

Why Study Positive Emotions in the Context of Eating Disorders?

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Abstract Experimental research, supported by systematic reviews, establishes that people with eating disorders have emotional difficulties in terms of recognising, regulating and expressing their emotions. These emotional difficulties contribute to poor social functioning and problems with relationships. The existing literature includes a broad range of studies, many of which have utilised self-report measures, but experimental studies of emotions in eating disorders are still limited. The primary aim of this paper is to highlight gaps in the clinical research on emotions in eating disorders, focusing on experimental investigations from our lab and highlighting potentially useful future directions for further basic research

and its translation into new developments in treatment and prevention. Recent findings using experimental paradigms to study the expression of emotions along with neuroimaging research exploring differences in facial emotion processing are discussed, and clinical implications are presented.

Keywords Eating disorders · Positive psychology · Experimental · Self-report · Emotions · Quality of life

Introduction

Clinical and experimental psychologists have studied negative emotions such as anger, sadness, fear and disgust extensively for the past few decades. The field of eating disorders is no exception. Eating disorders (EDs), including anorexia nervosa (AN) and bulimia nervosa (BN), are mental health problems associated with impaired quality of life [1], high social anhedonia [2, 3] and a limited number of relationships [4]. Recently, the number of studies reporting links between autistic spectrum disorders and anorexia has been growing [e.g. 5, 6]. An increasing body of theoretical and empirical literature has begun to map the broad range of difficulties with emotional processing experienced by people with EDs [e.g. 7] and the tentative aetiological underpinnings of these emotional problems [e.g. 8], as well as implications for treatment.

The vast majority of existing research regarding emotional processing in people with EDs is associated with the ‘deficit’ or ‘disease model’ in clinical psychology and psychiatry. Such approaches actively seek to identify, explain and remedy deficits or abnormalities that might cause/be caused by ‘mental illness.’ In contrast, positive psychology research, spearheaded by Seligman [e.g. 9], Fredrickson [10] and Csikszentmihalyi [e.g. 11], highlights the importance of studying strengths, resources, resilience, optimism and hope, as a challenge to the deficit model of human experience. This

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paradigm shift from ‘fixing the problem’ to ‘exploring strengths’ has influenced research and practice in a wide range of applied psychological fields [e.g. 12]. This paper aims to explore the theoretical applications of positive psychology for ED prevention and treatment in the context of currently available experimental data.

Positive Emotions and Their Implications for Eating Disorder Recovery

According to Fredrickson [10], ‘positive emotions serve as markers of flourishing, or optimal well-being’. Over a number of experiments, Fredrickson [10, 13] has demonstrated that positive emotions broaden our thought-action repertoires, can counteract/balance out negative emotions and build resilience [14, 15]. More specifically, the broadening effect of positive emotions facilitates the capacity to open up our minds, which helps us to ‘think outside the box’. This is a useful tool because it gives a ‘bigger picture’ view of our current situation, enabling humans to become more creative and flexible in finding alternative solutions to problems. Regarding EDs, Fredrickson’s findings [10, 13] may have implications for helping patients to move towards recovery. Thinking in terms of the ‘bigger picture’ in relation to goals around recovery is very important in EDs, particularly in AN where the illness is often ego-syntonic and many patients place high value on retaining the illness and its identity. Fredrickson’s findings [10, 13] suggest that patients may be able to make better decisions about their behaviours when experiencing some degree of positive emotion. The broadening effect of positive emotions has further important implications for EDs, as there is experimental evidence suggesting patients have difficulties with flexible and bigger picture thinking, as highlighted in a recent systematic review [16] despite the IQ of patients tending to be in the average to above average range [17]. Clinically, this information processing style is manifested by patients making decisions about their health based on small details [e.g. the calorie content of two food items], rather than the overall picture of their health and quality of life. It may be that working with patients to increase their daily experience of positive emotions might be one way of helping them to practise bigger picture thinking skills. Therefore, facilitating positive emotional states and broadening problem-solving skills seem highly relevant to the ED field.

