The influence of non-clinical eating-related psychopathology on the recognition of emotion from static faces and realistic social interactions

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Abstract

Emotion recognition deficits have consistently been reported in clinical and sub-clinical disordered eating. However, most studies have used static faces, despite the dynamic nature of everyday social interactions. The current aims were to confirm previous findings of emotion recognition deficits in non-clinical disordered eating and to determine if these deficits would be more evident in response to static as compared to dynamic emotional stimuli. We also aimed to establish if these emotion recognition deficits could be explained by comorbid psychopathology (depression, anxiety or alexithymia). Eighty-nine females were assigned to groups based on scores on the Eating Disorders Inventory (EDI); high (n=45) and low (n=44). Participants were presented with emotional faces and video clips portraying fear, anger, disgust, sadness, happiness, surprise and neutral affect. As predicted, the high EDI group correctly recognised fewer emotional displays than did the low EDI group. However, this deficit was not more evident for negative as opposed to positive emotions. Furthermore, the deficit was not larger for static stimuli in comparison to dynamic. Overall emotion recognition accuracy was negatively associated with Drive for Thinness, but not Bulimia or Body Dissatisfaction. Importantly, the emotion recognition deficits observed in the high EDI group and that were associated with eating disorder symptoms were independent of depression, anxiety and alexithymia. Findings confirm that even minor elevations in disordered eating are associated with poorer emotion recognition. This is important, as problems in recognition of the emotional displays of others are thought to be a risk factor for clinical eating disorders.

1. Introduction

The ability to accurately interpret the emotional intentions of others is crucial for successful functioning in social situations. There is substantial evidence that patients with clinically diagnosed eating disorders display significant deficits in the recognition of emotion from faces (Kucharska-Pietura, Nikolaou, Masiak, & Treasure, 2004) and in their ability to interpret social events (Bydlowski et al., 2005). Some studies have reported a general deficit in facial emotion recognition (Zonneville-Bender et al, 2002), whilst others have reported emotion specific impairments in EDs (e.g. Dapelo, Surguladze, Morris & Tchanturia, 2016; Legenbauer, Vocks & Ruddel, 2008). However, other studies have demonstrated no evidence of impaired emotion recognition in patients with eating disorders (e.g. Kessler, Schwarze, Filipic, Traue, & von Wietersheim, 2006; Mendlewicz, Linkowski, Bazelmans, & Philippot, 2005). Nevertheless, a recent systematic review and meta-analysis (Caglar-Nazali et al., 2014) demonstrated robust evidence that eating disorders are associated with impaired facial emotion recognition. Despite this, it is not entirely clear if these deficits are independent of comorbid psychopathology, such as depression (Mendlewicz et al., 2005) or alexithymia (Brewer et al., 2015). Alexithymia is characterised by a difficulty with describing and identifying one's own feelings, an absence of fantasies, and an externally oriented analytical cognitive style (Taylor & Bagby, 2000) and is highly prevalent in eating disorders (Nowakowski, McFarlane & Cassin, 2014).

Significant relationships have been observed between emotion recognition deficits and poor social functioning in patients with schizophrenia (Hooker & Park, 2002) and autistic spectrum disorders (Trevisan & Birmingham, 2016). Furthermore, in the context of eating disorders, it has been argued by Oldershaw et al (2011) that a reduced sensitivity in recognising emotional expressions of others could lead to misunderstandings during social interactions, which may undermine or inhibit the formation of significant social bonds. Moreover, as argued by Harrison et al (2009), difficulties in recognising the expressions of others are likely to make social interactions stressful, leading to avoidance of such interactions. Indeed, research has shown that those who go on to develop eating disorders are frequently shy with few friends (Fairburn & Harrison, 2003), and often experience social isolation or

inadequate interpersonal relationships (Jackson, Weiss, Lunquist, & Soderlind, 2005; McClintok & Evans, 2001). As a result, difficulties in this area are thought to play a key role in the development and maintenance of eating disorders (Schmidt & Treasure, 2006).

