



Body image disturbance in eating disorders

Paolo Artoni^{1*}

Abstract

Body image disturbance (BID) is a frequent symptom in patients with **eating disorders**. The symptom occurs mainly in patients with anorexia nervosa continuing to perceive themselves as average weight or even overweight despite being severely underweight.^[1] An altered perception of one's body and a severe state of bodily dissatisfaction characterizing the body image disturbance. This symptom is included among the diagnostic criteria for anorexia nervosa in DSM-5 (criterion C).^[2] The disturbance is associated with significant bodily dissatisfaction and is a source of severe distress, often persists in eating disorders after treatments,^{[3][4]} and is considered hard to treat.^[3] Thus, effective **body image interventions** could improve the prognosis in patients with ED, as **Hilde Bruch** suggested.^[5] Unfortunately, there is no hard evidence that current treatments for body image disturbance effectively reduce eating disorders' symptoms.^[6] Furthermore, pharmacotherapy is ineffective in reducing body misperception and it has been used to focus on correlated psychopathology (mood or anxiety disorders).^[7] However, to date, research and clinicians are developing new therapies such as virtual reality experiences,^{[8][9]} mirror exposure^[10] or **multisensory integration** body techniques,^{[11][12]} which are showing promising results.

Characteristics



Figure 1. Hilde Bruch, 1960

Hilde Bruch first identified and described body image disturbance in **anorexia nervosa**. In her famous article "Perceptual and Conceptual Disturbances in Anorexia Nervosa" ^[5] she wrote:

“ What is pathognomic of anorexia is not the severity of the malnutrition per se—equally severe degrees are seen in other malnourished psychiatric patients—but rather the distortion of body image associated with it: the absence of concern about emaciation, even when advanced, and the vigor and stubbornness with which the often gruesome appearance is defended as normal and right, not too thin, and as the only possible security against the dreaded fate of becoming fat.^[5] ”

—Hilde Bruch, *Psychosomatic Medicine*, 1962

Body Image Disturbance in Eating Disorders

Body image disturbance (BID) plays a critical role in eating disorders, often manifesting as a distorted view of one's self and physical appearance. This misperception can lead to severe and unhealthy eating behaviours, a symptom particularly noted in those diagnosed with anorexia nervosa^[13].

Maria Luigia Hospital, Via Montepelato Nord, 41, 43022 Monticelli Terme PR, Italy.

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Received 24-02-2022; accepted 18-02-2024

However, body image disturbance is not specific to anorexia nervosa^{[14][15]} but is sometimes present in other eating disorders such as [bulimia nervosa](#)^[16] and [binge eating disorder](#).^[17] Altered body perception is not a phenomenon exclusive to anorexia nervosa or eating disorders, but rather extends beyond these conditions^[18]. Recent studies contribute to a growing consensus that alterations in body perception are not exclusive to pathological states. Sadibolova et al.'s exploration of body perception in three dimensions challenges conventional methodologies focused on one or two dimensions, revealing complex perceptual distortions in healthy adults^[19]. For instance, their findings suggest discrepancies between perceived and actual sizes of body parts, implying an internal representation akin to a somatosensory homunculus.

Similarly, D'Amour and colleagues demonstrate dynamic changes in body size perception following exposure to distorted images^[20]. Collectively, this and other studies on the topic^{[21][22]} indicate that slightly altered body perception is a normative aspect of human experience, potentially intensifying in vulnerable individuals, such as those with eating disorders. In these pathologies, the nature and magnitude of perceptual distortions may be significantly greater compared to the general population, suggesting a nuanced understanding of body image disturbances across the spectrum of mental health.

Definition of body image disturbance

Different labels are used in research and clinical setting to define the body image disturbance generating terminological confusion. Some of the most used terms are "body image discrepancy",^[13] "body image self-discrepancy",^[23] "body image distortion",^[1] "disturbed body image",^[24] "disturbances in body estimations",^[25] "body image disturbance",^[26] and "negative body image".^[27] Sometimes, the term "[body dissatisfaction](#)" is also used to refer to body image disturbance indiscriminately.^[28] Moreover, the DSM-5 itself defines this symptom vaguely: "a disturbance in the way one's body weight or shape is experienced".^[2] Thus, the lack of a clear definition is problematic from both a clinical and basic research point of view.