Fredrickson’s work [10, 13] has led to a focus on 10 important positive emotions: joy, gratitude, serenity, interest, hope, pride, amusement, inspiration, awe and love. Her research demonstrates that enhancing our experience of these emotions can lead to greater psychological [and physical] well-being [10]. In addition, experimental research generated by the field of positive psychology demonstrates that writing letters of gratitude, performing kind acts, identifying and

cultivating strengths and visualising an ideal future all improve subjective happiness and well-being [18]. One implication these data have for the field of EDs, where patients have high levels of negative affect, might be that sharing these ideas with patients and coaching them to utilise these positive interventions in their daily lives might enhance their experience of positive emotion, allowing them to access better problem-solving strategies regarding their health behaviours. Therefore, it could be argued that the application of positive psychology is relevant in the realm of understanding and improving the well-being of people with EDs.

Positive Psychology and Its Role in the Prevention and Treatment of Eating Disorders

Resilience-building programmes developed by researchers in the field of positive psychology, such as the Penn Resilience Programme [e.g. 19], have been successful in helping to prevent depression in young people, as highlighted in a meta-analysis by Brunwasser and colleagues [20]. It is possible that positive psychology could also play an important role in the prevention of EDs. For example, Gongora [21] reports that drive for thinness, physical activity and body dissatisfaction were lower in female adolescents who reported higher levels of positive emotion, engagement in life and having a meaningful life. Whilst research into risk factors has significantly increased our understanding of what contributes to the development of EDs [22, 23], and has intuitive appeal in terms of enabling us to ‘fix’ what is wrong, it unfortunately neglects the flip side of what is right. More pertinently, prevention programmes aimed at reducing risk factors have demonstrated small to moderate effect sizes in reducing the onset of EDs and maladaptive eating attitudes and behaviours [24]. The promotion of protective factors, as proposed by the positive psychology framework, could enrich prevention programmes, thus enhancing their impact.

Positive psychology interventions may also play an important role in treating clinical EDs, in the context that despite cognitive behavioural therapy being identified as an evidence-based treatment for BN [25], AN continues to be one of the most challenging disorders to treat, with no specific treatment approach showing superiority for adult populations [26, 27]. A focus on the patient’s strengths and resources, as proposed by positive psychology, could enhance the effectiveness of current treatments. Indeed, some of the so-called third wave cognitive and behavioural psychological therapies have made attempts to apply emotion-focused interventions to an ED population. For example, compassion-focussed therapy, which among other components, focuses on enhancing skills of self-soothing and compassion towards the self, has already demonstrated some positive early outcomes as an intervention for people with EDs [28]. The same is true for acceptance and

commitment therapy [e.g. 29] and emotion acceptance behaviour therapy for AN [30], both of which involve components focusing on identifying and enhancing patients' resources and increasing the presence of positive emotional experiences. Finally, cognitive remediation and emotion skills therapy (CREST), which was developed specifically for patients with AN [31, 32], is a manualised treatment shown to be acceptable to patients [31, 32] and involves a social-emotional module [33], which focuses not only on helping patients to understand and manage emotions but also on increasing the presence of positive emotion in their life through positive psychology interventions like writing down three good things noticed each day.

It is argued here that the application of a positive psychology framework, directed towards the promotion of factors that protect against illness and utilise strengths to promote recovery from disordered eating, could represent a necessary, plausible and recovery-focused shift away from the disease model and a move towards holistic wellness.

In this context, the next section of this paper presents a review of the existing and emerging research literature regarding emotional processing in people with EDs. The review will highlight potential emotional processing strengths, as well as interesting future directions for research and clinical intervention and prevention programmes, relevant to EDs.

Emotional Intelligence in EDs

To our knowledge, only one study has explored emotional intelligence in people with EDs [34••]. Using the Mayer-Salovey-Caruso Emotional Intelligence Test [MSCEIT; 35], Hambrook and colleagues identified problems in this domain in a group of AN participants. Other studies have focused on more specific aspects of emotional processing in EDs, such as perception and recognition of emotions, neural correlates of emotion processing, and expression of emotions, and these data are reviewed below.

