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Review

The revolting body: Self-disgust as a key factor in anorexia nervosa

Klaske A. Glashouwer^{1,2} and Peter J. de Jong¹

Abstract

In this article, we present a theoretical model that points to disgust-induced avoidance as a mechanism that can help explain the persistent and excessive food restriction in individuals with anorexia nervosa (AN). Disgust is characterized by intense negative feelings of revulsion and an overwhelming and irresistible urge to avoid potential disgust elicitors. When eating, or even the prospect of eating, elicits overwhelming feelings of disgust in individuals with AN, this could explain why food restriction persists even when someone is in a state of starvation. Following this model, disgust is elicited by the expected impact of food on the own body ("becoming fat") resulting in body-related self-disgust. We argue that limiting food intake may serve to avoid self-disgust. This implies that when self-disgust remains unchanged after treatment of AN, residual levels of self-disgust after treatment could make individuals vulnerable to relapse.

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Keywords

Anorexia nervosa, Self-disgust, Theoretical model, Prolonged exposure.

When I eat ... I feel sick and guilty. . . . I feel that I'm filled up.

My body is filled. I just feel ... disgusting. I feel totally ... I feel that

the food invades everything. . . .It's a disgusting feeling of gluttony.

I feel so much better when I don't eat.

(Statement of individual with anorexia nervosa from Ref. [16])

Anorexia nervosa (AN) is a life-threatening eating disorder affecting around 1–4% of women during their lifetime (e.g., Ref. [27]). It involves a high psychological, social, and economic impact for patients, their family, as well as society in general (e.g. Ref. [48]). Almost half of individuals with AN do not improve after treatment, and even after initial successful treatment, the relapse rate is high [4,6,34,53]. One of the most distinct and disabling features of AN is excessive food restriction, resulting in significant weight loss [2]. A crucial, but so far unsolved, question is how do individuals with AN succeed in persisting with their rigorous restriction of food? How do they succeed in restricting their food intake where common dieters typically fail?

Many existing models stress the role of interpersonal difficulties in the onset and maintenance of AN, expressing itself in an increased sensitivity to interpersonal rejection and related emotions and cognitions, such as shame, guilt, social anxiety, and low self-esteem (e.g., Refs. [17,33,49]). Eating disorder behaviors are thought to function as a way to cope with these negative emotions and prevent the rejection of others. Also, food restriction is thought to be negatively reinforced by avoiding weight gain to prevent social judgments and rejection, the loss of the thin ideal and controlled behavior as important determinants of self-concept, and/or uncontrollable weight gain (cf., [35]). In addition, positive reinforcement such as receiving compliments and feelings of personal accomplishment might also contribute to the continuation of food restriction (e.g., Ref. [54]). Although such positive and negative reinforcers might indeed be involved in the onset of dieting, once individuals are in a state of starvation, the focus on food and the drive to eat become exceptionally strong (e.g., Ref. [28]). It is not directly evident, therefore, how the prospect of social rejection or self-concept violation in the future could have such an impact that it opposes the strong biological urge to eat in the present, outside of social contexts, meal after meal. In an attempt to solve this critical puzzle, we present a theoretical model that takes a different perspective and focuses on disgust in the prospect of food intake, proposing that the power of disgust has the potential

to overrule the biological urge to eat and drive the restriction of food [46].

Avoiding aversive feelings of disgust

During the last two decades, several researchers have started to link disgust and disgust-related mechanisms to AN [13,18,23,32,50]. Disgust is such an intense aversive feeling that it not only results in a strong urge to escape situations that elicit disgust but also drives the avoidance of potential disgust elicitors to prevent future negative experiences [46]. Both escape and avoidance behaviors are negatively reinforced by the direct decrease or prevention of disgust. Moreover, once something has acquired disgusting properties, it becomes intrinsically revolting and difficult to change with rational arguments (“cognitive impenetrable”). This makes disgust highly robust to corrective information [39]. This critical feature of disgust makes sense considering its evolutionary role in preventing infection from pathogens that are omnipresent but invisible to the naked eye [38,51]. When it comes to life or death, it is “better to be safe than sorry”. However, in the context of AN, this inherent power of disgust might have a paradoxical effect: when eating, or even the prospect of eating, elicits overwhelming feelings of disgust in individuals with AN, this could explain why food restriction persists even when someone is in a state of starvation. Although the idea that avoidance is an important factor in the maintenance of AN is not new, we propose that disgust as a driving force behind these behaviors could add to the understanding of the persistence of (food) restriction, and provide fresh starting points for treatment.