In addition to studies examining emotion recognition deficits in clinically diagnosed eating disorders there is a growing body of evidence demonstrating that the same emotion recognition difficulties are present in individuals with sub-clinical disordered eating (Jones, Harmer, Cowen, & Cooper, 2008; Ridout, Thom, & Wallis, 2010; Ridout, Wallis, Autwal & Sellis, 2012).This is important because many of these 'at risk' individuals will go on to develop clinically diagnosed eating disorders (Pringle, Harmer, & Cooper, 2010). This evidence is also consistent with the notion that emotion recognition deficits may play a key role in the development of disordered eating (Schmidt & Treasure, 2006). However, this proposal has yet to be explored longitudinally, and this is not within the remit of the present study.

In line with the literature in eating disorders, most studies examining emotion recognition in sub-clinical disordered eating have used static photographs of emotional faces (Jones et al., 2009; Ridout et al., 2012; Sharpe et al., 2016). The only exception is the study by Ridout et al (2010) who used dynamic emotional stimuli (The Awareness of Social Inference Test; TASIT, McDonald, Flanagan, & Rollins, 2002), which are arguably closer to everyday social interactions. However, interestingly, Gramaglia et al. (2016) compared emotion recognition performance in patients with eating disorders on dynamic (TASIT) and static faces and reported deficits on static faces, but not the dynamic stimuli. They argued that this was because interpreting the social signals present in static images is likely to be more complex than decoding emotions from dynamic stimuli. With this in mind, it would be interesting to conduct such a direct comparison in a sample of participants with subclinical disordered eating.

Therefore, the aims of the current study were to confirm previous findings of emotion recognition deficits in non-clinical disordered eating and to determine if these deficits would be more evident in response to static as compared to dynamic emotional

stimuli. We also aimed to establish if these emotion recognition deficits could be explained by comorbid psychopathology (depression, anxiety or alexithymia).

High and low scorers on the Eating Disorders Inventory (EDI) were presented with a series of static faces depicting seven different emotional expressions (happiness, sadness, anger, fear, disgust, surprise and neutral affect) and a set of video clips featuring dynamic social interactions involving the same emotional expressions. For both sets of stimuli participants were asked to identify the emotion portrayed. Participants also completed measures of mood (depression and anxiety) and alexithymia.   Based on previous research findings (Jones et al., 2008; Ridout et al., 2010; Ridout et al., 2012; Sharpe et al., 2016), it was predicted that high scorers on the EDI would correctly identify fewer emotional expressions than would low EDI scorers. It is expected that the deficit would be more evident for negative than positive emotional expressions, in line with previous work (Kucharska-Pietura et al., 2004; Ridout et al., 2012). Furthermore, in line with Gramaglia et al. (2016), it was expected that the emotion recognition deficits would be more evident in the static faces than the dynamic stimuli.

2. Method

2.1. Participants

Eighty-nine females took part in the study, all of whom were undergraduate psychology students recruited via poster advertisements and word of mouth. Volunteers were not compensated for taking part in the study. Participant ages ranged from 18 to 31 with a mean age of 20.94 (SD = 1.91). All participants were categorised according to median-split scores (median = 9) on the eating disorder subscales of the Eating Disorders Inventory (EDI-2; Garner, 1991). Participants with scores of 8 or below were categorised as the low EDI group (n = 44, mean = 3.89, SD = 2.80) and those with scores of 9 and above were classified as the high EDI group (n = 45, mean = 20.67, SD = 10.63). This study was approved by the university research ethics committee. Written informed consent was obtained from all participants prior to taking part and they were fully debriefed on completion of the study.

2.2. Emotion recognition from facial expressions (static images)

This task featured the six basic emotions (happiness, sadness, anger, surprise, disgust and fear) as facial expression stimuli (posed by 4 actors) taken from Ekman and Friesen's (1976) Pictures of Affect Series. Four examples of each emotion were presented on a computer screen for 400 ms, along with four expressions portraying no strong emotion (neutral affect) giving a total of 28 facial stimuli (presented in a randomised order). Participants were asked to indicate the emotion being displayed by making a forced choice between one of seven labelled emotions shown on the screen. Accuracy of emotion recognition was measured by calculating the number of emotions identified correctly by each participant. These stimuli have been used extensively in research and have excellent validity, as described in Young, Perrett, Calder, Sprengelmeyer, & Ekman (2002).