Perception of Positive Emotions in EDs

Oldershaw and colleagues [7] conducted a comprehensive systematic review and meta-analysis of the available experimental research exploring emotional processing in people with AN. Experimental work was chosen because the evidence base utilising this methodology was limited and less clear than research involving self-report measures. Oldershaw and colleagues concluded that emotional recognition had received the most attention, and it was possible to appraise the evidence in this domain, unlike in other areas of emotional processing. An update of the literature follows, with a specific

focus on the recognition of basic and complex positive emotions in individuals with EDs.

Basic Emotion Recognition

Early studies exploring basic emotion recognition in the ED population reported on the overall performance of participants without distinguishing between positive and negative emotions and produced mixed findings [36, 37]. Since then, most studies have looked at the how accurate ED patients are at identifying specific emotions separately (i.e. happiness, sadness, anger, etc.) (see Table 1 for all available studies). With only one exception [38], all these studies show different levels of performance for positive and negative emotions. Whilst the results for negative emotions are generally mixed, there is consistent evidence that ED participants do not differ from healthy controls (HCs) in their ability to recognise happiness in faces [39–44].

Emotional Theory of Mind

Originally designed as a measure of theory of mind (ToM), the Reading the Mind in the Eyes (RME) task [45] has been used to investigate complex emotional recognition, or emotional theory of mind (the ability to infer the emotional state of others). Even though most studies using this task report data from ED patients in the form of overall performance results (i.e. the ability to correctly identify emotions per se) [46–54], four studies to date have explored the effect of valence (positive/negative emotions) on participants' performance. These studies exhibit mixed results (see Table 2 for all available studies). For example, Oldershaw and colleagues [55] found that patients with AN performed more poorly than HC participants in identifying both positive and negative emotional states, suggesting a valence non-specific difference in the ability to infer emotion in others. In contrast, Tapajoz and colleagues [56] found no problems in identifying positive states by people with AN compared to HCs, but worse performance in identifying negative states. Medina-Pradas and colleagues [57] found AN participants demonstrated equivalent performance to HCs when identifying both positive and negative emotional states on the RME. Results are similarly mixed for individuals with BN. Medina-Pradas and colleagues [57] observed that BN participants exhibited poorer performance than HCs when identifying positive emotions in the eyes, though these results have not been replicated in later studies [56, 58].

In conclusion, this updated review of the literature suggests that there is consistent evidence that individuals with AN and BN do not differ from HCs in their ability to identify positive emotions in the faces of others. This aspect of emotion

Table 1 Basic emotion recognition tasks reported in eating disorder participants

Study	Number of samples	Measure/emotion	Findings for positive emotions	Findings for negative emotions
Zonnevylle-Bender et al. (2002) [36]				
ED	30	Emotion recognition task (pictures taken from JACFEE)	In general, ED participants showed worse performance recognising emotions from faces	In general, ED participants showed worse performance recognising emotions from faces
HC	33	Happiness, surprise Anger, contempt, disgust, fear, sadness	Only overall results provided, no details about specific emotions	Only overall results provided, no details about specific emotions
Zonnevylle-Bender et al. (2004) [37]				
AN adolescents	48	Emotion recognition task (pictures taken from JACFEE)	In general, no group difference in accuracy recognising emotions from faces	In general, no group difference in accuracy recognising emotions from faces
Mixed psychiatric controls	48	Happiness, surprise Anger, contempt, disgust, fear, sadness	Only overall results provided, no details about specific emotions	Only overall results provided, no details about specific emotions
HC	48			
Kucharska-Pietura et al. (2004) [39]				
AN	30	Emotion recognition experiment	No significant difference in accuracy recognising positive facial emotions	AN showed poorer performance recognising negative facial emotions, particularly for sadness and fear
HC	30	Happiness, interest, surprise Anger, contempt, disgust, fear, sadness, shame		
Mendlewicz et al. (2005) [40]				
AN	36	Emotion facial expressions task	No significant difference in accuracy recognising positive facial emotions	No significant difference between AN and HC in accuracy recognising negative facial emotions
Depression	21	Happiness		Depressed group showed lower accuracy recognising angry faces presented with 70 % of intensity
HC	32	Anger, disgust, fear, sadness		
Kessler et al. (2006) [41]				
AN	48	Facially expressed emotion recognition (pictures taken from JACFEE)	No significant difference in accuracy recognising happy faces	No significant difference in accuracy recognising negative emotions in faces
BN	31	Happiness, surprise	AN and BN showed worse performance recognising surprise, but the absolute difference was very small	
HC	78	Anger, disgust, fear, sadness		
Pollatos et al. (2008) [42]				
AN	12	Karolinska Directed Emotional Faces	Happy faces (along with angry faces) were better recognised than other emotions by all the participants (AN and HC)	Angry faces (along with happy faces) were better recognised than other emotions by all the participants (AN and HC)
HC	12	Happiness Anger, disgust, fear, sad Neutral	No significant group difference in the accuracy recognising happy faces	AN showed worse performance than HC recognising neutral, sad, and disgusted faces
Jansch et al. (2009) [38]				
AN	28	Facial expression recognition task (pictures taken from PoFa)	Overall, AN showed worse performance than HC recognising positive and negative emotions	Overall, AN showed worse performance than HC recognising positive and negative emotions
HC	28	Happiness, surprise Anger, disgust, fear, sadness	No particular emotion was identified more accurately in either group	No particular emotion was identified more accurately in either group