However, most recent studies define "body image disturbance" as a multidimensional symptom comprising various components of [body image](#).^{[29][16][3][11][12]}^[30] Specifically, we usually describe [body image](#) as a concept formed by the interaction of four body-related components: cognitive, affective, behavioural, and perceptual.

- Cognitive: thoughts and beliefs about one's body and its shape; it also consists of a conscious mental representation of one's body.^[31]
- Affective: feelings and attitudes related to the body (e.g., bodily satisfaction/dissatisfaction).^[32]
- Behavioral: actions that people perform to check on, modify, or hide their body parts.
- Perceptual: how one's body is perceived; it includes [proprioceptive](#), [interoceptive](#), [tactile](#), and visual self-perception.^{[33][34]}

All of these components are altered in body image disturbance.^{[12][35]}

Signs and Symptoms

Delving into the specific aspects of body image disturbance, this condition encompasses both perceptual and attitudinal issues. Common signs include:

- altered body size estimation and altered perception of the body and its shapes.
- mental images of one's distorted and overweight body.
- frequently third-person mental view of one's body.
- negative thoughts like "I'm fat" or "my thighs are huge."
- frequent body-checking behaviors.
- frequent comparisons between one's body and that of others
- emotions of anxiety, shame, and contempt for one's body

Clinically speaking, a growing body of research suggests that body image disturbance plays a significant role in the onset,^[36] maintenance,^{[37][38]} and relapse of [anorexia nervosa](#),^[39] as previously suggested by [Hilde Bruch](#) in 1962.^[5] However, despite increasing evidence, a recent review stated that the available empirical data are still insufficient and "provide no basis to answer the question whether body image disturbance is a (causal) risk factor for anorexia nervosa".^[40] As suggested by the authors, this lack of evidence is partly related to terminology problems used in the [body image field](#).^{[32][41]}

Refining the concept of Body Image Disturbance

Consistently, Artoni and colleagues proposed a more clarifying definition of body image disturbance in 2021.^[12] The authors suggested using the term "bodily dissatisfaction" when there are alterations in the body image's affective, cognitive, and behavioural components and strictly using "body image disturbance" only when all four components are altered, including the perceptual one. In short, they define body image disturbance as when an altered perception of the shape and weight of one's body is present and aggravates body dissatisfaction. The term is literally consistent with DSM-5 description "a disturbance in the way weight and body shapes are experienced"^[2] and it is therefore "preferable to others".

Altered components in body image disturbance

Cognitive

Patients with body image disturbance exhibit an altered conscious representation of their bodies. This representation is a third-person perspective, more precisely an allocentric representation of the body,^[42] which means how the body's image is stored in the memory. This representation is evoked in self-image tasks, such as comparing one's body with others or drawing one's body shapes. However, in patients with anorexia nervosa and bulimia nervosa, this mental representation of the body is frequently overextended compared to the actual body shapes^[43]. Also, patients with anorexia nervosa show negative thoughts about their body, such as "I'm too fat," "I'm horrible," and other negative body-related thoughts^[44]. In some cases, however, the ideal internalized body has canons of pathological thinness (e.g., a body without female shapes or "that communicates suffering"). A "sick body" could be a critical maintenance factor, generating more attention from family members, reducing the requests and expectations of others^[45], and sexual attractiveness (especially in patients with sexual trauma).^[46]

Affective

Affective alterations concern the feelings and emotions experienced towards one's body. Body dissatisfaction is frequently present,^{[1][47]} sometimes related to anxiety^[48] and shame^[49] when the body is exposed or gazed at in a mirror. In some cases, anger and feelings of aggression towards one's body are reported.^[50] Congruent with the [self-objectification theory](#), one's body is frequently experienced only as an

"object to be modified" and not as a "subject to take care of".^[51] Fear is associated with the idea of getting fat.^[50]

