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EMOTIONAL PERCEPTION DISTURBANCES IN ANOREXIA NERVOSA

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ABSTRACT

Anorexia nervosa (AN) is a severe and debilitating disorder with the highest standardized mortality rate among all mental health conditions. It is associated with cognitive impairments and difficulties in emotional regulation. Individuals with AN often exhibit a reduced ability to recognize emotions (Emotion Recognition Ability – ERA), particularly when it comes to negative emotions. The efficiency of emotion recognition has been found to correlate with Body Mass Index (BMI) and the duration of the illness, which may suggest a decline in socio-emotional functioning and neurobiological changes caused by prolonged starvation.

Impaired emotion recognition is linked to poorer treatment outcomes, making it crucial to focus on enhancing this skill during AN therapy. Since ERA plays a fundamental role in nonverbal communication – and, by extension, in social interactions – further research in this area is warranted. Available training programs aimed at improving emotion recognition abilities have the potential to significantly enhance communication between patients and healthcare providers as well as close relatives, thereby positively influencing the therapeutic process.

KEYWORDS

Anorexia Nervosa, Emotion Recognition Ability, Eating Disorder, Mental Illness, Anorexia

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Introduction.

Anorexia nervosa (AN) is an eating disorder characterized by a significant reduction in body weight, an intense fear of weight gain, and a distorted perception of one's own body weight. This condition is debilitating and can be life-threatening, as evidenced by standardized mortality rates that are the highest among all psychiatric disorders [1]. Nonetheless, the mechanisms underlying the development and maintenance of the disorder remain relatively poorly understood. Of particular interest are the difficulties in socio-emotional functioning observed in individuals with AN, including impairments in emotion recognition ability (ERA) [2]. Deficits in emotion recognition among patients with AN have been associated with poorer prognosis and reduced treatment efficacy. These difficulties may be present both during the acute phase of the illness and as a more persistent and complex deficit. Furthermore, some studies suggest that emotion recognition impairments may persist—in a milder form—even after remission has been achieved [3].

Effective treatment of anorexia nervosa requires a comprehensive approach to the patient. In addition to pharmacological interventions, psychotherapy plays a crucial role. Cognitive-behavioral therapy (CBT) is considered the most important, as it allows, through dialogue, the identification and analysis of factors underlying the disorder. This is a vital element of the overall treatment process. Numerous studies confirm that nonverbal forms of communication play a key role in conveying information. As noted by the American researcher Roy Birdwhistell, only 35% of communication is expressed verbally, while as much as 65% relies on nonverbal expression, which may be misinterpreted in patients with AN. The ability to regulate, recognize, understand, and appropriately express emotions is fundamental to effective social interaction, cooperation with others, and coping with challenges. Therefore, the assessment of alexithymia—defined as difficulty in consciously experiencing, identifying, and describing emotions—appears to be of significant importance. It may facilitate understanding of emotional functioning in patients with AN and thus contribute to better tailoring of psychotherapy to their individual needs [2].

Methodology

This narrative review provides a comprehensive overview of the current literature investigating emotional perception in individuals with anorexia nervosa. Relevant sources were obtained through targeted searches in PubMed and Google Scholar using keywords such as emotion recognition, anorexia nervosa, social cognition, alexithymia, and nonverbal communication. Both original and review articles were selected for the analysis, spanning between 2005 and 2024, and including original research, meta-analyses, systematic reviews, and theory papers. Special focus was placed on studies that used research instruments, for example, the Reading the Mind in the Eyes Test (RME), the Geneva Emotion Recognition Test (GERT), and the QUEST paradigm, to investigate the link between the deficits in the ability to recognize emotions and the changes in the psychopathology of anorexia nervosa across time.

Etiology

For many years, research has been conducted on the etiology and pathogenic mechanisms of anorexia nervosa (AN). It remains intriguing that only a small percentage of individuals engaging in restrictive dieting develop anorexia nervosa. Although the causes of eating disorders are not yet fully understood, it is generally accepted that the onset of the disease results from the interplay of biological, psychological, and social factors.