2.3. Emotion recognition from video clips (dynamic interactions)

Emotion recognition accuracy was assessed using the Emotion Evaluation section of The Awareness of Social Inference Test (TASIT; McDonald, Flanagan, & Rollins, 2002). This task consisted of 28 short (15-60 s) video clips of social interactions, each depicting one of the six primary emotions (happiness, sadness, anger, surprise, disgust and fear) or no strong emotion (neutral affect). Each emotion (including neutral affect) featured in four different video clips, presented in a fixed pseudo-random order. Participants were required to identify the emotion portrayed by making a forced choice between seven emotional descriptors. Emotion recognition accuracy was assessed by calculating the number of emotional displays identified correctly by each participant. TASIT is a valid measure of emotion recognition and social cognition in a variety of populations including adults with traumatic brain injury (e.g. McDonald et al., 2006) and adolescents (e.g. McDonald et al., 2015).

2.4. Measures

The presence and severity of eating disorder symptoms was assessed using the three eating disorder-related subscales of the Eating Disorder Inventory (EDI-2;

Garner, 1991). This measure consists of 23 items assessing Drive for thinness (7 items), Bulimia (7 items) and Body dissatisfaction (9 items). The possible range of scores on the three subscales is 0-21 (drive for thinness & bulimia) and 0-27 (body dissatisfaction), with higher scores indicating greater levels of eating psychopathology. Overall eating psychopathology score was calculated by summing the totals from each subscale. This is a valid and reliable measure, with Cronbach's alpha scores in the range of 0.90-0.97 for the three different subscales (Garner, 2004; Wildes et al. 2010). It has also been used successfully in earlier work to identify eating-related psychopathology in student populations (Laquatra & Clopton, 1994; Quinton & Wagner, 2005). In the present study, Cronbach's alpha values of 0.87, 0.61 and 0.90 were found for the Drive for thinness, Bulimia and Body dissatisfaction subscales respectively, which suggests a moderate to high level of reliability in the current sample.

Depression was measured using the Beck Depression Inventory (BDI-II; Beck, Steer, & Brown, 1996). This is a 21-item self-report questionnaire designed to assess the severity of depressive symptoms, with high scores reflecting increased symptoms of depression. Scores are assessed using the following guidelines: 0 to 13 (minimal depression), 14 to 19 (mild depression), 20 to 28 (moderate depression), and 29 to 63 (severe depression). This scale is widely used, and demonstrates high internal consistency with an alpha coefficient of 0.93 for non-clinical populations (Beck et al., 1996). The BDI has been used to provide a valid and reliable measure of depression within a similar non-clinical sample (Ridout et al., 2010). A high Cronbach's alpha score of 0.91 was also found in the present study.

Alexithymia was assessed using the Toronto Alexithymia Scale (TAS-20; Bagby, Parker, & Taylor, 1994a; Bagby, Taylor, & Parker, 1994b). This is a 20 item self-report scale which consists of the three subscales "Difficulty Identifying Feelings", "Difficulty Describing Feelings", and an "Externally Oriented (or concrete) Thinking Style". Items are rated using a 5-point Likert scale whereby 1 = strongly disagree and 5 = strongly agree. The total alexithymia score is the sum of responses to all 20 items, with higher scores reflecting greater levels of alexithymia. The TAS-20 uses cut-off scoring with scores equal to or less than 51 reflecting non-alexithymia, scores of 52 to 60 showing a possibility of alexithymia and those equal to or greater than 61 indicating alexithymia. Previous research shows the TAS-20 to be a valid measure of

alexithymia, which demonstrates high internal consistency (Cronbach's alpha = 0.81) when investigating student populations (Bagby et al., 1994a; Bagby et al., 1994b). In the current study, Cronbach's alpha values of 0.70, 0.82 and 0.71 were found for the difficulty identifying feelings, difficulty describing feelings and externally oriented thinking style subscales respectively, indicating that the TAS is also a reliable measure to use within the current sample.

