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Impaired emotional facial expression recognition in alcoholics: Are these deficits specific to emotional cues?

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Abstract

Previous studies have repeatedly linked alcoholism is to impairment in emotional facial expression decoding. The present study aimed at extending previous findings while controlling for exposure times of stimuli. Further, a control task was added on the decoding of non-emotional facial features. Twenty-five alcoholic participants were compared to 26 control participants matched for age, sex and educational level. Participants performed two computer tasks consisting of presentation of photographs of faces for either 250 or 1000 ms. The first task required "yes" or "no" responses as rapidly as possible to questions regarding non-emotional features of the face (gender, age range and cultural identity). The second task involved a different set of photographs implicating emotional facial expression decoding, with the same exposure times. Again, rapid "yes" or "no" responses to trials combining 32 emotional facial expressions by eight emotional labels (happiness, sadness, fear, anger, disgust, surprise, shame, and contempt) were required from participants. Reaction times were recorded for both tasks. Alcoholic and control participants showed similar results in both tasks in terms of response accuracy. Yet, in the emotional facial expression task, alcoholic participants' responses matched more negative emotional labels, especially sadness. Further, alcoholics were slower than control participants specifically to answer emotional questions on emotional facial expression. No differences appeared on reaction times in the control task. Contrary to expectations, no interaction of stimulus time exposure and group was observed. Overall, these findings replicate and extend previous results on emotional facial expression decoding ability: Alcoholics are specifically impaired on emotional non-verbal behavior information processing: They are slower to correctly identify an emotion.

Keywords: Alcoholism; Emotion; Face; Decoding; Non-verbal

1. Introduction

Alcoholics have impairment in cognitive processing of emotional signals. Indeed, studies of recovering alcoholics found deficits in the recognition of emotional facial expressions (EFE) (Oscar-Berman et al., 1990; Philippot et al., 1999; Kornreich et al., 2001a,b; Frigerio et al., 2002) as well as in the identification of affective prosody, a non-verbal aspect of speech (Monnot et al.,

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2001, 2002; Uekermann et al., 2005). More specifically, studies on the ability to decode emotional facial expressions have systematically revealed that alcoholics decode emotional facial expressions less accurately than normal controls (Oscar-Berman et al., 1990; Philippot et al., 1999; Kornreich et al., 2001a,b; Frigerio et al., 2002) and, to a lesser degree, than opiate dependent patients (Kornreich et al., 2003). In addition, recovering alcoholics overestimate the intensity of emotional facial expression (Philippot et al., 1999; Kornreich et al., 2001a,b). They also need a greater intensity of nonverbal signals to perceive an expression as being present (Frigerio et al., 2002), and they display different patterns of interpretation of emotion as compared to controls, with a specific bias towards perceiving expressions as hostile (Philippot et al., 1999; Frigerio et al., 2002; Townshend and Duka, 2003).

Such difficulties in the ability to recognize the emotions felt by others may have an important impact on sociability. Indeed, satisfying and successful interpersonal relationships are partly determined by the ability to accurately interpret non-verbal signals from interaction partners (Carton et al., 1999), among which emotion is a very important factor (Patterson, 1999). Concerning alcohol dependence specifically, it is well known that alcoholics are confronted with severe interpersonal problems in their daily functioning (Nixon et al., 1992; Duberstein et al., 1993), which are partly mediated by emotional facial expression decoding deficits (Kornreich et al., 2002).

In everyday life, facial expressions of emotion rarely last more than 1 s (Ekman, 1984). Further, even with 30 to 50 ms exposure time, emotional facial expression decoding accuracy rates in a normal population remains above chance level (Kirouac and Doré, 1984). In sum, in real life, facial expressions of emotion are displayed for a very short time and are recognized very rapidly. While results from earlier studies systematically evidenced impairments in the decoding of emotional information conveyed by the face, the true depth and nature of this deficit in alcoholics may have been hidden by the design used in these studies: Indeed, participants had the possibility to pace themselves and look at stimuli as long as they pleased, which does not correspond to real life conditions.