It is known that AN tends to aggregate in families [4]. Genetic predispositions are estimated to account for an increased risk of developing the disorder ranging from 50% to 74%. There are also data suggesting that children of mothers with AN during pregnancy are more vulnerable to developing the disorder, although it is often difficult to disentangle genetic influences from environmental factors [5]. Efforts are ongoing to identify genes associated with an elevated risk of anorexia nervosa. Analyses have included mutations in genes encoding estrogen receptors α and β, dopamine, leptin, serotonin, neuropeptide Y, and melanocortin. While it is challenging to definitively identify which of these are significantly linked to the disorder, particular research interest focuses on genes encoding uncoupling proteins (UCPs). The UCP-2 and UCP-3 genes have been localized to chromosome 11q13, a region previously implicated in obesity and hyperinsulinemia. One of two highly polymorphic marker sites located 3 cM from the UCP-2/3 coding region was found significantly more frequently in patients with AN compared to control groups [6].

Neuroimaging studies, such as functional magnetic resonance imaging (fMRI), have demonstrated that the neuronal mechanisms underlying executive functions and emotion regulation partially overlap, involving both the dorsal and ventral regions of the prefrontal cortex, as well as the anterior cingulate cortex. It has been observed that executive performance (e.g., cognitive flexibility, inhibitory control) is associated with the use of emotion regulation strategies. Research suggests that conscious emotion regulation leads to increased activation in the prefrontal cortex and the anterior cingulate cortex, highlighting the importance of executive functions in the processes of emotion regulation. The regulation of both positive and negative emotions engages these prefrontal brain areas, the cingulate gyrus, and the amygdala. In turn, experiencing emotions influences the allocation of attention to salient environmental stimuli, decision making, and memory encoding, thereby affecting cognitive and executive functioning [7].

Greater importance, however, is attributed to psychosocial factors. A substantial portion of research focuses on the influence of the family environment on the development of anorexia nervosa (AN). The literature frequently emphasizes the presence of a dominant, overprotective mother, while the father is typically perceived as withdrawn, passive, and uninvolved. Possible triggers for AN symptoms also include disturbances in parent–child relationships arising from dysfunctional family communication. It has also been noted that parental disregard for the child's natural needs for independence, identity affirmation, and the pursuit of autonomy may contribute to the development of anorexia nervosa [6].

In the neurobiological context, behavioral control is closely linked to the functioning of neurotransmitters and neuropeptides. It is assumed that hormonal disturbances involving the hypothalamic-pituitary-gonadal, hypothalamic-pituitary-adrenal, hypothalamic-pituitary-thyroid axes, as well as the hypothalamus–growth hormone (GH)–insulin-like growth factor 1 (IGF-1) axis, are secondary in nature. According to the cognitive-behavioral framework, an internal need for control over life and a harsh self-evaluation of appearance and body weight lead to food intake restriction [8]. Attention is also drawn to a possible involvement of dysfunctions within the dopaminergic system, which may account for hyperactivity, as well as impairments in reward processing and behavioral inhibition [9]. Some researchers also suggest that central nervous system damage occurring in the late fetal or perinatal period may influence the development of anorexia nervosa [6].

Risk factors for the development of the disorder include female sex, adolescence, affiliation with Western culture, and a family history of eating disorders, depression, anxiety, or obsessive-compulsive disorders, as well as dysfunctional relationships with caregivers (such as poor emotional bonding, excessive expectations, and conflicts). Additional factors may include experiences of sexual abuse, critical remarks from the environment regarding appearance and eating, social or occupational pressure to maintain thinness, low self-esteem, perfectionism, anxiety disorders, prematurity, and low birth weight [8].

Diagnostic Criteria

Anorexia nervosa is a medical term that literally translates to"nervous loss of appetite." The first clinical description of this disorder was presented by William Gull in the

journal *The Lancet* in 1888. Over time, the diagnostic criteria for AN have undergone significant changes. Currently, the most up-to-date diagnostic guidelines are found in the fifth edition of the *Diagnostic and Statistical Manual of Mental Disorders* (DSM-5), published by the American Psychiatric Association. One of the key changes compared to earlier classifications is the removal of the requirement for amenorrhea as a condition for diagnosis.