Behavioral

The behavioral component of body image disturbance contemplates different body-checking behaviors^[52] such as repeatedly weighing during the day, spending much time in front of the mirror or avoiding it, frequently taking [selfies](#), checking parts of the body with hands (e.g. circumference of the wrists, arms, thighs, belly or hips). Other behaviors are avoiding situations in which the body is exposed (for example, the swimming pool or the sea), and wearing very loose and covering clothes.^[53] More generally, avoidance of bodily sensations, particularly the interoceptive ones, is reported.^[54]

Perceptual

In body image disturbance, several perceptual domains are altered. Visual perception is the most studied,^{[55][56][57]} but research found misperceptions in other sensory domains such as haptic^[58] tactile,^[59] affective-touch.^[60] Also, the body schema is overextended.^[61] Some research suggested that this is related to a general enlarged mental representation of body size.^[62] A recent study published on *Nature*^[63] also highlighted how a perceptual disturbance is present in subjects recovered from anorexia nervosa even without affective-cognitive body concerns. Finally, interoception, the "sense of the physiological condition of the body"^[64] is problematic in eating disorders.^[65]

Onset

The age of onset for body image disturbance is often early adolescence.^{[66][67]} Age in which the comparison with peers becomes significant and leads to a greater sensitivity towards criticism and teasing about one's physical appearance. Furthermore, puberty leads to rapid changes in body size and shape that need to be integrated into the body image.^[68] For this reason, adolescence is considered a critical age, with a greater vulnerability to internalizing ideals of thinness,^[69] to develop body dissatisfaction, body image disturbance^[66] and eating disorders.^[70] In a recent review, eight on-topic studies were analyzed. The authors found that most adolescents with anorexia nervosa and bulimia nervosa already had body-checking behaviors, negative body-related emotions and feelings, low body satisfaction, and an altered estimate of their body size compared to healthy controls.^[66]

The influence of societal factors like fat shaming and media exposure plays a crucial role in shaping body image dissatisfaction. Studies have shown that frequent exposure to thin-ideal messages in media, such as through television programs, music videos, and edited selfies on social media, is associated with increased body dissatisfaction and disordered eating behaviors, particularly in adolescent girls.^{[71][72][73]} Additionally, the presence of fat shaming in society exacerbates this issue, negatively impacting adolescents' self-esteem and emotional well-being. Mond et al. (2011) found that weight-related body dissatisfaction in overweight adolescents is primarily due to societal and peer pressures rather than inherent self-perceptions.^[74] These societal influences, combined with the peer comparisons and body changes during adolescence, create a potent mix that can significantly affect young individuals' mental health and self-image, leading to an increased vulnerability to body image disturbances and eating disorders. This mix also heightens the risk of developing anxiety, depression, and mood disorders, as the pressures and changes can be overwhelming and lead to psychological distress. Additionally, gender differences play a crucial role in this context; girls are often more susceptible to internalizing societal standards of thinness and beauty, which can exacerbate their risk of body image issues and eating disorders.^[75] On the other hand, boys may face different pressures, such as the idealization of a muscular physique, and may experience these mental health challenges differently. In the United States, the prevalence of body dissatisfaction ranges from 13.4% to 31.8% among women and 9.0% to 28.4% among men, highlighting a significant concern across genders.^[76] Unfortunately, how one passes from an initial dissatisfaction with one's body to an actual perceptual disorder is still unknown despite its clinical relevance.^[77]

Body image disturbance and body dissatisfaction

Body dissatisfaction and body image disturbance are closely related. Personal, interpersonal, cultural, social, and ethnic variables largely influence bodily dissatisfaction,^[78] influencing the emergence of painful feelings towards one's body. In addition, social pressure is considered a risk factor for body dissatisfaction. For example, the frequent presence on media of thin female bodies determines, especially in young girls, a daily comparison between their bodies and models and actresses favouring bodily dissatisfaction;^[79] comparing an "ideal" and "real" body feed an intense dissatisfaction with one's body and increases the feeling of shame, disgust, and anxiety towards the one's body and appearance.^[80]