Finally, both state and trait anxiety were assessed using the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch & Lushene, 1970). This continuous measure consists of two subscales, each with 20 items. Higher scores indicate higher levels of state or trait anxiety. This is an extensively used inventory, with Cronbach's alpha coefficients in the range of 0.85-0.95 (Spielberger et al., 1970). Similarly, Cronbach's alpha scores of 0.92 were found for both state and trait anxiety in the present study, showing that the STAI has a high degree of reliability in this sample.

2.5. Procedure

On arrival, participants gave informed consent before providing demographic information and completing the questionnaires. This was followed by the emotional evaluation section of the TASIT and the facial recognition task. The order in which the two tasks were presented was counterbalanced across participants. On completion, all participants were debriefed and thanked for their participation.

2.6. Data Analyses

Independent t-tests were used to assess differences between the high and low EDI groups with regard to age, depression, alexithymia and anxiety. For each participant the total number (0-4) of correctly identified emotions was calculated for individual emotional displays (happiness, sadness, surprise, anger, fear, disgust, and neutral affect). These were summed to produce a total score for emotion recognition accuracy for each of the two tasks. Investigation of parametric assumptions regarding emotion recognition scores suggested that some of the data were not normally distributed. Transformations failed to considerably enhance the normality of the data. However, ANOVA is considered to be relatively robust even when there are issues with normality (Glass, Peckham & Sanders, 1972). Critically, there were no

violations of the assumption of homogeneity of variance. Therefore, parametric analyses were conducted on the original data set. However, because scores on questionnaire measures were not normally distributed, correlations involving these measures were conducted using Spearman's rank.

The effect of EDI group status and type of task on recognition accuracy was analysed using a 2 (EDI group) x 2 (task) x 7 (emotion) repeated measures ANOVA. Spearman's correlations were used to investigate the contribution of disordered eating variables (drive for thinness, bulimia and body dissatisfaction), depression, alexithymia, and anxiety to any differences in emotion recognition accuracy.

All statistical tests were two-tailed and the level of significance was set at $p<0.05$ for all statistical procedures. Where sphericity was violated Greenhouse Geisser correction was employed (although uncorrected degrees of freedom are reported in the text). Where partial eta squared (ηp^2) was used as the effect size measure, cut-off values for small, medium and large effect sizes were 0.01, 0.06 and 0.14, respectively. Where Cohen's d was used for effect size the values for small, medium and large effect sizes were 0.2, 0.5 and 0.8 respectively.

3. Results

3.1. Participant characteristics

The data presented in Table 1 indicate that the two groups did not differ significantly in age. However, the high EDI group scored significantly higher than the low EDI group on all three subscales of the EDI, confirming that they formed independent groups[1]. It is also important to note that the high EDI group reported significantly higher levels of alexithymia, anxiety and depression than did the low EDI group. Furthermore, of the seven participants meeting the cut off for clinically significant alexithymia[2], six were in the high EDI group. Similarly, of the 12 participants

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[1] Despite significant group differences on all EDI subscales, one sample t-tests revealed that the scores of the high EDI group did not differ significantly from published norms for healthy controls (Garner, 1991). Nevertheless, there was some evidence of slightly elevated scores on Drive for Thinness, t(44)=1.54, p=0.131, and Bulimia, t(44)=1.52, p=0.135.

[2] The established cut-off for clinically significant alexithymia is 61 on the TAS-20 and for borderline alexithymia is 52 (Bagby et al., 1994a).

classified as borderline alexithymic, nine were in the high EDI group. In terms of depression, 20 out of the 24 participants exceeding the cut off for clinically significant depression[3] were in the high EDI group. Finally, 12 out of 14 participants meeting the cut off for clinically relevant state anxiety[4] and 23 out of 28 exceeding the cut off for clinically significant trait anxiety were in the high EDI group. Therefore, it is important that the influence of these factors is considered when determining the effect of disordered eating on emotion recognition performance.

