Impaired Emotional Facial Expression Recognition in Alcohol Dependence: Do These Deficits Persist With Midterm Abstinence?

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Background: Emotional facial expression (EFE) decoding has been repetitively shown to be impaired in alcoholic inpatients. The present study aimed to replicate and extend previous findings on EFE recognition deficits in alcoholism.

Methods: Alcoholic and control participants' performances were compared on an EFE decoding task with a transversal and a longitudinal design. More specifically, 49 alcoholic individuals were recruited at a long-stay postdetoxification treatment center at the third or fourth week of their detoxification process. Twenty-two of them [abstinent alcoholic participants (AA)] were met at the end of their hospitalization process, 2 months later. The 27 remaining patients [dropping alcoholic participants(AD)] dropped out from treatment before the second meeting. A control group (C) of 22 participants was constituted, and assessed twice with the same average time as AA between the 2 assessments. The 3 groups were similar regarding age, sex, and education level. Participants were presented at both times with an EFE decoding test consisting of 16 photographs depicting EFE of happiness, anger, disgust, and sadness.

Results: The results corroborated previous findings highlighting more EFE decoding deficits in alcoholic participants compared with control participants, with no improvement after 3 months of abstinence. Transversal analyses further evidenced more EFE decoding difficulties in AD than in AA compared with controls.

Conclusions: EFE decoding deficits in alcoholism persist with midterm abstinence. Alcoholic patients who dropped from treatment had the worst EFE decoding performance at baseline. Emotional facial expression decoding deficit could have a prognostic value in alcohol dependence.

Key Words: Alcohol Dependence, Emotion, Facial Expression, Nonverbal Behavior, Midterm Abstinence.

ALCOHOLIC INPATIENTS PRESENT impairment in the processing of emotional signals. In particular, deficits in both affective prosody (a nonlinguistic aspect of language that conveys emotion and attitude during discourse) (Monnot et al., 2001) and emotional facial expression (EFE) (Foisy et al., in press; Frigerio et al., 2002; Kornreich et al., 2001a, 2003; Philippot et al., 1999; Townshend and Duka, 2003; Uekermann et al., 2005) decoding have been repetitively described in alcoholic inpatients. Specifically, alcoholic inpatients demonstrate deficits in the accurate labeling of the emotion displayed on faces and overestimate the emotional intensity of EFE stimuli compared with normal controls (Kornreich et al., 2001a, 2001b; Philippot et al., 1999). They are also biased toward negative emotions (Foisy et al., in press; Frigerio et al., 2002; Philippot et al., 1999; Townshend and Duka, 2003) and need nonverbal signals to be more intense to perceive an expression as being present (Frigerio et al., 2002).

As bio-psycho-social factors are implicated in the development and maintenance of alcoholism (Galizio and Maisto, 1995), some deficits may be present before alcoholism develops, whereas others may be due to chronic alcohol consumption per se. Thus, some deficits may improve with abstinence, whereas others may not. This would depend on the initial presence of the disorders or on their later onset, due to a toxic effect of chronic alcohol consumption on the brain with or without potential recovery with abstinence.

In line with this rationale, research has evidenced visuospatial (Corral et al., 1999; Schandler et al., 1995; Sullivan

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et al., 2000), social-skills deficits (Nixon et al., 1992; Segrin and Menees, 1996; Senchak et al., 1996) as well as P300 abnormalities (Polich and Bloom, 1999; Van der Stelt et al., 1998) in alcoholic individuals and in children of alcoholic individuals who represent a population at risk to develop an alcoholism. Alternatively, long-term abstinence has been widely associated with improvement in different areas of functioning (De Soto et al., 1989; Drake et al., 1995; Mann et al., 1999). However, the course of the recovery appears to vary, depending on the function affected (Mann et al., 1999). For instance, verbal information processing (Miller and Saucedo, 1983; Parsons and Leber, 1981) and some cerebral abnormalities (Bates and Convit, 1999) show rapid improvement within the first weeks of abstinence, while visuo-spatial skills, episodic, and working memories need a longer abstinence time to normalize (Nixon et al., 1992). The latter may even persist, either demonstrating some but not full improvement or no improvement at all with abstinence (Sullivan et al., 2002).

The irreversibility of some deficits could be explained both by the detrimental permanent toxic effect of alcohol chronic consumption on the brain and/or the presence of these deficits before alcoholism develops, eventually representing vulnerability factors.