Origins of disgust in anorexia nervosa

Disgust not only has an important function in avoiding potential contaminants (*pathogen disgust*) to safeguard the physical integrity of the individual but also in avoiding socio-moral transgressions (*moral disgust*) as a means to maintain the integrity of the social group [47]. Moral transgressions elicit disgust [10] and also when individuals are asked to transgress their own internalized sociomoral rules, they were shown to experience feelings of disgust [44]. Such instances of moral disgust are thought to help individuals stay of the wrong track and prevent exclusion from the social group [51].

Rules about which physical characteristics are “good” and which are “bad” are omnipresent in our social environment. Under the influence of certain personality characteristics some people may strongly internalize these rules. Punishment sensitivity which has been consistently linked to AN (e.g., Ref. [21]) might contribute to stronger internalization of sociomoral rules which helps to prevent punishment such as interpersonal rejection [49]. Other personality

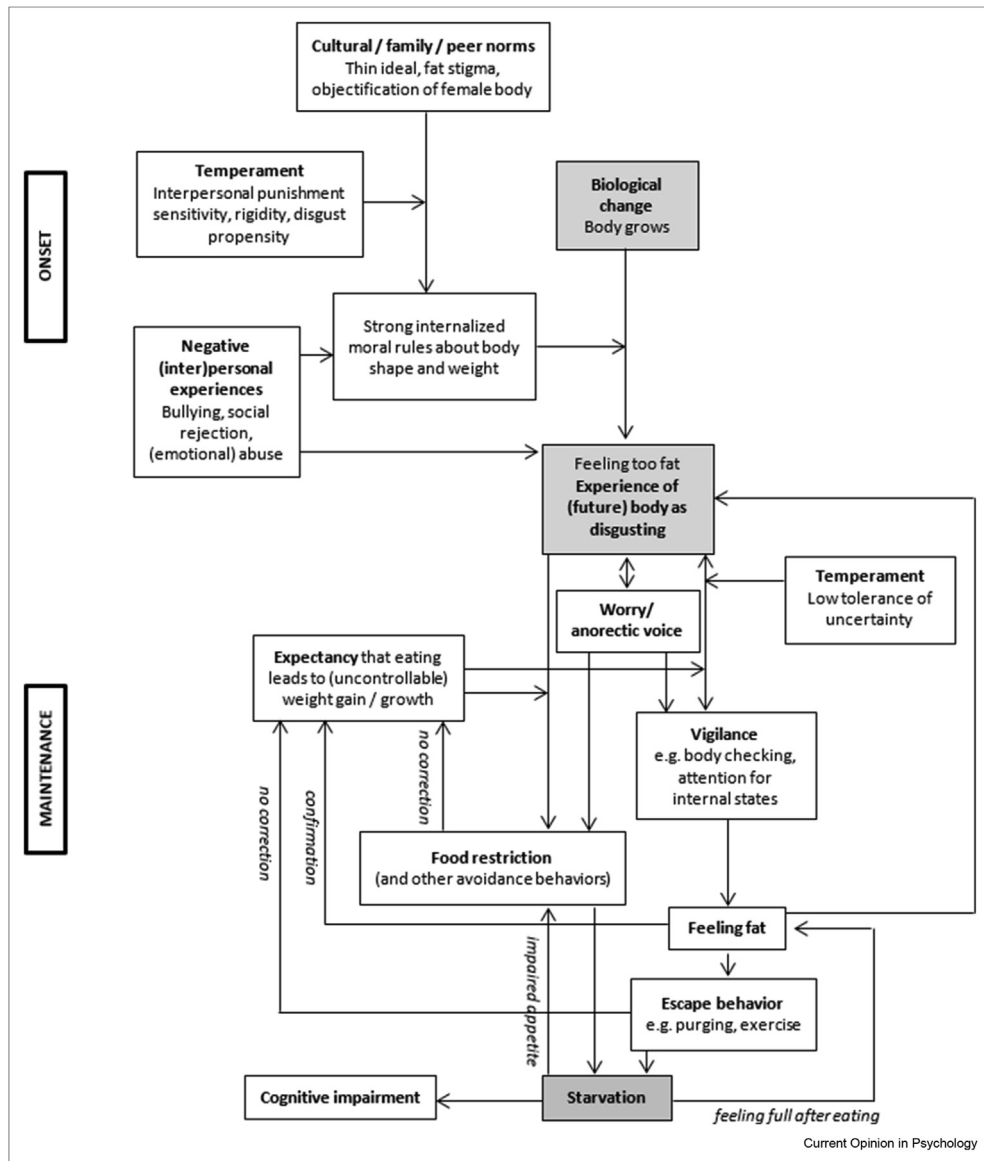
characteristics associated with AN are rigidity and disgust propensity, that is, the tendency to experience disgust quickly [1]. Also, these characteristics might facilitate the detection and internalization of moral rules (e.g., Ref. [24]). The transgression of these rules by others or by oneself (“I am too fat”) can result in disgust (cf [5]). So, when one’s appearance does not match internalized moral rules regarding shape and weight, confrontation with the own body can elicit self-disgust (cf [11,42]). Since adolescence is a period of great physical change and bodily growth, this helps explain why the onset of AN typically takes place during this developmental phase [25]. In addition, negative life events can contribute to the internalization of moral rules about weight and shape but also directly to self-disgust. In particular, negative interpersonal experiences such as bullying, social rejection, emotional neglect, or sexual abuse could lead to feelings of body-related self-disgust (cf [30]).