According to the DSM-5, the diagnostic criteria for anorexia nervosa include:

- restriction of energy intake relative to requirements, leading to a significantly low body weight in the context of age, sex, developmental trajectory, and physical health;
- intense fear of gaining weight or becoming fat, or persistent behavior that interferes with weight gain, even though at a significantly low weight;
- disturbance in the way in which one's body weight or shape is experienced, undue influence of body weight or shape on self-evaluation, or persistent lack of recognition of the seriousness of the current low body weight.

The DSM-5 also introduces a classification of anorexia nervosa severity based on the body mass index (BMI):

- mild: BMI $\geq$ 17 kg/m^2,
- moderate: BMI 16–16.99 kg/m^2,
- severe: BMI 15–15.99 kg/m^2,
- extreme: BMI less than 15 kg/m^2 [10].

According to ICD-10, the diagnostic criteria for anorexia nervosa include:

- weight loss (or failure to achieve expected weight gain in children), resulting in a body weight at least 15% below the normal value for age or a BMI equal to or less than 17.5;
- behavior aimed at weight reduction, such as avoidance of high-calorie foods, self-induced vomiting, misuse of laxatives, excessive physical activity, or use of appetite suppressants or diuretics;
- intense fear of weight gain and a distorted body image;
- endocrine disturbances—manifesting as amenorrhea in women and reduced libido and potency in men;
- absence of criteria for a diagnosis of bulimia nervosa [11].

Anorexia and social-emotional functioning

Anorexia nervosa is associated with serious consequences in physical, psychological, and social domains, and also increases the likelihood of suicidal behaviors. The disorder typically begins during adolescence, and its course is often prolonged and difficult to treat. Despite the currently available therapeutic methods, the disorder is characterized by a low rate of sustained remission and a high frequency of relapse.

Studies indicate that difficulties in emotion regulation play a significant role both in the development and maintenance of mental disorders, including anxiety, depression, and eating disorders. Lavender and colleagues observed that individuals suffering from anorexia nervosa exhibit considerable difficulties in emotion control. According to the authors, patients with AN tend to display disordered behavioral regulation, avoidance of emotionally distressing situations, suppression of emotions, and a lack of emotional acceptance. They are also characterized by low emotional awareness and a limited ability to recognize emotions in others [12].

Individuals with anorexia nervosa (AN) frequently present with alexithymia—a difficulty in identifying and verbalizing their own feelings. These patients often exhibit low self-esteem, a sense of worthlessness, pronounced self-criticism, and a tendency to direct anger inward. Empathy, which plays a substantial role in emotional and social functioning, comprises two main components: emotional resonance and the cognitive understanding of another person's perspective. Individuals with anorexia nervosa commonly demonstrate

deficits in these areas. Furthermore, anxiety and depressive symptoms, as well as traumatic childhood experiences, further disrupt emotion regulation abilities and emotional functioning. Therefore, it is crucial to consider these disruptive factors when assessing emotional processes in patients with AN [13–15].

The ability to recognize emotions—that is, to identify and interpret the emotional states of others—is crucial for healthy interpersonal relationships and social adaptation. Patients with anorexia nervosa (AN) exhibit deficits in this area, which translates into difficulties within the emotional and social domains. It is believed that emotion recognition is impaired in these individuals, and such difficulties may contribute to the development and maintenance of the disorder [13]. Inappropriate interpretation of emotions can lead to disturbances in interpersonal relationships, which in turn may provoke negative feelings such as anxiety, guilt, shame, or unease. Mistaken identification of negative emotions in others can result in interpersonal tension, while difficulty recognizing positive emotions limits the opportunity to form positive social experiences.