Recovery of EFE decoding deficits in alcohol-dependent individuals with abstinence has still to be investigated. Kornreich's et al. (2001b) results comparing control participants, recently detoxified alcoholic individuals, and abstainent individuals from 2 months to 9 years were indicative of no improvement on decoding accuracy. They showed, however, a normalization of emotional intensity evaluation. Somewhat dissimilar, but on a different population, the results of another study (Foisy et al., 2005) failed to reveal any improvement in polysubstance-dependent individuals with chronic alcohol dependence history. Both of these studies, although informative, suffered from 2 main limitations. First, they used transversal designs not allowing a firm conclusion. Second, the heterogeneous length of abstinence of patients in these studies made it difficult to obtain a precise potential recovery time course of EFE decoding deficits.

The present longitudinal study aimed to address whether midterm abstinence has an influence on EFE recognition in alcoholic individuals. Also, to evaluate whether alcoholic participants who dropped from the longitudinal design decode EFE differently than alcoholic individuals who completed both assessment sessions, transversal analyses were conducted on the first assessment measures.

METHOD

Participants

Forty-nine participants diagnosed with alcohol dependence according to DSM-IV criteria were recruited at a long-stay post-detoxification treatment center (Le Domaine, Braine-l'Alleud, Belgium) characterized by a maximum stay of 3 months. At the first assessment time, they were in their third or fourth week of detoxification process. Abstinence for recovering alcoholic patients was ensured both by staff's clinical supervision and by frequent alcohol breath test controls.

At the time of the initial assessment, all participants were provided with full details regarding the aims of the study and the procedure to be followed before giving their written consent. They were informed about the longitudinal design of the study, and they initially agreed to participate a second time at the end of their hospitalization. Participants were told that their principal task consisted of judging the emotion(s) portrayed by a series of stimulus persons at the 2 assessment times.

From the 49 inpatients initially met, 22 abstinent participants [abstinent alcoholic participants (AA)] were encountered at a second assessment time, 2 months later on average, at the end of their hospitalization. The 27 remaining participants [dropping alcoholic participants (AD)] dropped from the long-term detoxification center because of relapse, any misbehavior (i.e., violence, nonrespect of rules, etc.), or because they deliberately chose to quit treatment. From their own-report or relatives' report to the clinical staff, all subsequently relapsed.

Abstinent alcoholic participants and AD were matched for age (±5 years), gender, and education with 22 control participants (C) who were free of any psychiatric record. Participants in the control group were recruited among hospital staff employees and in the investigators' acquaintances. They completed the 2 assessments with the same mean time between the 2 assessments as AA (see Table 1 for a description of group characteristics).

Study participants were all drug free at the time of testing. All of them were compensated 10€ for their first participation, and 20€ for the second one.

Table 1. Abstinent Alcoholic Patients' (AA), Dropping Alcoholic Patients' (AD), and Controls' (C) Characteristics

	AD ($N = 27$)	AA ($N = 22$)	C ($N = 22$)
Age[NS]	42.44 (8.05)	46.41 (7.98)	44.86 (9.31)
Gender (male/female)[NS]	15/12	13/9	12/10
Education (1/2/3/4)[NS]	0/10/10/7	1/2/9/10	0/3/7/12
Number of days between assessment 1 and assessment 2[NS]	NA	59.82 (24.99)	73.21 (20.91)

Values are frequencies of categories or mean (standard deviation). Education categories were coded as follows: 1, completion of primary school; 2, completion of the 3 first years of secondary school; 3, completion of secondary school; and 4, post-secondary school training.
NS, not significant; NA, not applicable.

EFE Test

A series of EFEs constructed and validated by Hess and Blairy (1995) were used. Specifically, Hess and Blairy selected facial expressions of happiness, anger, sadness, disgust, and fear for 2 male and 2 female Caucasian actors from a series of standardized EFEs (JACFEE, Matsumoto and Ekman, 1988). The full technical details of the procedure for creating stimuli are available from Ursula Hess (University of Quebec at Montréal).