Dissatisfaction with one's body involves only three of the four components of the body image. Those suffering from bodily dissatisfaction can have negative thoughts about one's body (e.g., "I'm ugly" or "I'm too short"). In addition, they may have behaviors related to bodily dissatisfaction (e.g., going on a diet or resorting to cosmetic surgery^{[81][82]}). They may also have negative feelings of dissatisfaction with their body and be ashamed of showing it in public.^[78] However, all these aspects are not enough to define it as a body image disturbance. In fact, there is no perceptual alteration of one's body. Thus, body image disturbance cannot be overlapped by body dissatisfaction, but they are closely related.^[83]

Body image disturbance and body dysmorphic disorder

Body image disturbance in anorexia and **body dysmorphic disorder** are similar psychiatric conditions that involve an altered perception of the body or parts of it but are not the same disorder. Body image disturbance is a symptom of **anorexia nervosa** and is present as criterion C in the DSM-5,^[2] and alters the perception of weight and shapes of the whole body. Patients with anorexia believe that they are overweight, perceive their body as "fat" and misperceive their body shapes.^[84] **Body dysmorphic disorder** is an **obsessive-compulsive disorder** characterized by disproportionate concern for minimal or absent individual bodily flaws, which cause personal distress and social impairment^[85] Patients with BDD are concerned about physical details, mainly the face, skin, and nose.^[86] Thus, both **anorexia nervosa** and **body dysmorphic disorder** manifest significant disturbances in body image but are different and highly comorbid.^[87] For example, Grant and colleagues reported that 39% of AN patients in their sample had a comorbid diagnosis of body dysmorphic disorder, with concerns unrelated to weight.^[88] Cerea et al., reported that 26% of their AN sample had a probable BDD diagnosis with non-weight-related body concerns.^[89]

Similarities

Previous studies found that both BDD and eating disorder groups were similar in body dissatisfaction, body checking, body concerns,^[90] and levels of perfectionism.^[91] Furthermore, both BDD and AN patients report higher intensities of negative emotions, lower intensities of positive emotions,^[92] lower self-esteem,^[91] and anxiety symptoms.^[93] Moreover, we find severe concerns about one's appearance, leading to a continuous confrontation with others' bodies in both diseases. In

addition, body image disturbances and body dysmorphic disorder generally onset during adolescence. Finally, alterations in visual processes seems to be present in both disorders, with greater attention to detail and difficulty in perceiving stimuli holistically.^[94] Indeed neurophysiology and neuroimaging research suggests similarities between BDD and AN patients in terms of abnormalities in visuospatial processing.^{[95][96]}

Differences

Despite many similarities, the two disorders also have significant differences.^[97] The first is gender distribution. Body image disturbance is much more present in females,^[98] unlike BDD, which has a much less unbalanced relationship between men and women.^[99] Furthermore, those with **dysmorphophobia** tend to have more significant inhibitions and avoidance of social activities than those suffering from anorexia nervosa.^[90] Differences are self-evident when considering the focus of physical concerns and misperception in AN and BDD. Whereas BDD patients report concerns and misperception in specific body areas (mainly face, skin, and hair),^[100] in patients with AN the altered perception could involve arms, shoulders, thighs, abdomen, hips, and breasts, and concerns are about the whole body shape and weight.^[97] Thus, leading to an alteration of the entire explicit (**body image**)^[1] and implicit (**body schema**)^[101] body's mental representations.^[102] Furthermore, in anorexia nervosa, not only the visual perception of one's body is altered but also the tactile^[103] and interoceptive perception.^{[104][105]}

Finally, a recent review suggested that the two disorders could be classified as "body image disturbances" (plural) in light of similarities and differences. Although more in-depth studies are needed to confirm this new classification hypothesis.^[87]

Diagnosis

Body image disturbance is not yet clearly defined by official disease classifications. However, it appears in the DSM-5 as criterion C for anorexia nervosa and vaguely described as "a disturbance in the way weight and body shapes are experienced" and "the persistent lack of recognition of the severity of the current significantly low body weight".^[2] Thus, diagnosis is usually based on reported signs and symptoms; there are still no biological markers for body image disturbance. Numerous psychometric instruments to measure body image's cognitive, affective, and behavioral components are

also used. Among the most used in the clinical setting, we mention.

