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Impaired non-verbal emotion processing in Pathological Gamblers

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ABSTRACT

Impaired perception of emotion in others has been described and confirmed in addictions with substances, but no such data exists regarding addictions without substances. As it has been hypothesized that toxic effect of substances on the brain was responsible for the impairments described, studying addictions without substances could be of interest to confirm this hypothesis. Twenty-two male pathological gamblers were compared to 22 male healthy controls matched for age and education level on non-verbal emotion perception tasks including faces, voices, and musical excerpts. Depression and anxiety levels were controlled for. Pathological gamblers significantly underestimated the intensity of peacefulness in music, and overall they were less accurate when reading emotion in voices and faces. They also overestimated emotional intensity in neutral voices and faces. Although anxiety levels did account for accuracy problems when detecting fear in voices and for overestimating emotions in neutral faces, anxiety levels did not explain the range of deficits observed. This is the first study showing non-verbal perception deficits in a purely behavioural addiction. These findings show that deficits in decoding non-verbal signals are associated with addictive behaviours per se, and are not due solely to toxic effects of substances on the brain.

1. Introduction

Recognition of non-verbal emotional signaling has been shown to be impaired in alcohol dependent patients (for a review see Donadon et al., 2014 but also D'Hondt et al., 2014). These deficits include recognition of emotion in faces (Philippot et al., 1999; Kornreich et al., 2001; Frigerio et al., 2002; Townshend and Duka, 2003), voices (Monnot et al., 2001; Uekermann et al., 2005; Maurage et al., 2009) and postures (Maurage et al., 2009), and they have been associated with interpersonal problems (Kornreich et al., 2002) and emotional empathy deficits (Maurage et al., 2011).

Deficits in emotion recognition have also been described in other addicted populations including patients chronically taking methadone and poly-substance dependent patients (Kornreich et al., 2003).

One account of this pattern is that these emotional perception deficits directly cause interpersonal problems in addicted patients, because social perception difficulties lead to misunderstandings in social situations, which then add stress and constitute a vulnerability and/or a relapse factor (Kopelman, 2008; Uekermann and Daum, 2008). An alternative view is that prefrontal vulnerability to chronic alcohol consumption could be responsible for social cognition deficits in alcohol-dependent patients (Uekermann et al., 2007; Uekermann and Daum, 2008).

Therefore, studying an addicted population showing no toxic effect of substances on the brain might be particularly relevant to disentangle these two possibilities: whether (1) addictive behaviours per se are associated with emotional perception difficulties or (2) the toxic effect of substances on prefrontal or other brain regions impairs the capacity to read accurately non-verbal emotional signals.

Parallels between Pathological Gambling (PG) and substance use disorders have been noted, such as continued engagement despite negative consequences, tolerance, withdrawal, and repeated attempts to cut back or quit. Pathological Gambling has been recently included in the addiction section of the DSM 5 (DSM5). This decision has been based on evidence (see for example Petry, 2006; Potenza, 2008; Van den Brink, (2014)) showing many similarities of causes, mechanisms (Brevers et al., 2012; Brevers et al., 2013; Brevers et al., 2014), and developmental trajectories between addictions with or without substances (see for example Goudriaan et al., 2004).

Because a gambling disorder is not confounded by neurotoxicity associated with acute or chronic substance use, it represents an opportunity to study addictive behaviours independent of collateral neurotoxic consequences (Verdejo-García et al., 2008). In

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this study, we sought to ascertain whether problem gambling shares deficits of emotional non-verbal signals with substance use disorders.

We conducted a study following the same design as our previous work on alcohol-dependent patients using musical, vocal and facial emotional signals (Kornreich et al., (2013)). We carefully selected PG patients with no additional addiction on alcohol or drugs and taking almost no psychotropic medications, in order to address the primary research question: are deficits in non-verbal emotional processing associated with addictive behaviors, even in the absence of a (possible) toxic effect of chronic substance consumption on the brain?

2. Method

2.1. Participants

The pathological gambling group (PG) consisted of 22 male patients seeking ambulatory treatment for their gambling problem. Patients were recruited in the pathological gambling unit of the Brugmann University Hospital in Brussels. They were not paid for their participation. A clinical interview, as well as a mental state examination, was systematically conducted to ascertain that the inclusion/exclusion criteria were met. Inclusion criteria included subjects with pathological gambling according to the DSM IV-TR (American Psychiatric Association, 2000). Participants with a history of bipolar disorder, schizophrenia, dependence on alcohol or other drugs besides tobacco, or dementia, as assessed during the intake interview, were excluded. Two patients were currently taking psychotropic medications (one was taking benzodiazepines and the other one antidepressants). The control group consisted of 22 male volunteers with no psychiatric record or personal history of pathological gambling. The control group (C) was recruited from the investigator's social environment and volunteers were not paid for participation. The control group was matched for age and education level with the patients in the PG group. One patient and one control had taken cannabis previously for occasional consumption. Demographical and clinical variables for the two groups are given in Table 1.

