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Research report

# Deliberately generated and imitated facial expressions of emotions in people with eating disorders

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ABSTRACT

*Background:* People with eating disorders have difficulties in socio emotional functioning that could contribute to maintaining the functional consequences of the disorder. This study aimed to explore the ability to deliberately generate (i.e., pose) and imitate facial expressions of emotions in women with anorexia (AN) and bulimia nervosa (BN), compared to healthy controls (HC).

*Methods:* One hundred and three participants (36 AN, 25 BN, and 42 HC) were asked to pose and imitate facial expressions of anger, disgust, fear, happiness, and sadness. Their facial expressions were recorded and coded.

*Results:* Participants with eating disorders (both AN and BN) were less accurate than HC when posing facial expressions of emotions. Participants with AN were less accurate compared to HC imitating facial expressions, whilst BN participants had a middle range performance. All results remained significant after controlling for anxiety, depression and autistic features.

*Limitations:* The relatively small number of BN participants recruited for this study.

*Conclusions:* The study findings suggest that people with eating disorders, particularly those with AN, have difficulties posing and imitating facial expressions of emotions. These difficulties could have an impact in social communication and social functioning. This is the first study to investigate the ability to pose and imitate facial expressions of emotions in people with eating disorders, and the findings suggest this area should be further explored in future studies.



## 1. Introduction

Eating disorders (ED), such as anorexia (AN) and bulimia nervosa (BN), are characterised by disturbances in eating patterns and negative feelings about body shape and weight (American Psychiatric Association, 2013). In addition, people with ED often experience difficulties in the social domain (Caglar-Nazali et al., 2014), for example, reporting high levels of social anhedonia (Tchanturia et al., 2012) and avoidance of social rewards (Cardi et al., 2013). Moreover, eating disorder's detrimental impact on social relationships is the highest amongst all general functioning domains (Tchanturia et al., 2013a).

Non-verbal communication skills play an important role in overall social functioning and the maintenance of social relationships (Blanchard and Panzarella, 1998). In particular, facial expressions of emotion are thought to enhance social functioning by conveying people's emotional experience, increasing feelings of affiliation and rapport (Ekman, 1992; Schmidt and Cohn, 2001) and also by communicating specific information (Fridlund, 1994). According to the latter view, facial expressions of emotion can be seen as communication tools, in which there is a deliberate intention to deliver a message to others (Fridlund, 1994).

Studies investigating spontaneous facial expression of emotions in people with AN consistently report that these patients show reduced facial expression of emotions, including those elicited through film clips (Davies et al., 2011; Rhind et al., 2014; Dapelo et al., 2015) and videogames (Claes et al., 2012). There is also preliminary evidence for reduced expression of anger in response to videogames in BN (Tarrega et al., 2014), but other studies have not found differences between people with BN and healthy controls (HC) (Claes et al., 2012).

The study of spontaneous facial expressions can provide

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information about the extent to which participants are able to convey their emotional experience. However, being unintentional, spontaneous facial expressions may not reflect a deliberate intention to deliver a message to others (Dethier et al., 2012). In contrast, it has been proposed that posed facial expressions (i.e., facial expressions that are deliberately generated), which are more regulated by cognitive control (Rinn, 1984), may reflect skills required when using facial expressions to communicate a message (Dethier et al., 2012).

Communicating information through facial expressions of emotions requires intentional control when displaying affect. It has been suggested that imitation plays a role in developing control over our facial expressions (Williams et al., 2013). Facial imitation (i.e., copying a model's facial expression) is thought to be involved in social development, empathy, cooperation, and social relationships (Heyes, 2009). In addition, imitation may contribute for facial expressions to be culturally shaped, enhancing social communication (Whiten et al., 1999).

Posed and imitated facial expressions of emotions have shown to be altered in people with schizophrenia and autism spectrum disorders (Faso et al., 2015; Kohler et al., 2008; Schwartz et al., 2006; Sevlever and Gillis, 2010). However, even though similarities in the social and cognitive domain have been reported for AN and autism spectrum disorders (Mandy and Tchanturia, 2015; Oldershaw et al., 2011b; Tchanturia et al., 2013b; Zucker et al., 2007), to date no study has investigated posed and imitated facial expression of emotions in this population.