Table 1: Participant characteristics (mean ± SD)

	High EDI n = 45	Low EDI n = 44	df	t	p	d
Age	20.67 (1.03)	21.23 (2.49)	57.453	1.38	0.173	0.29
Alexithymia	47.27 (9.96)	42.66 (8.75)	87	2.32	0.023	0.49
Depression	12.98 (10.18)	6.02 (4.21)	58.907	4.23	0.000	0.89
State-Trait Anxiety Inventory (STAI)						
State	36.67 (9.72)	28.18 (5.63)	70.829	5.05	0.000	1.1
Trait	44.73 (9.87	34.89 (7.46)	81.863	5.32	0.000	1.0
Eating Disorders Inventory (EDI)						
Total	20.67 (10.63)	3.89 (2.80)	50.197	10.24	0.000	2.16
Drive for Thinness	6.76 (5.47)	0.84 (1.20)	48.310	7.08	0.000	1.50
Bulimia	1.78 (2.55)	0.36 (0.87)	54.211	3.52	0.001	0.75
Body Dissatisfaction	12.18 (5.65)	2.68 (2.49)	60.774	10.28	0.000	2.18

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[3] The established cut off for clinically significant depression is a score of 14 or above on the Beck Depression Inventory (Beck et al, 1996).
[4] The established cut off for state anxiety is a score of 41 and for trait anxiety is 44 on the State-Trait Anxiety Inventory (Ercan et al., 2015).

3.2. Emotion recognition accuracy

Analysis of emotion recognition accuracy (presented in Table 2) revealed significant main effects of task, $F(1,87) = 99.92$; $p<0.001$; $\eta p^2 = 0.54$, and emotion, $F(6, 522) = 81.43$; $p<0.001$; $\eta p^2 = 0.48$. There was also a significant task x emotion interaction, $F(6, 522) = 80.61$; $p<0.001$; $\eta p^2 = 0.48$. However, as these findings were not modified by group, all tests $p>.05$, no follow up analyses were conducted. Interestingly, results revealed a significant main effect of group, such that high EDI scorers recognised significantly fewer emotional expressions (total = 22.42, SD = 1.79) than did the low EDI group (total = 23.20, SD = 1.81); $F(1,87) = 4.78$; $p<0.05$; $\eta p^2 = 0.05$ (Cohen's d = 0.43).

Table 2: Group means ± standard errors (SD) for emotion recognition performance (TASIT and Ekman scores)

	High EDI (n=45)		Low EDI (n=44)	
	TASIT videos	EKMAN faces	TASIT videos	Ekman faces
Neutral	3.29 (0.84)	3.87 (0.34)	3.45 (0.82)	3.77 (0.48)
Happy	3.56 (0.62)	4.00 (0.00)	3.92 (0.39)	4.00 (0.00)
Surprised	3.64 (0.53)	3.96 (0.21)	3.64 (0.61)	3.93 (0.26)
Sad	3.33 (0.67)	1.98 (1.14)	3.41 (0.62)	2.11 (1.26)
Angry	3.20 (0.66)	2.60 (0.86)	3.43 (0.76)	2.70 (0.85)
Disgust	3.53 (0.69)	3.20 (0.99)	3.57 (0.63)	3.39 (0.84)
Fear	3.31 (0.85)	1.31 (1.15)	3.50 (0.73)	1.70 (1.37)
TOTAL (group / task)	23.87 (2.06	20.98 (2.51)	24.80 (2.00)	21.61 (2.69)
TOTAL (group)	22.42 (1.79)		23.20 (1.81)	

EDI=Eating Disorders Inventory; TASIT = The Awareness of Social Inference Test

To determine if the emotion recognition deficit exhibited by the high EDI scorers was due to comorbid psychopathology we repeated the analysis with depression, anxiety (state and trait), and alexithymia scores entered as covariates. The results of the ANCOVA revealed no main effects of depression, anxiety (state or trait), or alexithymia; all tests F<1. Furthermore, there were no significant interactions involving these factors; all tests p>.05. Critically, the significant main effect of EDI group on emotion recognition performance remained; $F(1, 83)=4.47$, $p<.05$.