Further, although the emotional facial expression decoding deficit observed in alcoholism has been well documented, its scope remains nevertheless unclear. It may be the result of a more general impairment in facial or visual perception. Few of the past studies used a control recognition task. Townshend and Duka (2003) included cognitive control tasks on pattern and spatial recognition in their methodology. Alcoholic patients made more errors than control participants in the pattern recognition task, but not in the spatial recognition task. Frigerio et al. (2002) used a control task with animated facial stimuli changing from masculine to feminine: Participants had to indicate when the gender changed. No difference emerged between control and alcoholic participants on this 'perception of face gender' task. Apart from this specific study, none of the previous studies included a control-decoding task on facial perception.

In order to extend and replicate previous data, the present study used a different approach to control these methodological difficulties and to approach real life conditions: It investigates emotional facial expression decoding in alcoholics while controlling for the exposure time of the stimuli (1000 or 250 ms). Reaction times of the participants were recorded. Further, a new control task on the perception of non-emotional features of the face was designed: Each face stimulus was associated with three questions on gender, ethnicity and age. Again exposure times of stimuli were controlled for (1000 or 250 ms) and reaction times responses of the participants were recorded. We hypothesized that compared to normal controls, recovering alcoholics would demonstrate difficulties in the processing of emotional features of the face, but would not display problems in the processing of non-emotional features.

2. Methods

2.1. Participants

Twenty-five inpatients diagnosed with alcohol dependence according to DSM-IV criteria were recruited in a psychiatric ward of a large university hospital in Brussels, Belgium. Alcoholic participants were in their third week of detoxification, and were not given any medication. Abstinence for recovering alcoholics was ensured both by the staff's clinical supervision and by frequent alcohol breath test controls. The presence of a psychotic disorder or of a history of coma led to exclusion from the study. Further, to avoid testing demented patients, all inpatients were screened for overt cognitive dysfunction through the clinical observation of the staff (nursing observation as well as medical and psychological evaluation) regarding their ability to correctly function during their hospitalization (ability to find their way, to be oriented in time, to express themselves properly and to retain information).

Alcoholic participants were matched for age (±5 years), gender, and education with 26 control participants who

were free of any psychiatric record. Participants in the control group were recruited from among the hospital staff and investigators' acquaintances. All participants were provided with full details regarding the aims of the study and the procedure to be followed before giving their consent.

Prior to testing, participants completed several measures: the Beck Depression Inventory (BDI; Beck et al., 1988), the Spielberger State–Trait Anxiety Inventory (STAI-form B; Spielberger et al., 1970) and the Severity of Alcohol Dependence Questionnaire (SAD-Q; Stockwell et al., 1983). Participants were then asked to fill in a socio-demographic questionnaire, including history of alcohol problems, among which familial history of alcoholism (recorded as positive if at least one biological parent had alcohol abuse or dependence), daily alcohol consumption, and number of previous inpatient detoxification stays. After explanation about the study had been provided, all participants signed an informed consent form. As shown in Table 1, alcoholic and control participants were similar in age, sex and educational level, but as expected, alcoholics showed higher levels of anxiety and depression than control participants.

Table 1
Characteristics of recovering alcoholics and control participants'

	Alcoholics (n=25)	Controls (n=26)
Gender : Men/Women^{NS}	16/9	16/10
Education : Level 1/2/3/4^{NS}	1/3/13/8	0/2/13/11
Age^{NS}	M(25)=46.76	M(26)=44.11
	S.D.(25)=9.29	S.D.(26)=9.50
Family history of alcoholism (yes/no)**	12/13	3/23
Age of 1st alcohol consumption^{NS}	M(24)=16.00	M(25)=14.80
	S.D.(25)=5.19	S.D.(25)=2.08
Number of drinks/day***	M(24)=18.79	M(26)=1.31
	S.D.(24)=8.92	S.D.(26)=1.33
Number of months of abuse	M(24)=201.76	NA
	S.D.=148.05	
Number of previous treatment	M(24)=2.96	NA
	S.D.(24)=1.83	
Number of days since last drink***	M(25)=22.88	M(25)=6.88
	S.D.(25)=9.88	S.D.(25)=11.66
BDI***	M(25)=12.16	M(26)=2.38
	S.D.(25)=7.87	S.D.(26)=2.93
STAI-TRAIT***	M(25)=51.84	M(26)=36.50
	S.D.(25)=8.33	S.D.(26)=8.12
SAD-Q***	M(25)=38.08	M(26)=20.00
	S.D.(25)=16.99	S.D.(26)=0.00