Based on the neutral face (0% of emotional intensity) and the full-blown EFE (100% of emotional intensity) of the same actor, and using the computer program Morph 1.0, a series of intermediate expressions differing in emotional intensity by 10% steps were constructed. Two sets of 2 (intensity: 30, 70%)×4 (emotions: happiness, anger, sadness, and disgust)×2 (actors) stimuli constituted the stimulus material. The number of expressions presented was limited not to overwhelm the subjects. The 30 and 70% intensity levels were

Table 2. Abstinent Alcoholic Patients' (AA), Dropping Alcoholic Patients' (AD), and Controls' (C) Scores on Control Measures at First Assessment Time

	AD ($N = 27$)	AA ($N = 22$)	C ($N = 22$)
BDI***[a]	9.10 (6.94)	12.57 (6.75)	3.57 (5.30)
STAI-E**[c]	42.55 (12.79)	50.38 (17.19)	33.55 (14.36)
STAI-T***[a]	49.35 (10.66)	52.86 (13.80)	35.76 (10.41)
BENTON*[b]	45.70 (3.18)	46.50 (4.88)	48.55 (3.07)
CCSE[NS]	27.67 (2.85)	28.23 (2.18)	29.00 (1.00)
WAIS[NS]	85.74 (18.71)	85.82 (20.65)	97.36 (16.81)
Age first contact with alcohol[NS]	14.00 (4.74)	16.38 (4.01)	14.60 (3.07)
Number of months of abuse[NS]	166.15 (92.23)	161.09 (114.10)	NA
Number of days since last drink[NS]	29.78 (10.27)	29.45 (7.93)	21.71 (71.83)
Number of detoxification treatment[NS]	3.48 (2.69)	2.27 (1.32)	NA
Number of drinks per day***[a]	18.81 (7.10)	14.77 (7.94)	0.39 (0.37)
Familial history of alcoholism (yes/no)***	17/10	13/9	4/18
History of head injury (yes/no)[NS]	5/22	5/17	1/21

Bonferroni post-hoc indicated: [a]AA = AD & AA [1]C & AD [1]C; [b]AA = AD & AA = C & AD [1]C; [c]AA = AD & AA [1]C & AD = C. Values are frequencies of categories or mean (standard deviation). A familial history of alcoholism was recorded if at least 1 biological parent had alcohol abuse or dependence.
*$p \leq 0.05$; **$p \leq 0.01$; ***$p \leq 0.001$.
NA, not applicable; NS, not significant; BDI, Beck Depression Inventory; STAI, State-Trait Anxiety Inventory; CCSE, Cognitive Capacity Screening Examination; WAIS, Weschler Adult Intelligent Scale.

chosen as they are more frequently encountered in real-life situations than full-blown expressions, but analyses were collapsed across this factor.

A set was randomly assigned to each participant at the first assessment time, and the other set was administrated at the second assessment time. The 16 stimuli of each set were presented in a random order on a Compaq Presario PC PowerBook.

Dependent Measures. Participants rated each expression on 8 emotional 7-point scales labeled "happiness," "anger," "sadness," "disgust," "fear," "shame," "contempt," and "surprise." This procedure was chosen to provide the participants with the possibility to have as much an open choice as possible and not to restrain them with a limited choice to the 4 target emotions. Statistics reflect the accuracy and intensity evaluation for target emotions (based on answers given for all the intensity scales).

These scales were presented in a random order on the computer screen, below the facial expression, 3 seconds after the face started to be displayed. The face was maintained on the computer screen until all scales were answered. All scales were anchored by "not at all" at one extremity and "very intensely" at the other. There was an intertrial time of 2 seconds between each face.

Decoding accuracy was defined as the observers' ability to infer the posed emotion correctly. An expression was considered as accurately identified when the emotional scale receiving the highest intensity rating on the emotion profile corresponded to the target emotion. An accurately identified expression received a score of 1 and a misidentified expression received a score of 0. Participants' performance was expressed as the percentage of accurately identified expressions.

Procedure

At the first assessment time, after completion of the EFE task, participants were further assessed on several control measures. To screen cognitive efficiency and visuo-spatial abilities, participants were administrated the Cognitive Capacity Screening Examination (CCSE; Jacobs et al., 1977), the Benton Facial Recognition Test (BFRT; Benton et al., 1983), and 3 of the 7 subscales composing the global performance scale of the Weschler Adult Intelligent Scale (WAIS; Wechsler, 1955) involving visuo-spatial abilities. More specifically, scales 1, 5, and 14 of the WAIS (respectively named "pictures completing," "cubes," and "objects assembling") were used in the present study. Scores on these 3 subscales were taken as a whole and added together in a global score. Participants then completed a socio-demographic questionnaire, including historical variables of alcohol problems, among which a familial history of alcoholism, daily alcohol consumption, number of previous inpatients' detoxification stays, and history of head injury. As shown in Table 2, AA and AD were similar on these last variables. Finally, Beck Depression Inventory (BDI; Beck et al., 1998), and Spielberger State-Trait Anxiety Inventory (STAI) forms A and B (Spielberger et al., 1970) were completed by each participant in the 3 subsequent days.