Table 1 (continued)

Study	Number of samples	Measure/emotion	Findings for positive emotions	Findings for negative emotions
Castro et al. (2010) [43]	30 40	Facial Affect Recognition Task Happiness Sadness Neutral	AN diagnosis was not associated with discrimination accuracy of happy faces Obsessionality was associated with discrimination accuracy of happy faces presented for 2000 ms, but did not remain significant after multiple testing correction	Discrimination accuracy of sad faces presented for 500 ms was associated with AN diagnosis, BMI, obsessionality and ED symptomatology In the multiple regression model, the only significant predictor was obsessionality Discrimination accuracy of sad faces presented for 2000 ms was associated with AN diagnosis, but it was no longer significant after correcting for multiple testing
Kühnpast et al. (2012) [44]	16 13	Karolinska Directed emotional faces Happiness Anger, fear Neutral	Happy faces were better recognised than the other emotions by all participants (BN and HC) No significant group difference in the accuracy recognising happy faces	BN showed poorer performance recognising angry faces, misclassifying them as fearful or neutral

Peer reviewed articles in English were included in this table

AN anorexia nervosa, BN bulimia nervosa, ED eating disorder, HC healthy control, JACFEE Japanese and Caucasian facial expressions of emotion, PoFa Pictures of Affect, BMI body mass index

Table 2 Reading the Mind in the Eyes task reported in eating disorder population

Study	Number of samples	Measure/emotion	Findings for positive states	Findings for negative states
Russell et al. (2009) [46]	22 22	Reading the Mind in the Eyes	Only overall performance reported. AN were less accurate than HC	Only overall performance reported. AN were less accurate than HC
Harrison et al. (2009) [47]	20 20	Reading the Mind in the Eyes	Only overall performance reported. AN showed fewer correct answers than HC	Only overall performance reported. AN showed fewer correct answers than HC
Harrison et al. (2010) [48]	50 50 90	Reading the Mind in the Eyes	Only overall performance reported. ED (AN and BN together) showed fewer correct answers than HC. AN scored fewer correct answers than BN	Only overall performance reported. ED (AN and BN together) showed fewer correct answers than HC. AN scored fewer correct answers than BN
Oldershaw et al. (2010) [55]	40 22 47	Reading the Mind in the Eyes	Current AN performed significantly worse than HC	Group differences approached significance. AN and recovered AN performed similarly, showing fewer correct answers than HC. But differences were not significant
Harrison et al. (2010) [49]	50 35 90	Reading the Mind in the Eyes	Only overall performance reported. Both, AN and recovered AN, performed similarly, showing fewer correct answers than HC	Only overall performance reported. Both, AN and recovered AN, performed similarly, showing fewer correct answers than HC
Medina-Pradas et al. (2012) [57]	44 30 23 39	Reading the Mind in the Eyes	AN performed similar to HC BN showed lower score than HC Trend for EDNOS to show poorer scores than HC	No difference between HC and clinical groups
Adenzato et al. (2012) [50]	30 32	Reading the Mind in the Eyes	Only overall performance reported. No differences between AN and HC	Only overall performance reported. No differences between AN and HC
Kenyon et al. (2012) [58]	48 34 57	Reading the Mind in the Eyes	No differences between groups	No differences between groups
Goddard et al. (2013) [51]	65 50 70 50 54	Reading the Mind in the Eyes	Only overall performance reported. No differences between ED offspring and HC offspring	Only overall performance reported. No differences between ED offspring and HC offspring