Values are frequencies of categories or Mean (n) and Standard Deviation (n). NA means Not Applicable.
Education categories were coded as follows: 1=completion of primary school; 2=completion of the first 3 years of secondary school; 3=completion of secondary school; 4=post-secondary school training.
Familial history of alcoholism was recorded if at least one biological parent had alcohol abuse or dependence.
^{NS} indicates that means are not statistically different; *P<0.05; **P<0.01; ***P<0.001.

2.2. Procedure

2.2.1. Control task

Control stimuli were selected on the Internet in order to constitute two sets of photographs of faces combining the following dimensions: 2 genders (male and female)×2 cultural identities (Caucasian and non-Caucasian)×2 age ranges (young and old). One series was presented to the participants over 250 ms, while the other was displayed for 1000 ms. Following the presentation of a photograph, one of three statements appeared on the computer screen: This person is… "old"; "a woman"; "of Caucasian type". Each of the 16 control stimuli appeared three times, in association to each of the three questions. All presentations (control stimuli and questions) were displayed in a random order. The participants were asked for "yes" or "no" responses by pressing a computer key as rapidly as possible.

2.2.2. Emotional facial expression task

Emotional facial expressions were selected from a series of standardized emotional facial expressions (JACFEE; Matsumoto and Ekman, 1988). Based on the neutral facial expression (0% of emotional intensity) and the full-blown emotional facial expression (100% of emotional intensity) of the same actor, a series of intermediate morphed expressions differing in emotional intensity by 10% steps was constructed and validated (Hess and Blairy, 1995).

From this series, 2 sets of 4 Emotions (happiness, anger, disgust and sadness)×2 Intensities (30% and 70%), displayed for either 250 or 1000 ms, were presented to participants. Immediately after the presentation of a photograph, one of the eight following emotional statements appeared on the computer screen: This person feels… "ashamed"; "contemptful"; "happy"; "afraid"; "disgusted"; "angry"; "sad"; "surprised". Thus, each emotional facial expression appeared eight times, associated to each of the eight emotional questions. All associations (emotional facial expression and emotional label question) were displayed in a random order. As in the control decoding task, participants were asked for "yes" or "no" responses by pressing a computer key, as rapidly as possible.

After the completion of the two computer tasks, participants were given the control measures to fill out. They were then fully debriefed and thanked for their participation.

2.3. Dependent measures

2.3.1. Decoding accuracy

Decoding accuracy was defined as the ability of the participant to correctly answer all questions associated to the stimulus. Participants' performance was expressed as the percentage of accurately identified stimuli. An accurately identified stimulus received a score of 1, and a misidentified stimulus received a score of 0. Thus, for each task, an incorrect acceptance or an inaccurate rejection of one question or more concerning a stimulus led to a score of 0 for this particular stimulus (the decoding control task with three questions associated to each stimulus, and the emotional facial expression decoding task with eight questions associated to each stimulus).Additionally, concerning the emotional facial expression decoding task specifically, the number of times each emotion was recognized as being present (correct identifications and false positives) was also investigated.

2.3.2. Reaction times for accurate responses

In both tasks — control and emotional facial expression task — only accurate responses were taken into account for reaction time analyses. Analyses were performed on global scores (the combination of both correct acceptances and correct rejections), taking into account the factor Exposure Time (250 versus 1000 ms).

3. Results

3.1. Data analysis

All statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 12.00 for PC. All statistical tests were two-tailed. Unless otherwise specified, $P<0.05$ was assumed to define statistical significance. 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 one-way analysis of variance (ANOVA) for ordinal variables, or chi-square statistical test for categorical variables. Statistical differences between the two groups (alcoholic and control participants) on (1) decoding accuracy and (2) reaction times for accurate answers in both tasks were evaluated by repeated measure analyses of variance using a multivariate approach (MANOVA). In the context of the present article, only main effects or interactions involving the factor 'Group' are of interest.