Self-disgust as the motor of food restriction

We recently developed a theoretical model incorporating key mechanisms of existing theories and described how body-related self-disgust can play a central role in the onset and maintenance of AN (see Figure 1; cf [19]). Individuals with AN typically engage in several avoidance behaviors, such as hiding their body in wide clothing, not touching their body, or taking a shower with the lights turned off [37]. Following this model, these avoidance behaviors might function as a way to decrease or prevent intense and overwhelming feelings of revulsion that are automatically elicited by the confrontation with their body. From this perspective, food restriction also serves the avoidance of self-disgust by preventing appalling changes in body size. The stronger the expectancy that eating food leads to an increase in shape/weight, the stronger the avoidance of food [31,52]. Via evaluative learning, food can even acquire disgust-eliciting properties itself and become intrinsically revolting (e.g., Ref. [14]). The core of this model is the assumption that the link between self-disgust and food restriction over time can lead to starvation. Once in a state of starvation, biological processes arise that further contribute to the development of a vicious circle, such as decreased appetite and feelings of fullness after eating which can be interpreted as being too fat. Finally, starvation can lead to general cognitive impairment, such as slowed thinking, impaired short-term memory, decreased cognitive flexibility, and concentration problems (e.g., Ref. [22]). As a result, reasoning becomes more difficult and rigid black-and-white thinking increases.

In addition, vigilance toward potential rule violation is expected to increase, for example, by repeatedly checking the body after eating or by focusing on internal states that could indicate being or becoming fat [37].

Figure 1



Theoretical model with self-disgust as a key factor in anorexia nervosa.

These behaviors likely lower the threshold for someone to “feel fat”. Feeling fat could then directly fuel self-disgust feelings and might work as a confirmation of the expectation that eating leads to weight gain. In addition, feeling fat can lead to escape, for instance by purging or compulsive exercise. Such escape behaviors again prevent the occurrence of expectancy violating experiences and prevent the correction of the expectation *if eating, then weight gain* (“I did not gain weight, because I compensated after eating”). There is some empirical evidence that checking behaviors indeed are followed by an increase in negative emotions (e.g., Ref. [29]).