In this context, the purpose of the study was to explore the ability to pose and imitate facial expressions of emotions in women with AN and BN, compared to a healthy control (HC) group. Given the evidence of reduced spontaneous facial expression in AN, we hypothesised that AN participants will show difficulties posing and imitating facial expressions of emotions. As the evidence for BN is more mixed, we hypothesised that they may exhibit a similar performance to the HC group.

## 2. Methods

### 2.1. Design

Cross-sectional, case-control study comparing three groups (two clinical groups, AN and BN, and HC) matched by age, on two experimental tasks (posed expressions task, and imitated expression task). The study was approved by the National Health Research Ethics Services Committee (13/LO/0201).

### 2.2. Participants

Participants were 103 women between the ages of 18 and 55 years: Thirty-six women with AN (17 restricting type, and 19 binge-eating/purging type), 25 with BN, and 42 HC. Participants with AN and BN were included in the study if they met DSM-5 criteria (American Psychiatric Association, 2013) for AN or BN diagnosis, respectively. This was assessed by the first author (MD) using the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID-I; First et al., 2002), along with measures of height and weight taken on the day of the assessment. A body mass index (BMI; $kg/m^2$) less than 18.5 was required for AN diagnosis, whilst for BN diagnosis it was required a BMI above 18.5. Inclusion criteria for HC participants were having no history of ED assessed through the SCID-I, and a BMI above 18.5. Exclusion criteria for all participants were having a head injury, autism spectrum disorders, and psychosis, not being fluent in English, and being unable to provide informed consent. Clinical participants were recruited from specialist ED services, and through advertisement on the Beat website (http://www.b-eat.co.uk/). The HC group was recruited from the local community. All participants signed informed consent prior to participate in the study.

### 2.3. Measures

#### 2.3.1. Body mass index (BMI)

Height and weight of participants were measured on the day of the assessment to calculate BMI.

#### 2.3.2. Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID-I) (First et al., 2002)

The eating disorders module of the SCID-I was used to assess ED diagnosis in all participants. In order to allow for the main changes in diagnostic criteria introduced by DSM-5 (American Psychiatric Association, 2013), amenorrhea was not required for AN, and the frequency of binge eating and purging behaviour was reduced to once a week for BN.

#### 2.3.3. Demographic Questionnaire

This is a self-report survey with questions on age, treatment status and medication usage.

#### 2.3.4. Eating Disorder Examination Questionnaire (EDE-Q) (Fairburn and Beglin, 1994):

This is a widely used 36-item self-report measure that assesses cognitions and behavioural features of ED. The internal consistency for the EDE-Q global score in the current sample was $\alpha = 0.98$.

#### 2.3.5. Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith, 1983)

This 14-item self-report questionnaire has been shown to have adequate validity and reliability (Bjelland et al., 2002). Internal consistencies in the current study were $\alpha = 0.74$ for the anxiety scale, and $\alpha = 0.71$ for the depression scale.

#### 2.3.6. Autism Quotient (AQ-10) (Allison et al., 2012)

The AQ-10 is the shorter version of the original AQ (Baron-Cohen et al., 2001), used to assess autistic features. In this study the internal consistency was $\alpha = 0.63$.

### 2.4. Tasks

#### 2.4.1. Posed expressions task

During the posed expression task participants were asked to generate a facial expression for five emotions (anger, disgust, fear, happiness, and sadness) in response to a verbal instruction. Participants sat in front of a computer laptop with a built-in camera and were asked to "pose or show the computer a facial expression for 'X' (i.e., anger, disgust, fear, happiness, or sadness)". Participants were asked to look straight at the camera to indicate the moment when they thought they were posing the facial expression at their best. First, the investigator posed the emotion 'surprise' as an example, and checked if the participant had understood the instructions. Then, participants attempted to pose the facial expressions for all five emotions (order was random), under the researcher's (MD) instruction. The researcher did not look at the participants whilst they were performing the task.

#### 2.4.2. Imitated expressions task

During this task participants were asked to imitate five facial expressions of emotions. The facial expressions were taken from the Pictures of Facial Affect set of prototypical facial expressions for emotions (Ekman and Friesen, 1976). Three randomisation lists with pictures of female faces displaying anger, fear, disgust,