It is also important to highlight that individuals with AN are frequently characterized by excessive ambition and perfectionism, accompanied by a lack of belief in their own efficacy. This paralyzing sense of ineffectiveness permeates their actions and thinking, constituting a fundamental aspect of their functioning. They tend to perceive their own actions more as reactions to the expectations of others than as the result of internal decisions. Deficits in autonomy and self-determination are often masked by a façade of passive resistance. In interpersonal relationships, people with AN often appear compliant, easy to manage, and undemanding. Their worldview tends to be extreme, and they strive for excessive emotional control [6].

Recent research in the field of anorexia nervosa (AN) has provided deeper insights into its course and neuropsychological mechanisms. Kiely, Conti, and Siano (2024) focused on the phenomenological experience of individuals with severe and enduring anorexia nervosa (SE-AN), highlighting its existential and identity-related dimensions. Based on the artistic work of a patient suffering for 18 years, they identified themes such as the”disappearing self, " dilemmas between the desire for life and death, and fluctuating hope. The findings emphasize that SE-AN extends beyond standard diagnostic classifications, with body image disturbance representing only a fragment of a deeper, more global distortion of the self. The authors suggest the need for new diagnostic criteria that incorporate elements of identity and broadly defined”impoverishment" of functioning across various life domains [16].

In contrast, Romero Frausto et al. (2024) conducted a study on body perception in adolescents with AN, investigating whether the overestimation of their own body size results from deficits in visual perception. By combining behavioral tasks with neurophysiological measurements (EEG/MEG), they found that body image disturbances are associated with emotionally biased attention and self-referential processing rather than primary visual impairment. Individuals with AN exhibited increased neural activity in response to underweight body silhouettes and reduced activity to bodies of higher mass, suggesting the consolidation of cognitive-emotional processing patterns related to somatic stimuli [17].

Techniques for testing emotional recognition abilities

In numerous studies, such as those conducted by Kessler et al. (2006), Mendlewicz and colleagues (2005), and Dinkler et al. (2019), instruments were employed that assess the recognition of basic emotions (fear, anger, disgust, happiness, sadness, and surprise) based on static photographs of facial expressions, for example, the Facially Expressed Emotion Labelling Test (FEEL). Nevertheless, tasks focused solely on recognizing basic emotions may lack sufficient sensitivity, as patients with anorexia nervosa (AN) particularly experience difficulties in identifying more complex emotions [15].

The assessment of the ability to recognize complex emotions has often been conducted using the Reading the Mind in the Eyes Test (RME). In this test, participants are asked to identify cognitive or affective mental states based solely on photographs of the eye region. However, the fact that RME combines cognitive (e.g., humorous, reflective) and emotional elements may limit its effectiveness. This is particularly relevant because individuals with AN tend to experience greater challenges in deciphering emotional, as opposed to cognitive, mental states in others [15, 18, 19].

Researchers have also evaluated difficulties in inferring emotional mental states using the Movie for the Assessment of Social Cognition (MASC). During this test, participants watch video recordings of conversations among four actors. The task involves cognitive elements such as false beliefs, faux pas, metaphors, and sarcasm. However, this instrument is better suited to assessing cognitive and affective states in complex social interactions than for the specific evaluation of emotion recognition based on nonverbal cues, since the actors also employ verbal emotional communication. Additionally, the MASC may be less

appropriate for studies on AN due to the presence of eating scenes and romantic themes that may distract participants with anorexia nervosa [18].

Another method for assessing the ability to recognize emotions based on nonverbal signals involves the analysis of body movement patterns. For this purpose, video clips are used in which actors, equipped with small lights, move in a dark room and convey one of four emotions—anger, fear, happiness, or sadness—through their gait. Study participants are tasked with identifying the emotion expressed by these body movements. This method has demonstrated that individuals with anorexia nervosa (AN) experience particular difficulty in recognizing sadness. However, this technique is limited to a small set of basic emotions and focuses exclusively on a single form of nonverbal signal (body movement), which constrains both the scope and validity of the assessment [20].