Table 2
Decoding accuracy scores in the control task as a function of Group: F-values for MANOVA

Sources	df	F-values	Power	η^2
Group	1,49	2.845	0.380	0.055
Exposure Time	1,49	2.117	0.297	0.041
Exposure Time × Group	1,49	3.335	0.433	0.064

Exposure time of the stimuli (250 and 1000 ms) as the within-subject factor and Group (Alcoholic and Control) as the between-subjects factor.

Table 3
Decoding accuracy scores in the emotional facial expression decoding task as a function of Group: F-values for MANOVA

Sources	df	F-values	Power	η^2
Group	1,49	1.939	0.276	0.038
Exposure time	1,49	30.301***	1.000	0.382
Emotion	3,47	50.920***	1.000	0.765
Intensity	1,49	19.631	0.991	0.286
Exposure Time × Group	1,49	0.120	0.063	0.002
Emotion × Group	3,47	1.660	0.407	0.096
Intensity × Group	1,49	1.083	0.175	0.022
Exposure Time × Emotion	3,47	3.469*	0.741	0.181
Exposure Time × Emotion × Group	3,47	0.408	0.125	0.025
Exposure Time × Intensity	1,49	0.004	0.050	0.000
Exposure Time × Intensity × Group	1,49	0.432	0.099	0.009
Emotion × Intensity	3,47	0.220	0.088	0.014
Emotion × Intensity × Group	3,47	0.595	0.164	0.037
Exposure Time × Emotion × Intensity	3,47	1.229	0.308	0.073
Exposure Time × Emotion × Intensity × Group	3,47	0.563	0.157	0.035

***$P<0.001$; *$P<0.05$.

Emotion (happiness, anger, disgust and sadness), Intensity (30% and 70%), and Exposure Time of the stimuli (250 and 1000 ms) as the within-subject factors, and Group (Alcoholic and Control) as the between-subjects factor.

3.2. Preliminary analyses

Whether in all participants or in the alcohol or control group only, no correlation reached statistical significance between age, and BDI, STAI-B, Sad-Q scores on the one hand, and any computed scores (including accuracy scores and reaction times for accurate responses) in both tasks — control and emotional facial expression task, on the other hand. Similarly, concerning alcoholic participants: length of consumption, length of abstinence, daily alcohol consumption, and number of previous inpatient detoxification stays did not have any impact on the dependent variables. Finally, no gender, educational level, history of coma and familial alcoholism antecedent significant main effect or interaction was observed on the computed dependent variables in the whole group of participants or in each group independently. Therefore,

Table 4
Emotional facial expression decoding task : *F*-values for MANOVA on the number of times each emotion was recognized as being present (on correct identifications and false positives)

Sources	*df*	*F*-values	Power	η^2
Group	1,49	3.989	0.330	0.047
Exposure Time	1,49	1.147	0.183	0.023
Emotion	3,47	42.585***	1.000	0.731
Intensity	1,49	15.081***	0.968	0.235
Scale	7,43	12.664***	1.000	0.673
Exposure Time × Group	1,49	0.166	0.068	0.003
Emotion × Group	3,47	3.116*	0.689	0.166
Intensity × Group	1,49	0.108	0.062	0.002
Scale × Group	7,43	2.437*	0.807	0.284
Exposure Time × Emotion	3,47	1.925	0.466	0.109
Exposure Time × Emotion × Group	3,47	0.896	0.231	0.054
Exposure Time × Intensity	1,49	2.785	0.373	0.054
Exposure Time × Intensity × Group	1,49	0.404	0.096	0.008
Emotion × Intensity	3,47	14.155***	1.000	0.475
Emotion × Intensity × Group	3,47	1.145	0.288	0.068
Exposure Time × Emotion × Intensity	3,47	4.694**	0.869	0.231
Exposure Time × Emotion × Intensity × Group	3,47	0.512	0.146	0.032
Emotion × Scale	21,29	38.041***	1.000	0.965
Emotion × Scale × Group	21,29	2.109*	0.916	0.604
Exposure Time × Scale	7,43	2.589*	0.834	0.296
Exposure Time × Scale × Group	7,43	0.201	0.099	0.032
Emotion × Exposure Time × Scale	21,29	1.678	0.821	0.549
Emotion × Exposure Time × Scale × Group	21,29	1.444	0.743	0.511
Intensity × Scale	7,43	10.244***	1.000	0.625
Intensity × Scale × Group	7,43	2.000	0.708	0.246
Emotion × Intensity × Scale	21,29	13.181***	1.000	0.905
Emotion × Intensity × Scale × Group	21,29	0.997	0.535	0.419
Exposure Time × Intensity × Scale	7,43	1.057	0.399	0.147
Exposure Time × Intensity × Scale × Group	7,43	0.256	0.115	0.040
Emotion × Exposure Time × Intensity × Scale	21,29	2.216*	0.931	0.616
Emotion × Exposure Time × Intensity × Scale × Group	21,29	1.499	0.763	0.520

