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Applying the disgust conditioning model of food avoidance: A case study of acceptance-based interoceptive exposure

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Abstract

Objective: The current case report details the treatment of a 16-year-old adolescent with anorexia nervosa utilizing a novel adjunct, acceptance-based interoceptive exposure, prior to family-based treatment (FBT) for eating disorders.

Method: The exposure-based module focused particularly on the tolerance of disgust. For six sessions, the clinician taught the client skills that could be used to tolerate distress to visceral sensations associated with disgust. These skills were to be used during in- and between-session exposures. Each session included exposure to physical sensations that occurred while drinking a milkshake.

Results: Across six sessions, the client reported improvement in symptoms in addition to gaining weight. Additionally, she consumed more calories of a test meal following the intervention. Within broader FBT, the client reached an established weight goal, was able to return to physical activity, and reported an increased ability to manage distress.

Discussion: Given the client's improvement on the Eating Disorders Examination-Questionnaire (EDE-Q) within six sessions, we believe IE may be a useful adjunct to FBT. Interoceptive exposure may augment the efficacy of FBT for anorexia nervosa as it provides clients with skills to utilize during the refeeding phase of treatment.

Keywords

acceptance-based behavior therapy; adolescent; food avoidance; interoceptive exposure; low-weight-eating disorder; restrictive eating disorder

1 | INTRODUCTION

Anorexia nervosa (AN) is a serious psychiatric disorder with high rates of morbidity and mortality (e.g., Fichter & Quadflieg, 1999). Family-based therapy (FBT) is evidence-based

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CONFLICT OF INTEREST

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for the treatment of adolescents with AN (Forsberg & Lock, 2015); however, remission rates at 1 year (e.g., 40.7%; Agras et al., 2014) suggest that not all patients achieve sustained treatment benefits. This clinical case report describes an example of novel therapeutic content that expands existing empirically supported family interventions using data from the neuroscience of learning in AN.

Characteristic features of AN include a relentless pursuit of thinness and intense fear of weight gain despite significantly low body weight (Walsh, 2013). Within broader low-weight-eating disorders (LW-EDs) which also include avoidant/restrictive food intake disorder, pathological food avoidance is the central clinical feature, and may result from deficits in learning. Adolescents with AN demonstrate impaired reversal learning (i.e., an inability to extinguish learned associations; Hildebrandt et al., 2015) and engender higher prefrontal activity than healthy controls during reversal tasks (Hildebrandt et al., 2018). Impaired reversal of food associations could explain why dieting (i.e., associations of calorie-dense food with an aversive threat state) becomes a chronic, pathological pattern. Stimuli signaling information about food (e.g., eating environments) and eating itself become associated with aversive sensations (e.g., pressure in stomach) often labeled as feeling “fat” or “gross.” Other stimuli (e.g., dieting tips, exercise cues, etc.) are paired with “safety” or absence of aversive sensations (e.g., empty stomach).

When weight loss becomes unhealthy, it should be possible to reverse these associations to promote consumption of higher density food and avoid the threat of malnutrition. Adolescents with LW-EDs do not demonstrate this adaptation, and we hypothesize that these individuals experience a disgust response to palatable food in addition to fear of gaining weight via eating. Such disgust aversion may be more resistant to extinction than fear (Olatunji, Forsyth, & Cherian, 2007). Additionally, individuals with EDs report higher levels of disgust surrounding situations involving food and the body (Troop, Treasure, & Serpell, 2002), implicating disgust as a unique treatment target that may require distinct intervention. Altered neuronal responses in the insula-amygdala-ventral striatum (IAVS) neurocircuitry common to threat processing and reward/aversive learning may underlie observable food avoidance within LW-EDs (Kaye, 2008). This IAVS sub-network assigns valence and communicates salient sensory information to prefrontal regions involved in decision-making, and contains key nodes known to be dysregulated in LW-EDs (Hildebrandt et al., 2015).