Overall, participants, whether alcoholic or not, demonstrated similar performances on the CCSE and on the WAIS scales. However, as expected, alcoholic participants, either AA or AD, showed significantly higher levels of depression and anxiety trait. Further, AA showed greater scores of anxiety state than both C and AD. Finally, AD had lower scores at the BFRT compared with the 2 other groups, but still demonstrated scores in the normal range.

At the second assessment time, the remaining participants (AA and C) were again asked to complete an EFE decoding task. To finish, they filled in the BDI and the STAI form A and B during the 3 subsequent days. As expected, differences between C's and AA's depression and anxiety state levels diminished with time, which was not the case for anxiety trait. Tables 2 and 3 illustrate these latter observations corroborated by repeated measure analysis of variance (ANOVA) using a multivariate approach with assessment time (times 1 and 2) as the within-subject factor and group (C and AA) as the between-subjects factor conducted on the scales used at both assessment times.

Table 3. Abstinent Alcoholic Patients' (AA) and Controls' (C) Scores on Control Measures at the Second Assessment Time

	Second assessment time	
	AA ($N = 22$)	C ($N = 22$)
BDI***	6.37 (3.32)	2.44 (3.58)
STAI-S[NS]	37.37 (10.83)	32.00 (11.81)
STAI-T**	45.53 (10.52)	34.67 (10,39)

Values are mean (standard deviation).
NS, not significant; BDI, Beck Depression Inventory; STAI, State-Trait Anxiety Inventory.
**$p \leq .01$; ***$p \leq .001$.

RESULTS

Overall, dependent measures showed a normal distribution and therefore were treated with parametric tests. All statistical analyses were conducted using Statistical Package for the Social Sciences (SPSS), version 12.0 for Windows. All statistical tests were 2-tailed and $p \leq 0.05$ defined statistical significance. The results of ordinal variables are expressed as means and standard deviations.

Correlations for preliminary analyses used the Pearson product–moment correlation coefficient (r). Moreover, between-group comparisons and within-group comparisons were conducted by using either 1-way ANOVA for ordinal variables, or the chi-square statistic test for categorical variables.

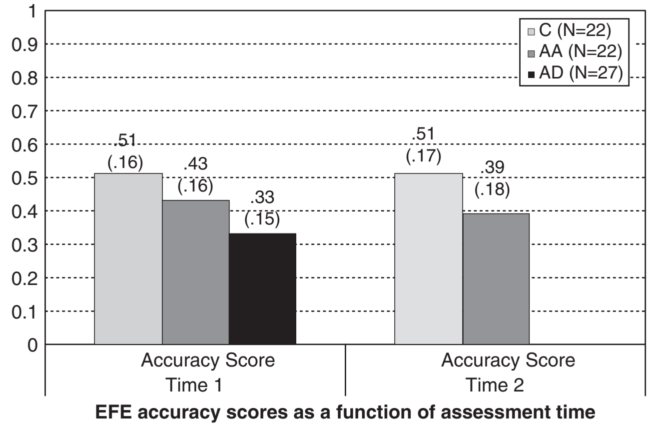
Data analysis proceeded in 2 principal steps: first, longitudinal analyses were performed on EFE scores—(a) EFE decoding accuracy scores; (b) intensity score attributed to EFE: AA scores were compared with those of C. Second, transversal analyses were conducted on the performances at the first assessment time to include the 27 alcoholic participants who dropped from the longitudinal design (AD). Analyses compared the performances of C, AA, and AD on the accuracy and intensity EFE scores.

Longitudinal Analyses

Preliminary Analyses: Control Measures and Their Influence on EFE Scores. Correlation analyses on the whole sample as on each group (AA, AD, and C) did not evidence any significant association between EFE decoding dependent variables and control measures: BDI, STAI state and STAI trait, BFRT, CCSE, and total of the 3 WAIS subscales. Further analyses were conducted to examine the potential effect of variables such as gender, familial history of alcohol (at least 1 biological parent), task version, educational level, and history of head injury on EFE decoding dependent variables. No effect or interaction with group reached significance. In the context of the longitudinal part of this study, only main effects or interactions involving the factor "group" and "assessment time" are of interest and discussion is limited to these results.