Limitations

An analysis of the previously described methods reveals that research on emotion recognition ability (ERA) based on nonverbal signals faces numerous limitations. The primary challenges include a focus on only a small range of basic emotions, the use of static images which constrain the scope of emotional signals being assessed—as natural emotional expression is both complex and dynamic—the application of tasks that complicate emotion identification, as well as small participant sample sizes. Consequently, this area remains insufficiently explored, and recent studies are making efforts to address and overcome these limitations.

ERA testing using the QUEST method

Based on a 2019 study, it is evident that researchers have moved away from previously employed methods, such as the Reading the Mind in the Eyes Test (RME) and prototypical facial photographs with explicit emotional expressions. Instead, they adopted an innovative psychophysical approach called QUEST. This method is characterized by high sensitivity, allowing for the detection of subtle difficulties in emotion recognition that may adversely affect social functioning and sustain anorexia nervosa. This was the first application of the QUEST paradigm in a large group of patients.

The results demonstrated that the most common error in emotion recognition was fear, which was misidentified in approximately half of cases—most frequently as surprise (21–24%). Other prevalent confusions included anger with disgust (17–22%) and sadness with indifference (14–18%). Happiness was recognized with the highest accuracy, with error rates ranging from 3% to 7%.

Therefore, it can be concluded that the studied patients exhibited marked deficits in emotion recognition, particularly with negative emotions such as fear and disgust. These difficulties impact subsequent cognitive processes, such as the interpretation of social situations, contributing to problems in social functioning [21].

These observations corroborate previous assumptions that there are individual differences in the thresholds for perceiving facially expressed emotions. Among the six basic emotions—happiness, surprise, fear, anger, disgust, and sadness—happiness is most easily recognized at the lowest perceptual threshold, while substantially more information is required for the accurate identification of fear. One study indicated that the average threshold for fear recognition reached as high as 97% signal strength, whereas happiness required only 35% [22].

Geneva Emotion Recognition Test

In 2021, the results of a study employing the Geneva Emotion Recognition Test (GERT) were published. The female participants with anorexia nervosa (AN) were recruited from a German clinic specializing in the treatment of eating disorders. Exclusion criteria for the study group included age below 16 years, life-threatening condition, schizophrenia, bipolar disorder, a history of substance abuse, and borderline personality disorder according to DSM-5 [23].

The assessment of emotion recognition ability utilized the GERT, which consists of 83 short video clips. In these recordings, ten actors displayed 14 different emotions: joy, amusement, pride, pleasure, relief, interest, anger, fear, despair, irritation, anxiety, sadness, disgust, and surprise. The actors expressed these emotions by delivering sentences in a pseudolanguage, thereby eliminating the influence of literal semantic content on interpretation. The recordings were produced under professional directorial supervision and set in realistic situations to ensure authenticity. The clips incorporated a range of nonverbal cues, including vocal prosody, facial expressions, gestures, and body posture. After each video, participants selected from 14 options the emotion they believed the actor was conveying. The test score was calculated as the mean percentage of correct responses [24].

The study demonstrated that individuals with anorexia experience greater difficulties in recognizing negative emotions, consistent with previous research findings. Additionally, lower emotion recognition abilities were associated with a longer duration of illness and a lower body mass index (BMI). These results support disease models emphasizing the deterioration of socio-emotional functioning over the course of anorexia nervosa. Poor functioning in these domains may lead to interpersonal distress, which in turn can exacerbate clinical symptoms. Measurement of illness duration is challenging, however, due to the ambiguous onset and periods of remission and relapse. The correlation between emotion recognition ability (ERA) and BMI may arise from brain alterations caused by starvation and irregular nutrition [21].

Psychobiological models of anorexia suggest that individuals susceptible to this disorder have elevated extracellular serotonin (5-HT) levels and an imbalance in postsynaptic 5-HT1A and 5-HT2A receptor activity, resulting in an intensification of negative mood. Starvation reduces serotonin production; therefore, dietary restriction may serve as a coping mechanism for unpleasant emotional states[25].