Table 2 (continued)

Study	Number of samples	Measure/emotion	Findings for positive states	Findings for negative states
HC fathers	51			
Tapajoz et al. (2013) [52]				
AN	24	Reading the Mind in the Eyes	Only overall performance reported. AN were less accurate than HC and BN groups	Only overall performance reported. AN were less accurate than HC and BN groups
BN	24			
HC	24			
Kanakam et al. (2013) [53]				
ED twins	51	Reading the Mind in the Eyes	Only overall performance reported. ED twins were less accurate than control twins at a trend level. The impairment was more pronounced in AN twins than BN	Only overall performance reported. ED twins were less accurate than control twins at a trend level. The impairment was more pronounced in AN twins than BN
Unaffected co-twins	19			
Control twins	42		Unaffected co-twins were less accurate than control twins at a trend level	Unaffected co-twins were less accurate than control twins at a trend level
Tapajoz et al. (2013) [56]				
AN	22	Reading the Mind in the Eyes	No difference between HC and clinical groups	AN performed significantly worse than BN and HC. BN performance was similar to HC
BN	19			
HC	24			
Goddard et al. (2014) [54]				
ED (males)	28	Reading the Mind in the Eyes	Only overall performance reported. No difference between ED and HC	Only overall performance reported. No difference between ED and HC
HC (males)	41			

Peer reviewed articles in English were included in this table

N sample size, *AN* anorexia nervosa, *BN* bulimia nervosa, *ED* eating disorder, *HC* healthy control

processing could represent a strength for people with EDs. However, it is unclear whether this ability is reduced when it comes to more complex positive emotions, such as those assessed by the RME task. A limitation that should be taken into account when interpreting these results is that all the studies evaluating basic emotional recognition assessed only one positive emotion: happiness. This is of relevance because as previously mentioned, Fredrikson's [10, 13] research highlights the existence of 10 positive emotions and research has shown that the main sign of happiness, the smile, is very easy to recognise. In two studies, one with AN participants and another with BN participants, happiness was associated with the highest recognition rate—around 99 %—in both the clinical and the non-clinical sample [42, 44]. Moreover, there is evidence that the accuracy in identifying happy faces tends to be very high—over 90 %—in several cultures, including Western cultures [59]. Therefore, given that most studies have used faces showing prototypical expressions of emotions, it is reasonable to suggest that a ceiling effect may be occurring here. Future studies should attempt to overcome this limitation by using more complex stimuli such as blended emotions, using other means of expressing happiness such as the tone of voice or body language, and assessing recognition of other positive emotions such as joy, gratitude, pride, awe or love [10].

Another limitation of the current literature is that it is mainly based on studies on female participants. Only one study explored emotion recognition in males with eating disorders using the RME task and found no differences among males with AN, BN and HCs [54]. This study looked at the ability to recognise emotions in general and did not report results for positive and negative emotional states separately, so it is not known whether the ability to identify positive emotional states of males with EDs differs from HCs. Investigating emotion recognition in males with EDs is relevant, because there is evidence of gender differences in emotion recognition in the general population, with females being more accurate than men at recognising basic facial emotions [60, 61].