Table 1
Characteristics of pathological gambling (PG) patients and normal control (C) subjects.

	Pathological gambling group (n=22)	Control group (n=22)
Age	Mean=41.45; SD=12.65	Mean=40.14; SD=9.11
Education level 1/2/3[a]	6/7/9	6/7/9
Familial antecedents [b]	7	0
Duration (in years)	Mean=15.45; SD=11.79	–
Debts	14	–
Frequency (per week)	Mean=4.63; SD=1.73	
DSM severity scale	Mean=7.73; SD=1.52	–
Tobacco use	8/22	5/22
MAST[****]	Mean=1.77; SD=2.14	Mean=0.82; SD=1.13
BECK[***]	Mean=8.77; SD=6.05	Mean=4.59; SD=3.5
STAI-A state[****]	Mean=40.86; SD=13.15	Mean=25.88; SD=5.3
STAI-B trait[*]	Mean=44.05; SD=11.41	Mean=33.94; SD=7.13

Difference between the average of the two groups (t Student)
[**] significant at 0.01;
[a] Education level: 1: junior or vocational; 2: college; 3: graduate studies;
[b] Presence of at least one first-degree relative (father and/or mother) with pathological gambling was considered as evidence for positive familial history.
[*] significant at 0.05;
[***] significant at 0.001;
[****] significant at 0.0001.

2.2. Current clinical status

Severity of gambling behaviour was assessed with the DSM IV Gambling Scale, consisting of a ten-item scale with severity scores ranging between 0 and 10 (American Psychiatric Association, 2000). Alcohol consumption was assessed using the Michigan Alcohol Screening Self-administered Test-Revised (MAST) (Selzer et al., 1975). The Beck Depression Inventory Second edition or BDI-II (Beck et al., 1988) was used as a self-report measure of depression. It contains 21 questions, each answer being scored on a scale value of 0 to 3 from 0 to 3. A score above 14 is considered to be indicative of a depressive state. Spielberger's "State Trait Inventory Anxiety"(Spielberger et al., 1983) was administered to control for anxiety (STAI-A (state anxiety), STAI-B (trait anxiety)). Both the A-State and B-Trait scales comprise 20 items each and are scored on 4-point forced-choice Likert scales. Scores range from 20 to 80, with higher scores suggesting greater levels of anxiety.

2.3. Emotion recognition tasks

For each stimulus (musical, vocal or facial), subjects were asked to report intensities of emotions on several scales. For an example of facial emotion rating see Fig. 1.

Scoring: For each test, 1 point was awarded when the target emotion obtained the highest mark (in terms of perceived intensity). The same intensity given to two or more emotions for one single item (one music excerpt, voice, or face) led to a 0 point mark (because there had to be one dominant emotion per stimulus). The subject also received 0 points when he/she awarded the highest score to an emotion that was not the target one.

For stimuli expressing neutrality (in vocal and facial excerpts), 1 point was awarded if the subject chose the same intensity for all emotions or if he/she circled a total absence of emotion for the concerned item ("0" for each emotion).

Emotional intensities were obtained by computing the mean intensity scores across all excerpts for all emotions.

2.3.1. Musical emotion recognition task

The musical material consisted of 56 excerpts, 14 in each of four categories of emotion (happiness, sadness, threat, and peacefulness) (Vieillard et al., 2008). They were all computer-generated and recorded in a piano timbre. For each excerpt, the participants were instructed to rate the intensity of the four emotions on a scale from 0 for 'absent' up to 9 for 'highly present'. The musical excerpts could only be listened to once, but the subject had unlimited time between each excerpt to rate the emotions.

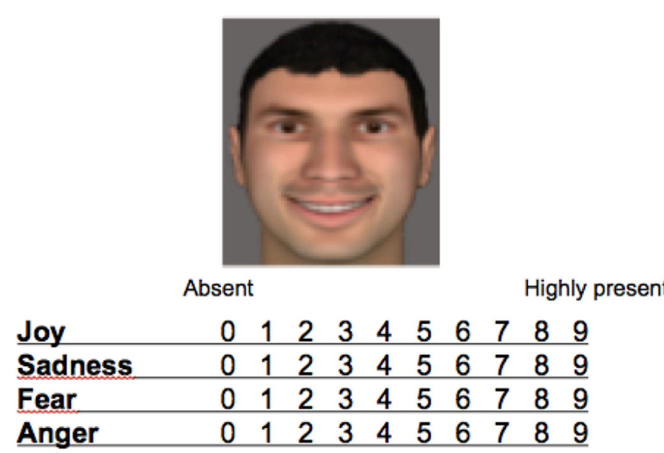

Fig. 1. Emotion scoring for faces. Subjects must rate emotion intensities on all scales. Correct answer (1 point) when subjects give the highest marks to the target emotion.