***$P<0.001$; **$P<0.01$; *$P<0.05$.
Emotion (happiness, anger, disgust and sadness), Intensity (30% and 70%), emotional Scale (happiness, sadness, anger, disgust, contempt, fear, shame, and surprise) and Exposure Time of the stimuli (250 and 1000 ms) as the within-subject factors, and Group (Alcoholic and Control) as the between-subjects factor.

all subsequent analyses were collapsed across these factors.

3.3. Decoding accuracy

3.3.1. Control task

In order to compare alcoholic and control participants' performances on the control task, a repeated MANOVA was conducted on the answers of the participants with Exposure Time of the stimulus (250 versus 1000 ms) as the within-subject factors, and Group (alcoholic and control participants) as the between-subject factor on accuracy scores. This analysis did not reveal any main effect or interaction involving the factor Group or the factor Exposure Time of the stimulus. Alcoholic and control participants showed similar performances in their decoding abilities of non-emotional cues in faces without modulation by exposure time of stimulus (see Table 2).

3.3.2. Emotional facial expression task

In order to assess whether there was a difference between alcoholic and control participants' performances in their ability to decode emotional facial expression, a repeated MANOVA was conducted with Exposure Time of the stimulus (250 and 1000 ms), emotional facial expression (happiness, anger, disgust and sadness) and Intensity (30% and 70%) as the within-subject factors, and Group (alcoholic and control participants) as the between-subjects factor on emotional facial expression accuracy scores. No main effect or interaction involving the factor Group was observed (see Table 3). A main effect of "Exposure Time of stimulus" revealed that overall participants demonstrated better accuracy scores

Table 5
Reaction times in the control task as a function of Group: *F*-values for MANOVA

Sources	*df*	*F*-values	Power	η^2
Group	1,49	2.365	0.326	0.046
Exposure Time	1,49	0.000	0.050	0.000
Answer Type	1,49	7.772**	0.780	0.137
Exposure Time × Group	1,49	1.573	0.233	0.031
Answer Type × Group	1,49	0.032	0.053	0.001
Exposure Time × Answer Type	1,49	0.061	0.057	0.001
Exposure Time × Answer Type × Group	1,49	2.529	0.344	0.049

**$P<0.01$.
Answer Type (correct acceptance versus correct rejection) and Exposure Time of the stimuli (250 and 1000 ms) as the within-subject factors, and Group (Alcoholic and Control) as the between-subjects factor.

with the 1000 ms than with the 250 ms exposure time of the stimulus (respectively, $m^{1000}=0.25$; S.D.$^{1000}=0.15$; $m^{250}=0.17$; S.D.$^{250}=0.13$).