Discussion

Difficulties in emotion recognition are associated with poorer prognosis and are considered to serve both as an early indicator and as a maintaining factor in anorexia nervosa. Misreading others' emotions can lead to disturbed social interactions that evoke feelings of insecurity, unpleasant guilt, shame, and anxiety, all of which may intensify pathological behaviors related to anorexia. Incorrect interpretation of negative emotions in others may trigger interpersonal stress, whereas misattribution of positive emotions can result in the loss of positive social experiences. Such blunted emotional responses may increase social anxiety, creating a vicious cycle in which patients restrict food intake in an attempt to alleviate negative emotions arising from interpersonal difficulties. Therefore, enhancing social-emotional processing skills in individuals with anorexia nervosa may represent an important step toward improved treatment outcomes [25, 26]. Previous studies have demonstrated that emotion recognition ability (ERA) can be improved in conditions such as schizophrenia, body dysmorphic disorder, and autism spectrum disorders. Similar techniques have also begun to be employed in the treatment of other illnesses. Given that emotion recognition is key to nonverbal communication and thus to social interactions, the implementation of ERA training in patients with anorexia nervosa appears justified. Such an intervention was evaluated in a study utilizing Training for Emotion Recognition Abilities. Compared to an active control group, this training resulted in greater short-term improvements both in ERA and in self-reported anorexia symptoms. The most pronounced benefits were observed in the recognition of emotions such as anger, joy, despair, surprise, and relief [26]. Importantly, other therapeutic approaches, such as cognitive remediation or the administration of oxytocin, did not yield the expected outcomes. Nevertheless, to fully assess the effectiveness of such additional treatment modules focused on ERA and social cognition in the therapy of anorexia, further studies involving larger patient samples, longer follow-up periods, and more comprehensive outcome measures are necessary [23].

Conclusions

Emotional functioning encompasses a complex coordination of various psychological processes, enabling an individual to recognize the mental states of others and appropriately regulate their own behavior. The ability to decode emotions from facial expressions constitutes a fundamental aspect of human cognition and plays a crucial role in social interactions. Research findings suggest that individuals with anorexia nervosa (AN) exhibit a diminished capacity for emotion recognition, particularly regarding negatively valenced emotions. Proficiency in this domain has been associated with body mass index (BMI) and illness duration, potentially reflecting a deterioration in socio-emotional functioning and neurobiological alterations induced by malnutrition. Further investigation is recommended to deepen the understanding of the potential mechanisms underlying the relationship between impaired emotion recognition and the course of AN.

Taking into account the latest research, the conceptualization of anorexia nervosa should be expanded to include existential and neuroemotional aspects. The experience of the illness—particularly in its severe, chronic form—is not limited solely to disordered eating, but encompasses deeply rooted distortions of identity and psychosocial functioning. Moreover, body image disturbances in adolescents with AN are not attributable to deficits in visual perception, but rather to emotionally charged attention and self-referential mechanisms. In light of these findings, it is essential to develop multidimensional treatment models that incorporate not only cognitive-behavioral components but also existential and identity-related elements, especially for patients with severe and enduring anorexia nervosa (SE-AN).

Preliminary data on the effectiveness of emotion recognition ability (ERA) training appear promising, suggesting that such interventions may be a valuable complement to current therapeutic programs. Moreover, implementing these interventions during adolescence may have preventive effects. Training in emotion recognition can significantly improve the quality of communication between patients and both medical staff and close relatives, thereby positively influencing the course of treatment. By enhancing ERA, patients may come to realize that others are not as negatively disposed toward them as previously believed, which can result in the mitigation of intense emotions and a reduced need to engage in restrictive eating behaviors as a means of regulating aversive emotional states.

Additionally, improved emotion recognition in patients may help them more accurately identify genuine negative emotional states in others, allowing for more appropriate responses and better fulfillment of social needs. This skill may facilitate more rapid conflict resolution and reduce interpersonal tension. As a result, it may lead to a reduction in the compulsive use of dietary rules as an adaptive coping mechanism. Furthermore, patients who, through improved ERA, perceive that others harbor positive feelings and intentions toward them may begin to view social interactions as more supportive and rewarding, which in turn may decrease the need to resort to anorexia nervosa-related behaviors for the regulation of interpersonal distress.

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