Eating Disorder Inventory 3

The Eating Disorder Inventory 3 (EDI-3) represents an improvement of the earlier versions of the EDI, a self-report questionnaire widely used both in research and clinical settings. It consists of 91 questions, and items are rated on a six-point Likert-type scale (always, usually, sometimes, rarely, never), with higher scores representing more severe symptoms. Precisely, the BD subscale of EDI-3 measures bodily dissatisfaction.^[106]

Body Uneasiness Test

The body uneasiness test (BUT) is a self-administered questionnaire. It explores several areas in clinical and non-clinical populations: weight phobia, body image-related avoidance behavior, compulsive self-monitoring, detachment and estrangement feelings toward one's own body. Besides, explore specific worries about particular body parts, shapes, or functions. Higher scores indicate significant body uneasiness.^[107]

The Body Image Disturbance Questionnaire

The body Image Disturbance Questionnaire investigates different areas related to body image disturbance. For example, evaluate the most problematic parts of the body, the psychological effects of worries on the body, and the effects on social life and eating behavior.^[108]

The Body Shape Questionnaire

The Body Shape Questionnaire is a 34-item self-assessment questionnaire designed to measure the degree of dissatisfaction with the weight and shape of one's body. It includes questions about the fear of weight gain and the urge/desire to lose weight.^[109]

The Body Checking Questionnaire

The Body Checking Questionnaire (BCQ) is a 23-item tool measuring the frequency and intensity of body checking behaviors, common in eating disorders, assessing general appearance, specific body parts, and idiosyncratic behaviors. Clinically, the BCQ aids in diagnosing and monitoring eating disorders, highlighting the role of body checking in the psychopathology of these conditions.^[110]

Brain alterations

fMRI studies examining brain responses in anorexia nervosa patients to paradigms that include body image tasks have found altered activation across different brain areas: the **prefrontal cortex**, **precuneus**, **parietal cortex**, **insula**, **amygdala**, **ventral striatum**, **extrastriate**

body area, and fusiform gyrus.^[111] However, as Janet Treasure commented, "the research [in the field] is fragmented, and the mechanism of how these areas map onto the functional networks described above needs further study [...] the mechanism by which the extremes of body distortion are driven and circuitry is not known yet."^[1]

Treatments

Treatments focused on cognitive, affective and behavioral components

Historically, research and clinicians have mainly focused on body image disturbance's cognitive, affective, and behavioral components. Consequently, treatments generally target symptoms such as body checking, dysfunctional beliefs, feelings, and emotions relating to the body. One of the best-known forms of psychotherapy in the field is CBT-E.^[112] CBT-E is a form of cognitive-behavioral therapy that has been enhanced with particular strategies to address the psychopathology of eating disorders. These include reducing negative thoughts and worries about body weight and shape, reducing clinical perfectionism, and body-checking behavior.^[113] A recent review has shown that CBT-E effectively reduces core symptoms in eating disorders, including concerns about the body. Despite this, the results of CBT-E are no better than other forms of treatment.^[114] In fact, a therapy of choice for eating disorders in adults has not yet been identified.^[1]

Additionally, two other noteworthy body image treatments are Cash's "Body Image Workbook"^[115] and Body Wise.^[116] The former is an 8-step group treatment within a classic cognitive-behavioral framework. The latter is a psychoeducational-based treatment improved with cognitive remediation techniques to promote awareness of body image difficulties, and reduce cognitive inflexibility and body dissatisfaction. Worthy of mention is The Body Project,^[117] an eating disorder prevention program within a dissonant-cognitive framework that provides a forum for high school girls and college-age women to confront unrealistic-looking ideals and develop a healthy body image and self-esteem. It has been repeatedly shown to effectively reduce body dissatisfaction, negative mood, unhealthy diet, and disordered eating.^[118] The Body Project is therefore not a treatment for eating disorders but a prevention program.