Finally, we incorporated two additional phenomena in the model that are often linked to AN. The first phenomenon is low tolerance of uncertainty [7]. Individuals who have difficulty tolerating uncertainty are expected to show a stronger urge to check their body to detect potential signals of rule violation. The second phenomenon is the so-called *anorectic voice* referring to critical self-talk in the form of comments on the own eating, weight, and shape and instructions to restrict or compensate (e.g., Ref. [43]). Self-disgust could strengthen the anorectic voice as well as rumination and both could “fire back” to self-disgust and fuel avoidance/vigilance behaviors.

Empirical evidence

Despite some theoretical attention to disgust in AN, empirical evidence regarding self-disgust in individuals with AN is scarce. Individuals with AN reported repulsive intrusive imagery of their own body [26] and higher self-disgust on a questionnaire than individuals without an eating disorder [3]. Qualitative findings indicate that self-disgust is linked to avoidance behaviors in AN [8,16]. Individuals with AN reported that they try to avoid feelings of disgust by avoiding food- and body-related situations [16], and that they are afraid of feeling disgusted or being perceived as disgusting by others when eating [8].

Future directions

Investigation of the proposed model starts with systematically testing the core assumption that body-related self-disgust leads to food restriction. Individuals with and without AN could be compared in their body-related self-disgust not only using self-report measures, but also physiological/behavioral indices to gauge difficulties that participants may have in distinguishing between emotions and to avoid demand characteristics [36]. Importantly, it should be taken into account that many individuals with AN might be quite successful in avoiding feelings of self-disgust. In addition, when self-disgust is driven by the anticipated appalling consequences of food ingestion on weight and shape, exposure to the current body might not elicit disgust. Virtual reality provides a unique opportunity to expose patients with AN to healthy or even overweight versions of their body and compare their disgust responses to individuals without AN. In addition, it is important to establish whether self-disgust prospectively predicts food restriction in AN, for instance by testing whether self-disgust levels after treatment predict relapse.

To investigate whether self-disgust is indeed a critical causal factor in the persistence of food restriction in AN (and not for example fear or shame), it would be important to test whether the modification self-disgust leads to a decrease in food restriction. An important strategy to reduce disgust is prolonged exposure. Prolonged exposure is based on the notion that, in contrast to anxiety and fear (e.g., Ref. [12]), expectancies are not considered to play a prominent role in eliciting disgust. Instead, disgusting stimuli are considered to be inherently disgusting. Therefore, habituation instead of expectancy violation is the critical target of prolonged exposure as a procedure to reduce disgust [15,46]. For instance, individuals whose works such as cleaning toilets and cutting dead bodies force them to have close contact with disgust elicitors tend to become neutral toward these stimuli after repeated exposure (cf [45]). Because disgust is thought to be elicited by the expected impact of food on the own

body (“becoming fat”), prolonged exposure to the own body seems to be a promising approach to stop food restriction via decreasing body-related self-disgust, in particular to body parts that most strongly elicit disgust. Again, virtual reality could be applied to expose patients with AN for a prolonged period to healthy or even overweight versions of their body (e.g., Refs. [40,41]). Although the actual impact of body exposure on self-disgust is still unknown, several studies have demonstrated positive effects of body exposure on body satisfaction in individuals with eating disorders (e.g., Ref. [20]).

The proposed model was specifically developed to address the critical question of how individuals with AN succeed in persisting with their rigorous restriction of food. Considering the great overlap between different eating disorder classifications [18] and the frequent diagnostic cross-over between disorders [9], this raises the question how disgust is involved in other eating and feeding disorders. The critical distinction between AN and bulimia nervosa (BN) is the weight level related to “success” in food restriction. It could be that in BN, the competition between the drive to eat and the drive to avoid self-disgust (often) results in favor of the drive to eat. One explanation could be that the drive to eat is still intact or simply stronger in individuals with BN than in individuals with AN which makes it difficult to keep dieting and leads to binge eating episodes. Self-disgust nevertheless might still fuel escape behaviors such as purging and exercise. Alternatively, it could be that self-disgust levels are lower in BN than in AN, or have decreased over time due to exposure to a healthy body (e.g., in treatment). In addition, the relative importance of body shape/weight-related sociomoral rules as basis for self-evaluation might decrease as people age and could lead to a decrease in self-disgust. The latter would be in line with the observation that the onset of AN typically takes place in a younger age group than the onset of BN, and with the phenomenon that more individuals with AN develop BN than the other way around [9].