EFE Decoding Abilities as a Function of Groups

Decoding Accuracy. A repeated measure ANOVA using a multivariate approach was conducted on the accuracy scores with assessment time (times 1 and 2) and emotion (happiness, anger, sadness, and disgust) as within-subject factors, and group (C and AA) as between-subjects factor. Overall, C ($M = 0.51$, SD = 0.13) were more accurate than AA ($M = 0.41$; SD = 0.14) in the decoding of EFE, as revealed by the main effect of group: $F(1, 42) = 6.111$; $p \leq 0.02$; $\eta^2 = 0.127$; power = 0.676. Assessment time and group factors failed to reveal any other effect or interaction: AA did not appear to improve on decoding accuracy scores with midterm abstinence, as illustrated in Fig. 1 (further below).



Note. Values are Mean (Standard Deviation).

Fig. 1. Emotional facial expression accuracy scores as a function of groups and of assessment time.

Intensity Scores. A repeated measure ANOVA using a multivariate approach with assessment time (times 1 and 2), emotion (happiness, anger, sadness, and disgust), and scales (happiness, sadness, fear, anger, disgust, surprise, shame, and contempt) as within-subject factors, and group (C and AA) as between-subjects factor was conducted on intensity scores.

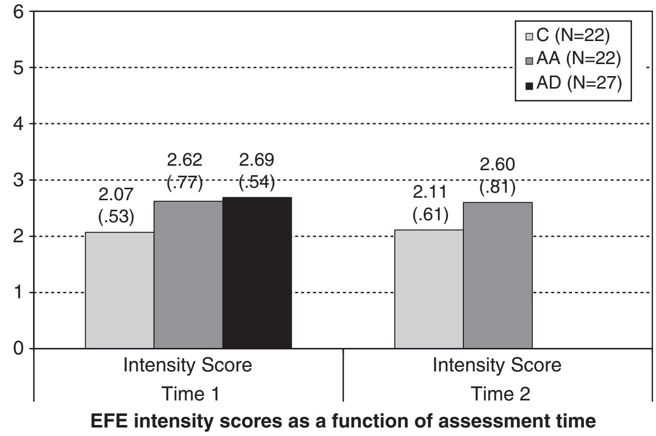
The results revealed a main effect of group: $F(1, 42) = 7.034$; $p \leq 0.02$; $\eta^2 = 0.143$; power = 0.736. This main effect was qualified by a significant group×emotion interaction: $F(3, 40) = 4.099$; $p \leq 0.02$; $\eta^2 = 0.235$; power = 0.810. Post hocs revealed that AA overestimated EFE of disgust ($p \leq 0.01$), of anger ($p \leq 0.02$), and of happiness ($p \leq 0.03$) compared with C. While not significant, post hoc on sadness EFE showed a tendency ($p = 0.051$) in the same direction. Thus, AA differed from C on their intensity scores for disgusted, angry, happy, and to a lesser extent sadness emotional expressions, demonstrating an overall overestimation (for AA: $M = 2.61$; SD = 0.74; and for C: $M = 2.09$; SD = 0.54).

Assessment time factor and group factors failed to reveal any other effect or interaction: with midterm abstinence, AA still overestimated EFE intensities compared with C (see Fig. 2 further below).

Transversal Analyses

Preliminary Analyses: Control Measures and Their Influence on EFE Scores. Correlation analyses on the whole sample as on each group (AA, AD, and C) did not evidence any significant association between EFE decoding dependent variables and control variables: age, data regarding alcohol consumption (length of the disease, number of drinks per day before the treatment), and scores at the BDI, STAI state and trait, CCSE, WAIS, and BFRT.

Analyses of variance on EFE scores were further conducted to screen the potential effect of gender, familial



Note. Values are Mean (Standard Deviation).

Fig. 2. Emotional facial expression intensity scores as a function of groups and of assessment time.

