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Facial expression of positive emotions in individuals with eating disorders



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ABSTRACT

A large body of research has associated Eating Disorders with difficulties in socio-emotional functioning and it has been argued that they may serve to maintain the illness. This study aimed to explore facial expressions of positive emotions in individuals with Anorexia Nervosa (AN) and Bulimia Nervosa (BN) compared to healthy controls (HC), through an examination of the Duchenne smile (DS), which has been associated with feelings of enjoyment, amusement and happiness (Ekman et al., 1990). Sixty participants (AN=20; BN=20; HC=20) were videotaped while watching a humorous film clip. The duration and intensity of DS were subsequently analyzed using the facial action coding system (FACS) (Ekman and Friesen, 2003). Participants with AN displayed DS for shorter durations than BN and HC participants, and their DS had lower intensity. In the clinical groups, lower duration and intensity of DS were associated with lower BMI, and use of psychotropic medication. The study is the first to explore DS in people with eating disorders, providing further evidence of difficulties in the socio-emotional domain in people with AN.

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1. Introduction

Facial expressions play a key role in human social interaction. They convey people's emotional experience (Ekman, 1990) and are used as social signals that communicate information to others (Fridlund, 1994). They are also essential for establishing rapport (Tickle-Degnen, 2006), deepening people's sense of connection and alliance during social interaction (Schmidt and Cohn, 2001). In contrast, lack of facial expression can be interpreted as an attempt to avoid attention in social settings, becoming undetected (Fridlund, 1994). Studies on individuals with limited facial expression indicate that people perceive them as reserved and unhappy (Tickle-Degnen and Lyons, 2004; Bogart et al., 2014) and report being less interested in establishing friendship ties with them (Hemmesch et al., 2009).

Facial expressions of positive emotions, such as smiling, have

been related to cooperative intentions (Schmidt and Cohn, 2001), readiness to play or connect (Fridlund, 1994), and social rewards (Shore and Heerey, 2011). People associate smiling with happiness, positive intentions (Floyd and Burgoon, 1999), and increased sociability (Matsumoto and Kudoh, 1993).

Early on, Charles Darwin noted that spontaneous smiles were characterized by the activation of the muscle that contracts the outer corner of the eyebrows (i.e., orbicularis oculi) producing wrinkles in the corner of the eyes, in addition to the zygomaticus major, which moves the corner of the lips upwards towards the cheekbones (Darwin, 1872). This is known as the Duchenne smile (DS) (Duchenne, 1990; Ekman et al., 1990). DS have been associated with reports of enjoyment, amusement and happiness (Ekman et al., 1990; Ruch, 1995), as well as specific patterns of brain activity (Ekman et al., 1990; Davidson et al., 1990). In contrast, Non-Duchenne smiles (NDS) do not involve the action of the orbicularis oculi, and are not associated with the experience of positive affect. Whereas DS have shown to evoke positive emotions in others, promoting positive social interactions and well being, NDS do not (Keltner and Bonanno, 1997; Harker and Keltner, 2001). Instead, NDS may be displayed in a deliberate attempt to

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convince others that a positive emotion is being felt when it is not (Ekman and Friesen, 1982), or as a way of signaling anticipation of the possibility of experiencing enjoyment (Ekman et al., 1990), and is often produced in response to social demands (Hess and Bourgeois, 2010).

Facial expression is part of a coordinated system of emotional responses (Levenson, 1994). It has been argued that in people who experience psychological difficulties, elements of this system may lack coordination, thus becoming dysfunctional (Rosenberg and Ekman, 1994). Studies in clinical populations have shown differences in the expression of DS in response to positive stimuli, compared to healthy controls (HC). For example, individuals suffering from depression have been found to produce fewer DS when exposed to positive stimuli (Ekman et al., 2005) and to show smiles that were followed by negative affect-related expressions in response to amusing film clips (Reed et al., 2007). Participants with schizophrenia display fewer DS when induced to feel positive emotions through remembering biographic emotional situations (Kohler et al., 2008). Similar results have been found for participants with post-traumatic stress disorder during a psychodynamic interview (Kirsch and Brunnhuber, 2007).