Treatments focused on perceptive component

New treatments for body image disturbance have re-

cently been developed, focusing on the disorder's perceptual component. One of the best known is **Mirror Exposure**. Mirror Exposure^[119] is a cognitive-behavioral technique that treatment aims to reduce experiential avoidance, reduce bodily dissatisfaction, and improve one's misperception of one's body. During the exposure, patients are invited to observe themselves in front of a large full-length mirror. There are different types of mirror exposure, guided exposure, unguided exposure, exposure with mindfulness exercises, cognitive dissonance-based mirror exposure.^{[119][120]} To date, few studies have investigated the effects of mirror exposure in patients with body image disturbance. Key et al.^[121] conducted a non-randomized trial in a clinical sample and compared a body image group therapy with or without mirror exposure. They found a significant improvement in body dissatisfaction only in the mirror exposure therapy group. Despite the positive evidence, a recent review suggests that Mirror Exposure has a low-to-medium effect in reducing body image disturbance and further studies are needed to improve it.^[122]



Figure 2. Common VR Research Setting

Another novelty treatment for body image disturbance is [Virtual Reality - Body Swapping](#). VR-Body Swapping is a technique that allows generating a body illusion during a virtual reality experience. Specifically, after building a virtual [avatar](#) using [3D modelling software](#), it is possible to generate the illusion that the avatar's body is one's own body through a specific procedure. The avatar is a 3D human body model that simulates the actual size of the patient and can be modify directly. Some studies have found that applying this technique to anorexia nervosa reduces the misperception of one's body.^{[30][123]} This treatment is promising but provides, at the moment, only a short-term effect.^[124]

Additionally, a recent study by Emily M Choquette and colleagues has brought attention to the potential benefits of Floatation-REST (Reduced Environmental Stimulation Therapy) for body image disturbance and anxiety in anorexia nervosa. This parallel group randomized controlled trial found that participants receiving Floatation-REST sessions exhibited significant reductions in body dissatisfaction and anxiety compared to those receiving usual care. These effects were noted both acutely after each float session and at a six-month follow-up, suggesting the potential utility of Floatation-REST in treating body image disturbance and anxiety in anorexia nervosa. However, further research is needed to confirm these findings and explore their generalizability^[125].



Figure 3. Hoop Training Session

However, other treatments for body image disturbance have also recently been developed to integrate tactile, proprioceptive, and interoceptive one's body perception, the [Hoop Training](#) and the [Body Perception Treatment](#). Hoop Training is a short-term 8-week intervention (10 minutes per session) designed to become aware of and reduce body misperceptions. Hoop Training works on different components of body image disturbance: the cognitive, affective, and perceptive ones.^[11]

Another novelty is the [Body Perception Treatment](#) (BPT). BPT is a specific group intervention for body image disturbance focused on tactile, proprioceptive, and interoceptive self-perceptions during a body-focused experience.^[12] The treatment is consistent with the recent hypothesized role of [interoception](#) in developing body image disturbance by Badout & Tsakiris.^[54]

Both Hoop Training and Body Perception Treatment showed effective results and were designed to work within a [multisensory integration](#) framework.^{[11][12]} Indeed, they also complement and do not replace current standard therapies for eating disorders. However, both are also novelty treatments, and the results have not yet been replicated in independent studies. Thus, their actual effectiveness will be confirmed/disconfirmed by future research.

General Conclusion and Implications

As we conclude this comprehensive exploration of body image disturbance (BID), several key implications emerge, both for future research and clinical practice. Initially identified by Hilde Bruch in the context of anorexia nervosa, BID has since been recognized as a complex, multidimensional symptom prevalent in various eating disorders. This disturbance encompasses cognitive, affective, behavioral, and perceptual components, each contributing to the distorted self-perception seen in individuals with BID.

One of the primary challenges in addressing BID lies in its definitional ambiguity. The term has evolved to encapsulate a spectrum of body-related dysfunctions, yet a clear, unified definition remains elusive. This lack of clarity poses difficulties in both clinical diagnosis and research methodologies. However, it's crucial to distinguish between mere body dissatisfaction and true perceptual distortion, a distinction that underlines the severity and clinical significance of BID.