A second repeated MANOVA was performed on the number of times each emotion was recognized as being present (correct identifications and false positives) with Exposure Time of the stimulus (250 and 1000 ms), emotional facial expression (happiness, anger, disgust and sadness), Intensity (30% and 70%) and Emotional Scale (i.e., happiness, anger, disgust, sadness, fear, shame, contempt and surprised) as the within-subject factors, and Group (alcoholic and control participants) as the between-subjects factor. This analysis revealed three significant interactions: (1) "Group × Emotional Scale", (2) "Group × Emotion" and (3) "Group × Emotion × Emotional Scale" (see Table 4). Of the 32 (4 Emotions × 8 Emotional Scales) Bonferonni post hoc tests computed to specify this third level interaction, six revealed an effect of Group. More specifically, in alcoholics, emotional facial expressions of happiness were more often judged as reflecting surprise than in control participants ($P\leq 0.03$, respectively, $m=0.37$, S.D.$=0.31$; $m=0.20$, S.D.$=0.20$). Emotional facial expressions of disgust were more frequently labeled as reflecting sadness by alcoholic participants than by control participants ($P\leq 0.02$, respectively, $m=0.38$, S.D.$=0.20$; $m=0.24$, S.D.$=0.21$). Concerning emotional facial expressions of anger, alcoholic individuals were more prone than the control volunteers to identify them as disgust ($P\leq 0.003$, respectively, $m=0.51$, S.D.$=0.28$; $m=0.30$, S.D.$=0.20$) or sadness ($P\leq 0.004$, respectively, $m=0.38$, S.D.$=0.25$; $m=0.20$, S.D.$=0.18$). Finally, the alcohol group rated emotional facial expressions of sadness as expressions of disgust more frequently than control participants ($P\leq 0.05$, respectively, $m=0.33$, S.D.$=0.28$; $m=0.19$, S.D.$=0.21$), and they more frequently inferred sadness correctly than individuals with no history of alcohol dependence ($P\leq 0.02$, respectively, $m=0.65$, S.D.$=0.20$; $m=0.50$, S.D.$=0.24$).

Thus, alcoholic and control participants demonstrated similar accuracy scores. Yet, both groups slightly differed in their pattern of answers, alcoholics generally matching more negative emotional items, particularly sadness, with negative emotional facial expressions, be they actual sadness expressions or not.

3.4. Reaction time for accurate responses

3.4.1. Control task

A repeated measures analysis of variance using a multivariate approach with 2 Exposure Times of the stimulus (250 versus 1000 ms) and 2 Answer Type (correct acceptance versus correct rejection) as the within-subject factors, and Group (alcoholic and control participants) as the between-subjects factor was computed on the reaction times for accurate answers on the control task (89, 64% of the total number of responses in the whole sample: 87, 75% and 89, 50% in alcoholic and control participants, respectively). There was no effect of 'Group' (see Table 5): Alcoholic ($m=2009.08$; S.D.$=773.80$) did not differ statistically from control participants ($m=1709.60$; S.D.$=610.17$) in their reaction time to questions relating to non-emotional cues of the face, regardless of the exposure time of the stimulus. A main effect of the factor "Accurate Answer" was observed: Overall, participants were faster for correct acceptances ($m=1772.70$; S.D.$=633.14$), compared to correct rejections ($m=1940.10$, S.D.$=825.76$).

3.4.2. Emotional facial expression task

A repeated measures analysis of variance using a multivariate approach with Exposure Time of the

Table 6
Reaction times in the emotional facial expression decoding task as a function of Group: *F*-values for MANOVA

Sources	*df*	*F*-values	Power	η^2
Group	1,49	6.171*	0.683	0.112
Exposure Time	1,49	1.769	0.256	0.112
Answer Type	1,49	6.178*	0.683	0.112
Exposure Time × Group	1,49	0.606	0.119	0.012
Answer Type × Group	1,49	0.823	0.144	0.017
Exposure Time × Answer Type	1,49	1.465	0.221	0.029
Exposure Time × Answer Type × Group	1,49	1.692	0.247	0.033

*$P<0.05$.
Answer Type (correct acceptance versus correct rejection) and Exposure Time of the stimuli (250 and 1000 ms) as the within-subject factors, and Group (Alcoholic and Control) as the between-subjects factor.