Conclusion

Current treatments for AN already address many relevant factors incorporated in the current model, which might explain their partial effectiveness. However, when self-disgust indeed is a key factor in the maintenance of food restriction, residual levels of self-disgust after treatment could make individuals vulnerable to relapse. Because treatments currently do not specifically address self-disgust, this could explain why the effectiveness is often limited on the long term. Therefore, it seems worthwhile to investigate whether body-related self-

disgust indeed is a crucial treatment target for AN and whether reduction of self-disgust can further improve the effectiveness of current treatment approaches.

Conflict of interest statement

Nothing declared.

References

Papers of particular interest, published within the period of review, have been highlighted as:

* of special interest

- Aharoni R, Hertz MM: **Disgust sensitivity and anorexia nervosa**. *Eur Eat Disord Rev* 2012, **20**:106–110, <https://doi.org/10.1002/erv.1124>.
- American Psychiatric Association: *Diagnostic and statistical manual of mental disorders*. 5th ed. Arlington, VA: American Psychiatric Publishing; 2013.
- Bell K, Coulthard H, Wildbur D: **Self-disgust within eating disordered groups: associations with anxiety, disgust sensitivity and sensory processing**. *Eur Eat Disord Rev* 2017, **25**:373–380, <https://doi.org/10.1002/erv.2529>.
- Berends T, Boonstra N, van Elburg A: **Relapse in anorexia nervosa: a systematic review and meta-analysis**. *Curr Opin Psychiatr* 2018, <https://doi.org/10.1097/YCO.0000000000000453>.
- Borg C, de Jong PJ, Weijmar Schultz W: **Vaginismus and dyspareunia: relationship with general and sex-related moral standards**. *J Sex Med* 2011, **8**:223–231, <https://doi.org/10.1111/j.1743-6109.2010.02080.x>.
- Brockmeyer T, Friederich H, Schmidt U: **Advances in the treatment of anorexia nervosa: a review of established and emerging interventions**. *Psychol Med* 2018, **48**:1228–1256, <https://doi.org/10.1017/S0033291717002604>.
- Brown M, Robinson L, Campione GC, Wuensch K, Hildebrandt T, Micali N: **Intolerance of uncertainty in eating disorders: a systematic review and meta-analysis**. *Eur Eat Disord Rev* 2017, **25**:329–343, <https://doi.org/10.1002/erv.2523>.
- Cardi V, Leppanen J, Mataix-Cols D, Campbell IC, Treasure J: **A case series to investigate food-related fear learning and extinction using in vivo food exposure in anorexia nervosa: a clinical application of the inhibitory learning framework**. *Eur Eat Disord Rev* 2018, **27**:173–181, <https://doi.org/10.1002/erv.2639>.
- Castellini G, Lo Sauro C, Mannucci E, Ravalidi C, Rotella CM, Faravelli C, Ricca V: **Diagnostic crossover and outcome predictors in eating disorders according to DSM-IV and DSM-V proposed criteria: a 6-year follow-up study**. *Psychosom Med* 2011, **73**:270–279, <https://doi.org/10.1097/PSY.0b013e31820a1838>.
- Chapman HA, Anderson AK: **Things rank and gross in nature: a review and synthesis of moral disgust**. *Psychol Bull* 2013, **139**:300–327, <https://doi.org/10.1037/a0030964>.
- Clarke A, Simpson J, Varese F: **A systematic review of the clinical utility of the concept of self-disgust**. *Clin Psychol Psychother* 2018, **26**:110–134, <https://doi.org/10.1002/cpp.2335>.
- Craske MG, Treanor M, Conway CC, Zbozinek T, Vervliet B: **Maximizing exposure therapy: an inhibitory learning approach**. *Behav Res Ther* 2014, **58**:10–23, <https://doi.org/10.1016/j.brat.2014.04.006>.
- Davey GCL, Buckland G, Tantow B, Dallos R: **Disgust and eating disorders**. *Eur Eat Disord Rev* 1998, **6**:201–211, <https://doi.org/10.1002/erv.2373>.
- De Houwer J, Thomas S, Baeyens F: **Association learning of likes and dislikes: a review of 25 years of research on human evaluative conditioning**. *Psychol Bull* 2001, **127**:853–869, <https://doi.org/10.1037/0033-2909.127.6.853>.