Table 4. Significant Analyses Conducted on the Group × Emotion × Scale Interaction

Scores on	Bonferroni's post hocs	*p*
Happy EFE		
Sad intensity scale	C < AD & AA = C & AA = AD	≤0.01
Disgust intensity scale	C < AD & AA = C & AA = AD	≤0.05
Angry EFE		
Fear intensity scale	C < AD & AA = C & AA = AD	≤0.02
Surprise intensity scale	C < AD & AA = C & AA = AD	≤0.02
Disgust intensity scale	C < (AD = AA)	≤0.01
Sad EFE		
Fear intensity scale	C < AD & AA = C & AA = AD	≤0.02
Shame intensity scale	C < AD & AA = C & AA = AD	≤0.01
Disgusted EFE		
Anger intensity scale	C < (AD = AA)	≤0.001
Sad intensity scale	C < (AD = AA)	≤0.01
Fear intensity scale	C < (AD = AA)	≤0.001
Surprise intensity scale	C < AD & AA = C & AA = AD	≤0.02
Shame intensity scale	C < (AD = AA)	≤0.001
Contempt intensity scale	C < AD & AA = C & AA = AD	≤0.04

C, control participants; AA, abstinent alcoholic participants; AD, dropping alcoholic participants; EFE, emotional facial expression.

history of alcoholism (at least 1 biological parent), educational level, and history of head injury. The overall results revealed 2 significant interactions with group. Specifically, on accuracy scores, group×familial history of alcoholism interaction was observed ($p < 0.05$), while on intensity scores, a group×gender interaction reached significance. However, because of unclear post hocs results, these interactions were difficult to interpret. For instance, while AD with a familial history of alcoholism demonstrated worse accuracy scores than AD with no familial history of alcoholism, the reverse was observed in AA. Analyses were thus collapsed across all preceding factors.

In the context of the transversal part of this study, only main effects or interactions involving the factor group are of interest and discussion is limited to these results.

EFE Decoding Abilities as a Function of Groups

Decoding Accuracy. A repeated measure ANOVA using a multivariate approach was conducted on the accuracy scores with emotion (happiness, anger, sadness, and disgust) and intensity (30%, 70%) as within-subject factors, and group (C, AD, and AA) as between-subjects factor.

The results revealed a significant main effect of "group": $F(2, 68) = 7.821$; $p \leq 0.001$; $\eta^2 = 0.187$; power = 0.943. Bonferonni's post hocs were computed to clarify this effect: AD were less accurate than AA and C, the latter 2 groups not being statistically different. Thus, alcoholic patients who dropped from the longitudinal design also demonstrated worse EFE accuracy scores than both control (C) and alcoholic participants who remained in the therapeutic program and were assessed a second time (AA). No other main effects or interactions involving group emerged (see Fig. 1).

Intensity Scores. A repeated measure ANOVA using a multivariate approach with emotion (happiness, anger, sadness, and disgust), intensity (30%, 70%), and scales (happiness, sadness, fear, anger, disgust, surprise, shame, and contempt) as within-subject factors, and group (C, AD, and AA) as between-subjects factor was conducted on the intensity scores.

Overall, alcoholic inpatients (AD and AA) overestimated EFE intensity compared with C, as reflected by the significant main effect of "group": $F(2, 68) = 7.100$; $p \leq 0.01$; $\eta^2 = 0.173$; power = 0.920. The 2 alcoholic groups did not differ from each other (see Fig. 2).

However, 2 significant interactions involving group additionally qualified this main effect: (1) group×emotion: $F(6, 134) = 3.398$; $p \leq 0.01$; $\eta^2 = 0.132$; power = 0.933 and (2) group×emotion×scales: $F(42, 98) = 1.621$; $p \leq 0.05$; $\eta^2 = 0.410$; power = 0.991.

Post hoc analyses for the group×emotion interaction showed that C differed from both AA and AD, who demonstrated similar performances for EFE of anger and disgust (respectively, $p \leq 0.02$; $p \leq 0.001$). For EFE of sadness and happiness (respectively, $p \leq 0.03$; $p \leq 0.04$), however, AD differed from both AA and C and the latter 2 groups did not differ from one another. Thus, on sad and happy EFE, AA demonstrated similar intensity estimations as C, whereas for disgust and angry EFE, all alcoholic inpatients differed from C.

Finally, significant analyses and the post hocs conducted on the group×emotion×scale interaction are summarized in Table 4.

The results on intensity ratings seemed indicative of less intensity overestimations in AA than in AD as most interaction post hocs indicated differences between AD and C. Abstinent alcoholic participant's intensity scores were similar to those of the other 2 groups (C and AD). Moreover, most differences were exhibited on negative-emotion scales: alcoholic patients exhibited negative overestimation biases on EFE recognition.