To determine which of the eating disorder symptoms were associated with emotion recognition performance we conducted a series of Spearman correlations. Results revealed that emotion recognition accuracy (collapsed across tasks) was negatively correlated with scores on the Drive for Thinness subscale of the EDI, $r_s(89)= -.296$, $p<0.01$, but was not related to scores on the Bulimia or Body Dissatisfaction subscales, both tests p>0.05. Importantly, a partial correlation revealed that the relationship between scores on the Drive for Thinness subscale of the EDI and emotion recognition performance remained after controlling for depression, anxiety (state and trait), and alexithymia, $r(83)=-31$, $p<.01$.

4. Discussion

The aims of the current study were to confirm previous findings of emotion recognition deficits in non-clinical disordered eating and to determine if these deficits would be more evident in response to static as compared to dynamic emotional stimuli. We also aimed to establish if these emotion recognition deficits could be explained by comorbid psychopathology (notably depression, anxiety or alexithymia).

The prediction that high scorers on the EDI would correctly identify fewer emotional expressions than would low EDI scorers was supported by the current findings. Although this was of only a moderate effect size (Cohen's d =0.43), this finding is consistent with previous studies that have observed poor emotion recognition in both clinical (Kucharska-Pietura et al., 2004; Zonnevijlle-Bender et al., 2002) and sub-clinical disordered eating (Jones et al., 2008; Ridout et al. 2010; 2012). However, the expectation that the deficit would be more evident for negative emotions than positive was not supported, which is inconsistent with previous findings (Kucharska-Pietura et al., 2004; Ridout et al. 2010; 2012). One possible explanation for this is

the relatively low EDI scores in the current study compared with our previous work (Ridout et al., 2010; 2012), in which the scores of the high EDI groups were significantly higher than published norms for healthy controls. As recognition of negative emotions in those studies was negatively associated with scores on the body dissatisfaction factor of the EDI, the relatively low body dissatisfaction scores in the high EDI group of the current study might account for our findings. However, another potential explanation concerns social anxiety. Eating psychopathology is associated with high levels of social anxiety (Pallister & Waller, 2008) and this factor is associated with attentional avoidance of threatening emotional faces (Mansell, Clark, Ehlers, & Chen, 1999). Given that successful facial emotion recognition is dependent on attention to relevant facial features (Schurgin, et al., 2014), it is plausible that previous findings of impaired recognition of negative emotional faces in participants with disordered eating might have been a consequence of comorbid social anxiety. As the current sample exhibited relatively low levels of eating psychopathology, it is plausible that they also had low levels of social anxiety, which may explain why the deficit in emotion recognition was not specific to negative emotions. Future work should include a validated measure of social anxiety to establish the influence of this factor on facial emotion recognition in participants with disordered eating. Nevertheless, it is worth noting that other studies (e.g. Gramaglia et al., 2016) have also reported emotion recognition deficits in eating disordered individuals that were not limited to negative emotions.

The prediction that the emotion recognition deficits would be more evident in the static faces than the dynamic stimuli was not supported by the current data, which is at odds with the findings of Gramaglia et al (2016). This might be due to the difference between the samples of the two studies; whereas Gramaglia et al (2016) recruited patients with anorexia nervosa the current sample compared non-clinical participants with high and low scores on the EDI. However, it is notable that the patients with anorexia in Gramaglia et al. (2016) had significantly lower educational attainment than did the control group. This is important, as educational attainment is positively associated with emotion recognition ability (Mill et al., 2009; Trauffer et al., 2013) and influences neural processing of facial emotion (Demenescu et al., 2014). If, as argued by Gramaglia and colleagues, recognition of emotion from static faces was more cognitively demanding than recognition from dynamic stimuli then their

findings could have been due, at least in part, to the differences in educational background of their two groups. As the participant groups in the current study were matched in terms of their educational background then this might account for the lack of difference in emotion recognition from static vs dynamic stimuli, particularly as the performance of both groups was close to ceiling on both tasks.