Neural Correlates of Positive Emotions in EDs

To our knowledge, only two studies have explored neural correlates of emotional processing in people with EDs. In the first one, Friederich and colleagues [62] explored the startle reflex paradigm using positive and negative stimuli selected from the International Affective Picture System [63]. Generally, they found that a strong startle reflex was associated with fear and disgust. As expected, HCs had a strong startle response to negative images, a less pronounced

response to neutral images and a very weak response to positive images, suggesting that the images had a differing effect on the participants. Interestingly, in both clinical groups (AN and BN), the participants exhibited a strong startle response to both positive and negative images and a less strong response to neutral stimuli, suggesting that patients and non-ED participants had different biological responses to emotions.

In the second study, Fonville and colleagues [64••] used an implicit emotion task [65] with neutral and positive faces to examine brain activation using fMRI. This paradigm allowed us to explore how people with and without AN responded to neutral, 50 % happy and 100 % happy faces, whilst completing a gender discrimination task. Comparing 31 AN and 31 HC participants, Fonville [64••] found that the presentation of 100 % happy faces was associated with significantly increased blood flow in the right fusiform gyrus and occipital lobes in AN participants, compared to HCs. These data provide preliminary evidence of a different biological response to positive emotion when positive stimuli are perceived, whether in the form of a positive image or a happy face.

Expression of Positive Emotions in People With EDs

Another area of emotional processing that has received interest is the study of emotion expression in people with EDs. Although there has been little experimental investigation in this area, findings from Davies [66••, 67] suggest that people with AN express positive and negative emotions differently to HCs. Specifically, when asked to describe their emotional experience, people with AN used fewer words and, more importantly, fewer positive affect words than HCs [68]. A further study carried out by the same investigators explored coded facial emotional expression in response to video clips depicting different emotional valences, in people with current AN, individuals who had recovered from AN (RecAN) and HCs [67]. In response to an amusing clip, AN participants showed significantly less positive emotional expression (e.g. smiling) than both HC and RecAN groups, and both AN and RecAN groups showed more negative expression than HC participants. In response to a sad clip, there was no difference between the groups in terms of positive expression, but AN participants showed significantly less negative expression than HCs [67]. These results echo findings from self-report studies where it has been shown that people with EDs inhibit their expression of emotions [e.g. 69], and it has been proposed that these difficulties may contribute to the maintenance of the illness, inhibiting recovery [8]. A similar pattern of findings has been observed in adolescent ED patients [70]. In addition, emotion expression has been studied in participants with BN, but results for this population are less clear.

For example, Davies' study on verbal emotion expression [68] did not find significant differences between participants with BN and HCs. In contrast, Tarrega and colleagues [71] studied the facial expression of joy and anger in response to a therapeutic video game and found differences among individuals with current BN, people who had recovered from BN (RecBN) and HC participants. Whilst playing the game, participants with BN exhibited facial expressions of joy for longer time than HCs and expressed anger for less time than HCs. The RecBN group exhibited an intermediate pattern. These results could be interpreted as evidence of intact ability to express positive emotions in BN, which could be a strength to be used in treatment. However, Tarrega's video game was not aimed at eliciting positive emotions, and their BN participants described themselves as more anxious than HCs, which led to the authors' suggestion that the increased facial expression of joy might not be an authentic response and could be related to a desire to gain acceptance and avoid rejection [71]. More studies are needed to further characterise the expression of positive emotions in people with BN and its possible role in the ED pathology.

In general, a smile is a very powerful social signal that has been associated with positive intentions [72] and increased sociability [73]. Lack of expression, on the other hand, is a strong signal of disinterest or rejection of the opportunity to make contact. The reduced facial expression of positive emotions in AN participants might be related to their higher levels of social anhedonia, a failure to seek out and experience reward from social interaction [2, 3, 74]. Furthermore, there is some evidence that making friends and maintaining a social network is highly problematic for people with an ED even before the onset of illness [4*]. It might be that since people with AN gain less pleasure from social communication, they are less interested in attracting social interactions, and the reduced facial positive expression serves the purpose to avoid social interaction. On the other hand, it might be the case that since people with AN exhibit less positive facial expressions, they are less likely to participate in positive social interactions, and therefore, they are less exposed and obtain less pleasure out of the experience. In any case, it would be important to support these patients to build their social skills to help them flourish. Assisting patients with AN to facially express more positive emotions, particularly to smile more often, along with techniques aimed at increasing their experience of positive emotions, such as those described by Lyubomirsky and Layous [18], might have a positive impact in their social life. This is relevant because patients with AN tend to isolate themselves and to report a high impact of the illness on social leisure and relationships [1]. Improving patients' social life will benefit their overall quality of life and might facilitate the process of recovery.

