunctions for specific primary emotions and intact decoding of more complex facial emotion expressions with social relevance. Inmate primary emotions (e.g., anger, fear) and associated displays are believed to be modulated by the right hemisphere. In contrast, social emotions (e.g., guilt, jealousy) and associated ‘display rules’ are thought to be modulated by the left hemisphere. Display rules can modulate primary emotional displays for social purposes. Evidence suggests that upper facial displays are processed by the right hemisphere, as part of the primary emotional system, while lower facial displays are processed by the left hemisphere, as part of the social emotional system (Prodan et al., 2001). We speculate that these mechanisms may be differentially impaired in patients with alcoholism. Further studies are necessary to explicitly test this hypothesis.

Second, long-term abstinence, lack of co-morbid conditions and depressive symptoms, and relatively high psychosocial functioning suggest that our patients exhibited a less severe form of alcohol addiction. Our sample is characterized by a relatively late onset of addiction (Table 1), which may have prevented the patients from a toxic effect of alcohol on the developing brain. Third, previous studies used entire faces depicting different intensities of emotions (Kornreich et al., 2001, 2003; Townshend and Duka, 2003), whereas in the Eyes Test subjects view eye-regions and are asked to choose the appropriate word for the mental state. It is possible that patients with alcoholism are not able to synthesize many emotion cues in a face, but they are able to comprehend a few details such as the eye region. Further studies are warranted to test this hypothesis.

Cognitive deficits related to the abnormal functioning of the prefrontal cortex are recognized in alcoholism, independently from co-morbid conditions such as depression (Uekermann et al., 2003). Kornreich et al. (2001) suggested the impairment of right fronto-temporal and cingulate cortex, whereas Townshend and Duka (2003) emphasized the role of amygdala as a neural substrate of enhanced fear response. Interestingly, the impairment of facial emotion recognition can be observed in patients who display normal performances on tests of prefrontal functions (Townshend and Duka, 2003). The Eyes Test evokes a unique pattern of brain activity, including dorsomedial prefrontal and superior temporal cortex (Calder et al., 2002), and damage to the amygdala and right prefrontal cortex leads to impaired performances on the Eyes Test (Shaw et al., 2005). These areas are important in the processing of social information and in the recognition and attribution of complex mental states. Our data suggest that the functional capacity of this social cognitive brain network is spared in patients with alcoholism after long-term abstinence.

REFERENCES