Eating disorders are characterized by disturbances in patients' eating patterns, body image or body weight, which may lead to physical, cognitive or social difficulties (Fairburn and Harrison, 2003; Tchanturia et al., 2013). People with eating disorders exhibit high levels of comorbidity with disorders that have shown to be related to reduced facial expression, such as anxiety and depression (Herzog et al., 2000). In addition, socio-emotional difficulties found in eating disorders include high levels of alexithymia (Nowakowski, et al., 2013), social anhedonia (Tchanturia et al., 2012), self-silencing (i.e., the tendency to avoid expressing negative emotions) (Hambrook et al., 2011), and fear of the social consequences of expressing emotions (Ioannou and Fox, 2009; Hambrook et al., 2011). It has been proposed that socio-emotional difficulties may contribute to the maintenance of the eating disorder psychopathology (Treasure et al., 2012; Schmidt and Treasure, 2006; Speranza et al., 2007) and in the case of AN, that eating disorder symptoms function, in part, to help the individual cope with aversive emotional states (Wildes et al., 2010).

A few studies have investigated facial expressions in people with eating disorders (Davies et al., 2011, 2013; Rhind et al., 2014). Davies et al. (2011) found that adult AN patients showed fewer facial expressions when watching negative and positive films, and reported feeling less positive emotions and similar levels of negative emotions, compared to HC. Similar results were described in young people with AN (Rhind et al., 2014). Claes et al. (2012) used a different experimental procedure to monitor facial expression of anger and joy in AN and BN participants when playing a therapeutic video game and reported that AN patients exhibited less anger through their facial expressions compared to HC. In BN participants, facial expression of anger was not significantly reduced compared to HC. The study found no differences among the groups in their facial expressions of joy. In a second study using the same paradigm, patients with BN showed higher levels of joyous facial expressions, and reduced facial expression of anger compared to HC (Tárrega et al., 2014). Reduced expression of emotions may contribute to the difficulties in the socio-emotional area, worsening the impact of the eating disorder in patients' social functioning (Tchanturia et al., 2013).

The studies described above provide preliminary evidence suggesting that patients with AN and BN show reduced negative facial emotional expression (sadness and anger) compared to HC. However, results for facial expressions of positive emotions are more equivocal: AN showed fewer positive facial expressions compared to HC when using film clips as mood elicitors, but not

when using a video game. Furthermore, BN participants seem to display as many positive facial expressions as HC. Studies on positive emotions are scarce in the eating disorders field, and there is a need for further investigation in the area (Tchanturia et al., 2015). Therefore, this study aimed to build upon previous findings, by further investigating positive facial expression of emotions in AN and BN. Specifically, examining the expression of DS as an expression of genuine positive affect and potential benefits for well being, in comparison to NDS.

Based on previous findings, it was hypothesized that participants with AN will show fewer DS and NDS, compared to HC. Even though the literature on BN is more limited, it was hypothesized that this group will produce similar levels of DS and NDS to HC. To our knowledge, this is the first study to investigate DS in people with eating disorders.

2. Method

2.1. Participants

Sixty adult women, grouped into 20 AN (9 restricting type, and 11 binge-eating/purging type), 20 BN and 20 HC, were included in the study. Given that studies using FACS were not available in the eating disorders literature, studies carried out on other psychiatric populations (mainly schizophrenia and mood disorders) were used to estimate the sample size. It was estimated that a sample size of 20 participants per group would allow detecting medium to large effect sizes with 80% of power, setting $\alpha < 0.01$. Participants with eating disorders were recruited from specialist eating disorders services, and through advertisement on the Beat website (<http://www.b-eat.co.uk/>). The HC group was recruited from the local community. Eating disorder diagnosis was assessed using the Eating Disorders module of the Structured Clinical Interview for DSM-IV-TR Axis I Disorders (SCID-I) (First et al., 2002). The inclusion criterion for the clinical groups was a diagnosis of AN or BN, according to DSM-5 (APA, 2013). A body mass index less than 18.5 was used as a threshold for AN diagnosis. Participants were excluded from the study if they have had a head injury, autism spectrum disorders, and psychosis, were not fluent in English, or were unable to provide informed consent. The same exclusion criteria as well as the absence of current or past eating disorder were applied for the HC group. Participants were compensated for their time with £10.

2.2. Measures

2.2.1. Body mass index (BMI in kg/m²)

This was calculated from measures of height and weight obtained on the day of the assessments.

2.2.2. Structured clinical interview for DSM IV disorders (SCID-I) (First et al., 2002)

The eating disorders module of the SCID-I was used to assess current or past diagnosis in all participants. In order to adjust the interview to DSM-5 criteria, amenorrhea was not required for AN diagnosis, and the frequency of binge eating and purging behavior was reduced to once a week for the diagnosis of BN.

2.2.3. Eating disorder examination questionnaire (EDE-Q) (Fairburn and Beglin, 1994)

This 36 item self-report questionnaire is designed to assess eating disorders symptomatology. It has four subscales (i.e., dietary restraint, eating concern, weight concern, and shape concern) and a global score that ranges from 0 to 6.

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