Future Directions

More empirical studies, particularly experimental studies, exploring emotional processing and expression in people experiencing EDs are needed to provide clinically relevant data to inform and refine existing prevention and treatment methods. In particular, our review has highlighted that very few experimental studies have actually delineated and reported data regarding whether people with EDs process positive and negative emotions differently to HCs. It would be helpful for future studies to include such analyses involving the effect of emotional valence in order to establish a more comprehensive and representative understanding of these phenomena.

Further research is also required to explore the range of positive emotions in people with an ED. No studies have directly explored ED patients' subjective experience of a broad range of positive emotions. Both experimental and qualitative ideographic methodologies would be helpful in furthering this line of research.

In future clinical research, it may be helpful to explicitly pilot and evaluate the use of therapeutic interventions derived from positive psychology in the treatment of people with EDs (e.g. 'three good things', how to elicit simple pleasures, behavioural activation toolbox, gratitude letters, etc.). If people with EDs do struggle to identify their own and other people's emotions and have difficulty expressing positive emotion, then it is plausible that therapeutic approaches incorporating an emphasis on increasing positive emotions and positive communication, developing personal strengths, finding direction and meaning and engaging in the present moment may prove helpful in improving well-being and promoting the recovery of people with EDs.

Duckworth and colleagues [9] point out that positive psychology emphasises not only the study of positive emotion, personal strengths and skills of the individual but also that of positive institutions. These are institutions that allow the experience and expression of positive emotions, such as the family, school/work and the community, to enhance mental health and promote wellness. From this perspective, it is clear that *positive institutions* such as the family, schools and the workplace could be utilised to develop personal strengths and resilience in order to protect against the development of EDs. It is well established that institutions such as the media (e.g. via promotion of the 'thin ideal'), peer group and patterns of family communication can all act as risk factors for the development of EDs [75, 76]. However, it is also possible that these institutions might hold the power to exert a positive influence on well-being and protect against the development of EDs (e.g. via ED prevention programmes in schools promoting a healthy body image and critical media consumption and family-based interventions focusing on personal strengths). Indeed, there is evidence that eating disorder prevention

programmes can produce small to moderate effects on reducing maladaptive eating attitudes and behaviours [e.g. 24]. These are also important areas for future research to explore.

Conclusion

This paper has reviewed the experimental research on emotions in people with EDs, generated by our research group and others in the field. It has also explored the application of a positive psychology framework, in particular, the study and application of positive emotions for supporting recovery from an ED. The review highlights that there are few studies addressing these areas, despite the evident potential benefits of this approach in the prevention and treatment of EDs.

The domain which has received greater interest is the perception of emotions. This review shows that there is consistent evidence that people with EDs are able to recognise simple positive emotions (i.e. happiness) in other people's faces, but it is less clear whether or not they have similar abilities when it comes to more complex positive states, as exhibited by results from the Reading the Mind in the Eyes task. Furthermore, recent studies have attempted to determine whether people with EDs show different brain processes when performing emotional tasks, providing preliminary evidence of different neurological responses to positive emotional stimuli. In the field of emotion expression, our review suggests that people with AN use fewer words to describe emotional experiences and exhibit reduced facial expression of emotions, compared to HCs.

Taking all of these findings into account, this review proposes that the study of positive psychology, in particular the study of positive emotions, would enrich our understanding of eating pathology and provide new tools that might have a positive impact on prevention, treatment and in improving quality of life. Given these potential clinical implications, this review represents a call for more research in these areas.

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Compliance with Ethics Guidelines

Conflict of Interest Kate Tchanturia, Marcela A. Marin Dapelo, Amy Harrison, and David Hambrook declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

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- Of importance
- Of major importance

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