- de Jong PJ: **Learning mechanisms in the acquisition of disgust**. In *Changing emotions*. Edited by Hermans D, Rimé B, Mesquita B, London: Psychology Press; 2013:74–80.
- Espelet EMS, Gulliksen KS, Nordbø RHS, Skårderud F, Holte A: **The link between negative emotions and eating disorder behaviour in patients with anorexia nervosa**. *Eur Eat Disord Rev* 2012, **20**:451–460, <https://doi.org/10.1002/erv.2183>.
In this qualitative study patients with AN are interviewed in depth about their emotional experiences and how they think these are linked to their eating disorder behaviors.
- Fairburn CG, Cooper Z, Shafran R: **Cognitive behaviour therapy for eating disorders: a transdiagnostic theory and treatment**. *Behav Res Ther* 2003, **41**:509–528.
- Fox JRE, Smithson E, Baillie S, Ferreira N, Mayr I, Power MJ: **Emotion coupling and regulation in anorexia nervosa**. *Clin Psychol Psychother* 2013, **20**:319–333, <https://doi.org/10.1002/cpp.1823>.
- Glashouwer KA, de Jong PJ: **Walging als de motor achter voedselrestrictie in anorexia nervosa**. *Gedragstherapie* 2020, **3**:174–186.
- Griffen TC, Naumann E, Hildebrandt T: **Mirror exposure therapy for body image disturbances and eating disorders: a review**. *Clin Psychol Rev* 2018, **65**:163–174.
- Harrison A, O'Brien N, Lopez C, Treasure J: **Sensitivity to reward and punishment in eating disorders**. *Psychiatr Res* 2010, **177**:1–11.
- Hatch A, Madden S, Kohn M, Clarke S, Touyz S, Williams LM: **Anorexia nervosa: towards an integrative neuroscience model**. *Eur Eat Disord Rev* 2010, **18**:165–179.
- Hildebrandt T, Grotzinger A, Reddan M, Greif R, Levy I, Goodman W, Schiller D: **Testing the disgust conditioning theory of food-avoidance in adolescents with recent onset anorexia nervosa**. *Behav Res Ther* 2015, **71**:131–138, <https://doi.org/10.1016/j.brat.2015.06.008>.
- Inbar Y, Pizarro D, Iyer R, Haidt J: **Disgust sensitivity, political conservatism, and voting**. *Social Psychological and Personality Science* 2012, **3**:537–544.
- Javaras KN, Runfola CD, Thornton LM, Agerbo E, Birgegard A, Norring C, Bulik CM: **Sex- and age-specific incidence of healthcare-register-recorded eating disorders in the complete Swedish 1979–2001 birth cohort**. *Int J Eat Disord* 2015, **48**:1070–1081, <https://doi.org/10.1002/eat.22467>.
- Kadriu F, Claes L, Wittman C, Norré J, Vrieze E, Krans J: **Characteristics and content of intrusive images in patients with eating disorders**. *Eur Eat Disord Rev* 2019, **27**:495–506, <https://doi.org/10.1002/erv.2671>.
- Keski-Rahkonen A, Mustelin L: **Epidemiology of eating disorders in Europe: prevalence, incidence, comorbidity, course, consequences, and risk factors**. *Curr Opin Psychiatr* 2016, **29**:340–345, <https://doi.org/10.1097/YCO.0000000000000278>.
- Keys A, Brozek J, Henschel A, Mickelsen O, Taylor HL: *The biology of human starvation*. Minneapolis: University of Minnesota Press; 1950.
- Kraus N, Lindenberg J, Zeeck A, Kosfelder J, Vocks S: **Immediate effects of body checking behaviour on negative and positive emotions in women with eating disorders: an ecological momentary assessment approach**. *Eur Eat Disord Rev* 2015, **23**:399–407, <https://doi.org/10.1002/erv.2380>.
- Lenk M, Ritschel G, Abele M, Roever P, Schellong J, Joraschky P, Croy I: **The source effect as a natural function of disgust in interpersonal context and its impairment in mental disorders**. *Sci Rep* 2019, **9**:4239, <https://doi.org/10.1038/s41598-019-40802-4>.
- Milos G, Baur V, Schumacher S, Kuenzli C, Schnyder U, Mueller-Pfeiffer C, Martin-Soelch C: **How fat will it make me? Estimation of weight gain in anorexia nervosa**. *Appetite* 2017, **114**:368–373, <https://doi.org/10.1016/j.appet.2017.04.002>.
- Moncrieff-Boyd J, Byrne S, Nunn K: **Disgust and anorexia nervosa: confusion between self and non-self**. *Advances in*