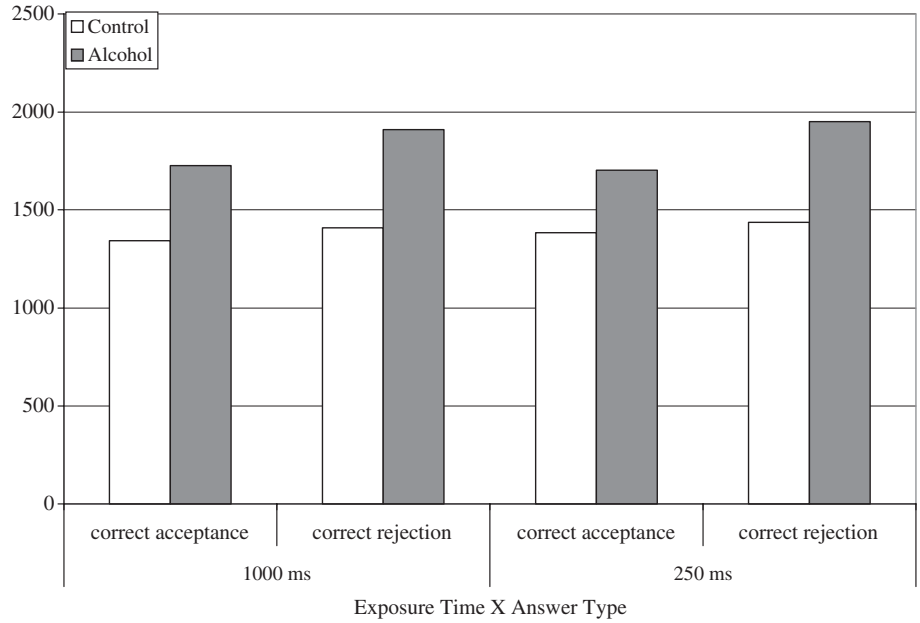

Fig. 1. Reaction times for accurate responses in the emotional facial expression decoding task as functions of Groups (Control and Alcohol), Exposure Times of stimuli (250 and 1000 ms), and the types of answers expected (correct acceptance versus correct rejection).

stimulus (250 versus 1000 ms) and Answer Type (correct acceptance versus correct rejection) as the within-subject factors, and Group (alcoholic and control participants) as the between-subjects factor was computed on the reaction times for accurate answers on the emotional facial expression task (76.07% of the total number of responses in the whole sample: 74.50% and 77.58% in alcoholic and control participants, respectively). It revealed a main effect of 'Group' and a main effect of 'Accurate Answer' (see Table 6). Fig. 1 shows that, overall, correct acceptances ($m=1534.79$; S.D.$=576.47$) were made faster than correct rejections ($m=1671.85$; S.D.$=808.38$) and that alcoholics needed significantly more time ($m=1818.12$; S.D.$=684.92$) than control participants ($m=1375.56$; S.D.$=585.18$) to answer accurately to questions pertaining to the emotional decoding of the emotional facial expression task, regardless of the exposure time of the stimulus, and the type of answer expected (correct acceptance versus correct rejection).

4. Discussion

In the present study alcoholic and control participants were presented with two face-related tasks. In both tasks stimuli were presented for fixed short durations. A first task involved judging non-changeable characteristics of the faces (e.g., gender, age range and cultural identity). In a second task, participants had to identify the emotion portrayed in photographs of emotional facial expressions.

Two main issues were raised. The first one pertains to the specificity of alcoholics' deficits in emotional facial expression decoding: Do recovering alcoholics and control participants differ in their pattern of response regarding the decoding of both emotional and non-emotional features of faces? The second issue addresses whether recovering alcoholics and control participants are different in their reaction times when decoding the emotional and non-emotional features of faces.

Contrary to our hypothesis, no interaction implicating exposure time of the stimulus and group was observed. Overall, alcoholic and control participants displayed similar accuracy scores in the control task as well as in the emotional facial expression task. Better results were observed in the 1000 ms time exposure condition as compared to the 250 ms time exposure condition but only in the emotional facial expression task. However, the patterns of emotional labeling in the emotional facial expression task slightly differed between groups.

Alcoholic patients selected more negative emotional labels, especially sadness. Further, while correct acceptances were overall faster than correct rejections, alcoholics needed significantly more time to accurately answer an emotional question than control participants in the emotional facial expression task, while no difference emerged in the control task.