In the current study, emotion recognition accuracy was associated with scores on the *drive for thinness* subscale of the EDI. It is notable that previous work in subclinical samples has identified *body dissatisfaction* (Ridout et al., 2010; 2012) and *bulimia* (Sharpe et al., 2016) as the critical factor accounting for emotion recognition deficits. This suggests that, although the presence of facial emotion recognition deficits in subclinical disordered eating appears to be a robust phenomenon, its relationship to specific eating disorder symptoms is not reliable. As noted above, the scores for body dissatisfaction exhibited by the high EDI scorers in the current study did not differ significantly from norms for healthy controls. In contrast, the samples reported in our previous work (Ridout et al., 2010; 2012) exhibited elevated scores on this measure. This might account for the variations in the findings across the different studies.

Importantly, the emotion recognition deficit observed in the high EDI group was not due to comorbid psychopathology, as it remained once the influence of depression, anxiety and alexithymia had been controlled. Therefore, the current findings conflict with previous work highlighting the impact of depression on emotion recognition (e.g. Mendlewicz et al., 2005; Persad & Polivy, 1993; Surguladze et al., 2004). Similarly, our data are inconsistent with findings of impaired emotion recognition in alexithymia (e.g. Lane et al., 2000; Mann, Wise, Trinidad, & Kohanski, 1994). Furthermore, our data do not support previous studies suggesting that emotion recognition deficits in disordered eating are a consequence of comorbid alexithymia (Brewer et al., 2015; Ridout et al, 2010).

The current finding of a general emotion recognition deficit in participants with elevated EDI scores is important because such difficulties are thought to play a key role in the development and maintenance of eating disorders (Schmidt & Treasure, 2006), possibly by undermining social support (Oldershaw et al, 2011). The potential

importance of emotion recognition processes in eating disorder prognosis was highlighted by Clyne et al. (2010), who demonstrated that an intervention targeting the ability to recognize the emotional displays of others led to significant symptom reduction in a group of patients with binge eating disorder in comparison to a waitlist control group. The authors also compared the size of their treatment effect to those reported in studies using other psychological interventions (e.g. CBT and DBT) and concluded that their intervention was at least as effective as CBT and DBT in reducing binge rates and that it may be more effective in bringing about longer-term improvements in symptoms (Clyne et al, 2010).

There were several limitations to the current study that need to be acknowledged. The first is the use of the median split procedure to allocate participants to groups. A consequence of this procedure is that participants with very similar scores on the EDI could have been allocated to different groups. Nevertheless, given the observed relationship between *drive for thinness* scores and emotion recognition performance, it would seem likely that using a method to create more distinct groups (e.g. taking the top and bottom third of scores) would have resulted in stronger effects. Another limitation of the study also concerns the sample. Analysis of the EDI scores revealed that the High EDI group did not differ from published norms for healthy controls, which can at least partially explain the lack of some of the predicted effects. The scores on the emotion recognition tasks were close to ceiling, which suggests these measures may not have been sufficiently sensitive to detect more subtle emotion recognition deficits in these participants, particularly given the high level of their educational background.

To summarise, as predicted, the high EDI group recognised fewer emotional displays than did the low EDI group. However, this deficit was not more evident for negative, as opposed to positive emotions. Furthermore, the expectation that the deficit in high EDI scorers would be larger in static compared to dynamic stimuli was not supported. Importantly, the deficit in facial emotion recognition exhibited by the high EDI scorers was independent of comorbid depression, anxiety and alexithymia. Interestingly, emotion recognition performance was related to eating disorder-related symptoms, specifically drive for thinness. Again, this relationship could not be explained by comorbid psychopathology. These findings are important, as emotion

recognition deficits are thought to play a key role in the development and maintenance of eating disorders (Schmidt & Treasure, 2006). However, future work needs to examine this longitudinally.

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