- Eating Disorders: Theory, Research and Practice* 2013, **2**:4–18, <https://doi.org/10.1080/21662630.2013.820376>.
33. Munro C, Randell L, Lawrie SM: **An integrative bio-psycho-social theory of anorexia nervosa.** *Clin Psychol Psychother* 2017, **24**:1–21, <https://doi.org/10.1002/cpp.2047>.
 34. Murray SB, Quintana DS, Loeb KL, Griffiths S, Le Grange D: **Treatment outcomes for anorexia nervosa: a systematic review and meta-analysis of randomized controlled trials.** *Psychol Med* 2018, **49**:535–544, <https://doi.org/10.1017/S0033291718002088>.
 35. Murray SB, Treanor M, Liao B, Loeb KL, Griffiths S, Le Grange D: **Extinction theory & anorexia nervosa: deepening therapeutic mechanisms.** *Behav Res Ther* 2016, **87**:1–10, <https://doi.org/10.1016/j.brat.2016.08.017>.
 36. Nabi RL: **The theoretical versus the lay meaning of disgust: implications for emotion research.** *Cognit Emot* 2002, **16**:695–703, <https://doi.org/10.1080/02699930143000437>.
 37. Nikodijevic A, Buck K, Fuller-Tyszkiewicz M, de Paoli T, Krug I: **Body checking and body avoidance in eating disorders: systematic review and meta-analysis.** *Eur Eat Disord Rev* 2018, **26**:159–185, <https://doi.org/10.1002/erv.2585>.
 38. Oaten M, Stevenson RJ, Case TI: **Disgust as a disease-avoidance mechanism.** *Psychol Bull* 2009, **135**:303–321, <https://doi.org/10.1037/a0014823>.
 39. Olatunji BO, Forsyth JP, Cherian A: **Evaluative differential conditioning of disgust: a sticky form of relational learning that is resistant to extinction.** *J Anxiety Disord* 2007, **21**:820–834, <https://doi.org/10.1016/j.janxdis.2006.11.004>.
 40. Porras-García B, Ferrer-García M, Serrano-Troncoso E, Carulla-Roig M, Soto-Usera P, Miquel-Nabau H, Olivares L, Marnet-Fiol R, Santos-Carrasco IM, Borszewski B, Díaz-Marsá M, Sánchez-Díaz I, Fernández-Aranda F, Gutiérrez-Maldonado J: **AN-VR-BE. A randomized controlled trial for reducing fear of gaining weight and other eating disorder symptoms in anorexia nervosa through virtual reality-based body exposure.** *J Clin Med* 2021, **10**:682, <https://doi.org/10.3390/jcm10040682>.
 41. Porras-García B, Serrano-Troncoso E, Carulla-Roig M, Soto-Usera P, Ferrer-García M, Figueras-Puigderrajols N, Yilmaz L, Onur Sen Y, Shojaeian N, Gutiérrez-Maldonado J: **Virtual reality body exposure therapy for anorexia nervosa. A case report with follow-up results.** *Front Psychol* 2020, **11**:956, <https://doi.org/10.3389/fpsyg.2020.00956>.
- This study is the first application of prolonged exposure to current and healthy weight versions of the own body via virtual reality in a patient with AN.
42. Powell PA, Simpson J, Overton PG: **An introduction to the revolting self: self-disgust as an emotion schema.** In *The revolting self: perspectives on the psychological, social, and clinical implications of self-directed disgust*. Edited by Powell PA, Simpson J, Overton PG, London: Karnac; 2015:1–24.