These results are in line with previous studies showing a deficit in the recognition of emotional expression in alcoholics, with a particular bias for negative emotions (Philippot et al., 1999; Frigerio et al., 2002; Townshend and Duka, 2003). Alcoholic participants encountered specific difficulties in decoding facial expression content, regardless of the exposure times. However, results failed to reveal an accuracy deficit. This discrepancy between the present results and those of former studies may be explained by the particular task used: Participants were asked for "yes" or "no" answers as rapidly as possible to briefly exposed stimuli, while earlier studies had used different procedures. For instance, in Kornreich and colleagues' work (Konreich et al., 2001a,b, 2002) and the study of Townshend and Duka (2003), participants had the possibility to nuance their response on intensity scales for each emotion. In the study of Frigerio et al. (2002), participants were faced with a multiple choice response format with four possibilities of emotion (anger, disgust, happiness, sadness). These former procedures might be more sensitive to subtle differences in emotional facial expression decoding.

Interestingly, response time differences between groups were only observed for the emotional facial expression decoding task and not for the control task. Such differences suggest a specific difficulty for alcoholics when confronted with emotional material. These differences are even more noteworthy, given that response times were shorter in the emotional facial expression task than in the control task. This latter observation replicates previous data showing that emotional facial decoding is extremely rapid and automatic (Kirouac and Doré, 1984). Further, it suggests that the emotional facial expression task was no more difficult to process than the control task. Therefore, longer reaction times regarding emotional facial expression decoding in alcoholics, as compared to non-emotional dimensions decoding, cannot be explained by a particular difficulty in processing complex information.

The relative slowness of emotion decoding in alcoholics and their bias towards negative emotions might have an impact on everyday life functioning and might partly explain interpersonal difficulties in alcoholism. It has already been observed that interpersonal difficulties are related to emotional facial expression decoding errors in this specific population (Kornreich et al., 2002). Further, research has shown that a major source of relapse is related to the interpersonal difficulties encountered by alcoholic patients (Marlatt, 1996). It may thus be important to address the issue of emotion decoding deficits in clinical settings, with interpersonal and emotional therapeutic work. However, social skills abilities were not recorded in the present study, leaving the question open whether relational problems are linked to longer reaction times in decoding emotional facial expressions in alcoholics.

Some research has evidenced general visuo-spatial deficits in alcoholics (Beatty et al., 1996; Sher et al., 1997; Sullivan et al., 2000). However, the present study failed to find any difference between alcoholic and control participants in the control decoding-task, a result also observed by Frigerio et al. (2002). While not explicitly addressing visuo-spatial efficiency per se, and relying on a different procedure, control tasks of both studies (Frigerio et al., 2002, and present study) required participants to discriminate non-emotional features of the faces. Alcoholic may thus present general visuo-spatial deficits, but no specific impairment of the ability to process non-emotional features of faces. The visuo-spatial deficit evidenced in other studies is thus unlikely to account for the emotional facial expression-decoding deficit observed here.

Some limitations need nevertheless to be acknowledged. Participants were not matched on their actual intellectual functioning, but on their educational level. Further, the two tasks were not of the same difficulty: In the control task, participants had to correctly answer three questions per stimulus, while in the emotional facial expression task, they had to accurately answer eight questions per stimulus. However, participants were faster to answer questions of the latter task, which may indicate that this difference of difficulty did not have an impact on their response reaction times.

The present study took into account three important ecological aspects of real life emotional facial expression exposure and recognition (different emotional facial expression intensity levels, short exposure time to stimuli, and short reaction time). Results highlight the difficulties of alcoholics compared to control participants while decoding emotional facial expressions. These findings are contrasted with the absence of difference between alcoholic and control participants in a comparable control task on the recognition of facial non-emotional features. Thus, overall, the present findings corroborate the specificity of a deficit in the processing of emotional cues in alcoholism as previously observed in emotional facial expressions (Philippot et al., 1999; Kornreich et al., 2002; Townshend and Duka, 2003) and in emotional prosody (Monnot et al., 2001, 2002; Uekermann et al., 2005).

It may also be important to observe simultaneously the decoding of different aspects of emotional non-verbal communication (emotional facial expression, emotional prosody, emotional posture, etc.) in ecological settings, and to measure their association to interpersonal

difficulties in alcoholism. The use of video-material depicting short standardized interpersonal interactions could be helpful to raise this issue. More essentially, such research may potentially help the development of a remediation program in alcoholism since, as previously mentioned, emotional facial expression decoding abilities are linked to interpersonal difficulties (Kornreich et al., 2002), these latter being associated with more negative outcomes in alcoholics (Marlatt, 1996).

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