The onset of BID is often linked to developmental and societal factors, particularly during the tumultuous pe-

riod of adolescence. Here, external influences like media exposure and societal standards of beauty play a pivotal role in shaping self-perception and body image. These influences are particularly potent among adolescents, making them a vulnerable group for developing BID and associated eating disorders. In comparing BID with body dysmorphic disorder (BDD), we find notable similarities in perceptual distortions, but also crucial differences in the focus of concern and associated behaviors. This comparative analysis underscores the nuanced nature of body image-related disorders and the need for tailored approaches in both diagnosis and treatment.

Assessment tools like the Eating Disorder Inventory and the Body Uneasiness Test have been instrumental in diagnosing BID, yet the absence of biological markers continues to challenge clinicians. Treatment approaches have evolved from focusing primarily on cognitive and behavioral aspects to incorporating novel methods that address the perceptual component of BID, such as Mirror Exposure, Body Perception Treatment and Virtual Reality techniques.

In conclusion, while substantial progress has been made in understanding and treating Body Image Disturbance (BID), it remains a multifaceted and intricate condition necessitating continued research and innovation in therapeutic strategies. The societal and developmental dimensions underpinning BID necessitate a broader approach, incorporating public awareness and preventive measures, especially targeted at adolescents. This continued exploration is vital for a deeper understanding and more effective addressing of body image disturbance across various contexts.

Furthermore, advancing scientific research, particularly in understanding how egocentric and allocentric representations of the body interact with each other, holds the potential for valuable insights into the comprehension and treatment of BID. Egocentric representations, centered around motor functions, are presumably linked to the parieto-premotor circuits. These are crucial for direct, movement-related perceptions and interactions with the environment. In contrast, allocentric representations of the body and bodily memories in allocentric format reflect the activity of grid and place cells in the hippocampus and entorhinal cortex, playing a significant role in spatial navigation and memory.

Therefore, exploring the interplay between these two types of representations could unravel new dimensions of how individuals with BID perceive and interact with their bodies and surroundings. This understanding could lead to more targeted and effective interventions,

blending cognitive, perceptual, and motor aspects of body image, and could potentially offer new avenues for treatment, combining neurophysiological insights with psychological and behavioral approaches. In this pursuit, the field of BID research stands at the frontier of integrating neuroscience with mental health, offering a promising path for future developments.

Limitations

In the present work of synthesis on Body Image Disturbance (BID) in eating disorders, we must acknowledge several critical limitations that influence the scope and depth of our understanding.

Lack of a Clear and Shared Definition

A primary challenge in BID research is the absence of a universally accepted definition. This lack complicates the analysis of literature and differentiating body dissatisfaction from body image disturbance. A more precise definition, as proposed by researchers like Artoni et al.,^[14] could significantly contribute to distinguishing these two aspects more clearly, aiding accurate categorization of research findings and the development of targeted interventions.

Challenges in Studying Perceptual Disturbance

BID, by its nature, involves perceptual disturbances that are intrinsically subjective. Current research tools and methodologies often capture only a portion of this subjective phenomenon. The perceptual component of body image is multifaceted, involving not just visual and attitudinal aspects but also tactile, proprioceptive, and interoceptive elements. This complexity necessitates the development of more sophisticated and nuanced tools that can fully capture the breadth of perceptual disturbances in BID as suggested by Gadsby.^[15]

Neurophysiological Understanding

One key limitation in this domain is our incomplete knowledge of the neurophysiological basis for body representation. It is presumed that egocentric representations, which are vital for movement, are linked to visuo-motor transformations and the circuits within the parieto-premotor regions.^[21] Additionally, the formation of body memories from an allocentric point of view probably involves grid and place cells located in the hippocampal gyrus and the entorhinal cortex.^[22] However, the precise manner in which these

egocentric and allocentric representations interact remains unclear. This gap in understanding is partly due to the lack of data on non-human primates, marking it as an entirely unexplored area in basic research. This uncertainty underscores a significant limitation in our current understanding of how body representation processes operate at a neurophysiological level.

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