- In this book the phenomenon of self-directed disgust is thoroughly discussed and the role of self-disgust is examined in relation to psychological experiences, psychopathology, and physical health.
43. Pugh M, Waller G: **Understanding the ‘anorexic voice’ in anorexia nervosa.** *Clin Psychol Psychother* 2017, **24**:670–676, <https://doi.org/10.1002/cpp.2034>.
 44. Rachman S, Radosky AS, Elliott CM, Zysk E: **Mental contamination: the perpetrator effect.** *J Behav Ther Exp Psychiatr* 2012, **43**:587–593.
 45. Rozin P: **Hedonic “adaptation”: specific habituation to disgust/death elicitors as a result of dissecting a cadaver.** *Judgment and Decision Making* 2008, **3**:191–194.
 46. Rozin P, Fallon AE: **A perspective on disgust.** *Psychol Rev* 1987, **94**:23–41, <https://doi.org/10.1037/0033-295X.94.1.23>.
 47. Rozin P, Haidt J, McCauley CR: **Disgust: the body and soul emotion in the 21st century.** In *Disgust and its disorders*. Edited by Olatunji BO, McKay D, Washington, D.C.: American Psychological Association; 2008:9–29.
 48. Stuhldreher N, Konnopka A, Wild B, Herzog W, Zipfel S, Löwe B, König HH: **Cost-of-illness studies and cost-effectiveness analyses in eating disorders: a systematic review.** *Int J Eat Disord* 2012, **45**:476–491, <https://doi.org/10.1002/eat.20977>.
 49. Treasure J, Willmott D, Ambwani S, Cardi V, Bryan DC, Rowlands K, Schmidt U: **Cognitive interpersonal model for anorexia nervosa revisited: the perpetuating factors that contribute to the development of the severe and enduring illness.** *J Clin Med* 2020, **9**:630, <https://doi.org/10.3390/jcm9030630>.
 50. Troop N, Baker A: **Food, body, and soul: the role of disgust in eating disorders.** In *Disgust and its disorders: theory, assessment, and treatment implications*. Edited by Olatunji B, McKay D, Washington DC: American Psychological Association; 2009:229–251, <https://doi.org/10.1037/11856-011>.
- This chapter gives a comprehensive overview of how disgust might be involved in eating disorders.
51. Tybur JM, Lieberman D, Kurzban R, DeScioli P: **Disgust: evolved function and structure.** *Psychol Rev* 2013, **120**:65–84, <https://doi.org/10.1037/a0030778>.
 52. Waller G, Mountford VA: **Weighing patients within cognitive-behavioural therapy for eating disorders: how, when and why.** *Behav Res Ther* 2015, **70**:1–10, <https://doi.org/10.1016/j.brat.2015.04.004>.
 53. Zipfel S, Giel KE, Bulik CM, Hay P, Schmidt U: **Anorexia nervosa: aetiology, assessment, and treatment.** *The Lancet Psychiatry* 2015, **2**:1099–1111, [https://doi.org/10.1016/S2215-0366\(15\)00356-9](https://doi.org/10.1016/S2215-0366(15)00356-9).
 54. Walsh BT: **The enigmatic persistence of anorexia nervosa.** *Am J Psychiatr* 2013, **170**(5):477–484, <https://doi.org/10.1176/appi.ajp.2012.12081074>.