2 | AUGMENTING INTEROCEPTIVE EXPOSURE FOR AN

Interoceptive Exposure (IE) has been tested in a range of conditions (e.g., panic disorder, irritable bowel syndrome; Craske et al., 2011; Craske, Rowe, Lewin, & Noriega-Dimitri, 1997) and involves exposure to uncomfortable bodily sensations, identifying problematic cognitions elicited by sensations, and sustaining sensations without avoidance or distraction. Theoretically, IE targets the IAVS sub-network to extinguish learned associations characterized by visceral sensitivity and may be used as a larger exposure-based approach to FBT (Hildebrandt, Bacow, Greif, & Flores, 2014; Thomas et al., 2017). However, given disgusts’ unique resistance to extinction within LW-EDs, we incorporated acceptance-based skills (e.g., willingness to tolerate discomfort) during exposures to help

clients tolerate distress generated by disgust-based exposures. This intervention, acceptance-based interoceptive exposure (ABIE), challenges individuals to increase fear, worry, and disgust surrounding food and utilize skills to withstand distress generated by visceral sensations associated with disgust (e.g., pressure in stomach, nausea). ABIE targets associative mechanisms by increasing one's ability to withstand visceral, interoceptive sensations associated with eating and through counter-conditioning to these visceral cues via explicit pairing of positive experiences with feeding in order to increase appetitive response to food. Research demonstrates that although threat expectancy is often lower after extinction, individuals may still evaluate the unconditioned stimulus (i.e., food) negatively (e.g., Kang, Vervliet, Engelhard, van Dis, & Hagenaars, 2018) or in this case, experience disgust. Thus, each session, patients learn skills for tolerating versus mitigating uncomfortable sensations which is paired with a positive stimulus in order to address more persistent negative evaluation of the experience of eating. The purpose of counter-conditioning is not to distract from physical sensations, but rather add a positive valence to the experience of eating which may remain negative despite decreased fear of eating food.

3 | ABIE STRUCTURE

ABIE targets learned associations characterized by visceral sensitivity through in-session exposure to physical sensations and disgust, skills to manage feelings and physical discomfort elicited by eating, and counter-conditioning of the food (see Table 2). At all sessions, clients drink a milkshake made with ingredients unknown to the client and family and are assigned the task of engaging in a pleasurable activity or providing explicitly positive experiences during meals at home (e.g., playing favorite music). At-home practice should be increasingly challenging, and skills build weekly to produce a comprehensive toolkit for naturalistic eating. All sessions include a review of homework and collection of the client's weight. ABIE was placed at the beginning of treatment in order to reduce treatment contamination within our randomized clinical trial.

4 | CLIENT CHARACTERISTICS AND RATIONALE FOR TREATMENT

We utilized ABIE in the treatment of a 16-year-old female with a 6-month history of restrictive eating and a DSM-5 diagnosis of AN, restricting subtype. A 15-pound weight loss had resulted in a body mass index on the 1.97th percentile (71.8% of ideal body weight; see also Table 1). She endorsed shape and weight concerns and fear of gaining weight, which were reportedly exacerbated by increasing academic-related stress over the prior year. The client's parents recalled that she had switched from a vegetarian to vegan diet and eliminated nearly all high-calorie food groups. Exercise and purging behaviors were denied. Treatment was provided by a doctoral-level clinician, K.F., at an outpatient ED clinic.

5 | ABIE IMPLEMENTATION

All exposures utilized a meal replacement shake made within the clinic and involved: (1) highlighting uncertainty, (2) encouraging the patient to drink until she felt visceral sensations/disgust, (3) tolerating disgust without trying to change the feeling, and (4) counter-conditioning by parents, patient, or both. Exposure lasted approximately 30 min

and occurred after the introduction of a new tolerance skill. The client was instructed to continue exposure the entire time regardless of whether or not habituation occurred. Should habituation occur, the client was instructed to make exposure more challenging for herself with the help of her parents.