DISCUSSION

Overall, the results of both longitudinal and transversal analyses demonstrate EFE decoding difficulties in alcoholic inpatients, corroborating, and extending anterior empirical evidence showing deficits in the decoding of nonverbal cues in alcoholism (Foisy et al., in press; Frigerio et al., 2002; Kornreich et al., 2001a; Monnot et al., 2001; Philippot et al., 1999; Townshend and Duka, 2003). Contrasting with Kornreich et al's. (2001b) study, alcoholic abstainers did not appear to improve with abstinence at all as the factor "assessment time" had no impact on participants' performances at the EFE task, whether alcoholic or control. Abstinent alcoholic participants exhibited more decoding errors and overestimated EFE intensity compared with C, regardless of the length of their abstinence. This observation agrees with the results of a former study (Foisy et al., 2005), which failed to evidence recovery in EFE decoding abilities among polysubstance-abusing individuals with alcoholism antecedents.

Further, alcoholic inpatients who dropped from their detoxification treatment before term (and thus were not retested at the second assessment time) demonstrated even worse EFE decoding abilities than alcoholic abstainers. Indeed, transversal analyses showed that alcoholic patients who dropped out before the second assessment time were less accurate than both control participants and alcoholic abstainers, the latter not statistically differing from each other. Moreover, while all alcoholic participants, whether abstinent or droppers (AA and AD), demonstrated EFE intensity overestimation, the results tend to show even higher intensity scores in AD. Indeed, post hocs on intensity scores mostly failed to reveal difference between AA and C, while AD almost systematically over-estimated EFE intensities compared with the 2 other groups. Additionally, most group differences on intensity estimations were accounted for by negative emotional scales.

Taken as a whole, the current outcomes replicate anterior findings showing EFE decoding problems in alcoholism (Foisy et al., in press; Kornreich et al., 2001b; Philippot et al., 1999; Townshend and Duka, 2003), with a tendency toward negative emotions' overestimations (Frigerio et al., 2002; Philippot et al., 1999; Townshend and Duka, 2003). Our results also seem indicative of more EFE decoding problems in alcoholic participants who dropped from the center before the end of their hospitalization. However, other control measures failed to evidence much difference between the 2 alcoholic groups of the present study. The findings also replicated empirical evidence showing that visuo-spatial (Borod et al., 1993) or facial recognition skills (Adolphs et al., 1996; Streit et al., 2000) did not interfere much with EFE decoding abilities: indeed, EFE performances were not associated with scores on the BFRT, neither on the 3 WAIS subscales.

While differences in EFE decoding competences may exist between AD and AA, abstinence was not associated with any improvement in AA. As mentioned, this absence of recovery may be understood either by the presence of EFE decoding deficits before the development of alcoholism or by their installation because of chronic alcohol consumption detrimental effects on the brain. Alternatively, 3 months of abstinence may not be sufficient to observe any EFE decoding improvements. Besides, EFE decoding abilities may have a prognostic value: alcoholic patients who present less deficits could be better candidates for completing detoxification treatment as shown by the differences evidenced between AD and AA.

The EFE test used here could present some limitations. While in real-life conditions, EFE are displayed for a very short time, rarely more than 1 second (Ekman, 1984), the EFE task of the present study allowed participants to take the time needed to observe and answer the 8 emotional intensity scales associated with each of them. The use of an EFE test has indeed less ecological validity compared with real-life situations where other domains of nonverbal communication (e.g., prosody, posture) and contextual clues might compensate for the observed EFE dysfunction.

Additional studies are needed to better understand nonverbal communication deficits in alcoholism. Particularly, the time course installation and possible recovery of EFE decoding deficits in alcoholism, and their link with other potential mediating variables such as interpersonal difficulties are of interest. Indeed, research (Kornreich et al., 2002) has shown an association between impaired EFE recognition and interpersonal problems. Alcoholism is well known to be associated with severe relational difficulties (Nixon et al., 1992), which are described as a major source of relapse (Marlatt, 1996). Moreover, deficits in the processing of emotional social signals could worsen these difficulties as reflected by the discrepancies observed here between AA and AD. Further, as interpersonal skills training has been shown to improve the outcome of alcoholic patients (Eriksen et al., 1986; Miller et al., 1998), EFE decoding training could also be useful in a clinical setting.

Longitudinal studies with longer controlled abstinence lengths of time as well as studies on population at risk to develop alcohol dependence are also required. They should also explore possible differences in EFE decoding competence between different alcoholic subpopulations, such as AD compared with AA.

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