Along with components listed in Table 2, familial involvement was elicited in session 1 via psychoeducation, obtaining a description of aversive somatic symptoms (e.g., fullness and bloating) to shape ABIE between sessions, parent modeling of ABIE by drinking the shake themselves, and collectively recalling experiences with disgust around eating (e.g., food poisoning). Through practice and parent modeling, the client developed the ability to describe the experience of drinking the milkshake utilizing non-evaluative language. The therapist praised the client for tolerating somatic experiences (e.g., bloating) and worked with the family to identify sensations in need of further work. As with inhibitory learning approaches to exposure (e.g., Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014), sessions focused on eliciting heightened emotional states versus within-session habituation (e.g., Lader & Mathews, 1968). At all sessions, the family was instructed to continue ABIE and engage in counter-conditioning between sessions.

5.1 | Skills aiding ABIE

Skills taught in the remaining sessions were founded on mindfulness and values-based therapies. Session 2 introduced the concept of observing and describing an experience non-judgmentally utilizing language practiced first in session via an eating exercise (Kabat-Zinn & Hanh, 2009). The family was asked to mindfully eat one raisin, placing particular attention to observing and describing this experience. ABIE was subsequently initiated for additional practice with this skill. Session 3 involved attention to internal bodily changes to increase tolerance to discomfort around eating. The family completed a two-part breathing exercise in which they focused on their breath without altering it and were subsequently challenged to restrict their breathing rate to 6-second intervals. The family then discussed tolerating versus controlling normal, moment-to-moment, internal bodily changes. We included this exercise to illustrate accepting bodily experiences during ABIE versus controlling emotional experiences.

Session 4 focused on willingness to experience discomfort (Hayes, 2005) as a tool for managing negative experiences. The therapist provided the family with examples of events where pain is chosen or endured to arrive at a valued outcome (e.g., pregnancy). Session 5 expanded upon values-based activities as skills to confront distress. Metaphorical scenarios and the client's experiences highlighted the importance of using values to endure pain and discomfort. A list of positive coping strategies was generated to pair with discomfort produced by eating by exploring activities in line with values (e.g., being proactive in friendships that are cherished) to be used during ABIE. Sessions did not extensively address values exploration as in other therapies given that weight gain is essential during refeeding but acknowledged the discomfort eating engendered in order to achieve better health.

In the final session, the therapist reviewed the client's progress in describing aversive somatic symptoms and her ability tolerate interoceptive symptoms following treatment. The therapist assessed the family's attempts at counter-conditioning to encourage further

use during refeeding. The final skill, active acceptance acknowledged current difficulties to be followed with active intention to continue living life in a values-based way despite difficulties (Hayes, 2005). The therapist presented metaphorical scenarios of active acceptance so that the client could consider values in the context of ongoing challenges with eating and incorporate this into the final exposure.

6 | OUTCOMES

Within this case, the therapist found that skills, particularly mindfulness, resonated with the client's parents. In addition to reporting reduced ED symptoms, the client's heart rate returned to normal. She was later able to reengage in an extracurricular sport stopped during the refeeding phase of treatment and adhered to healthier guidelines regarding energy exertion.

As displayed in Table 1, the client reported changes in ED symptoms and responded well to ABIE. After six sessions, her weight increased to 106 pounds and following 20 sessions of open FBT subsequent to ABIE, increased to 115 pounds, the target weight set based on her growth curves prior to AN onset. Additionally, she consumed more calories during an open meal presented to her prior to and following ABIE. To evaluate whether the client's progress demonstrated significant clinically meaningful change, we calculated reliable change indices (RCI; Jacobson & Truax, 1991) utilizing norms from a sample of adolescents with AN (Jennings & Phillips, 2017). The Global Eating Disorder Examination Questionnaire (EDE-Q) score and subscales before and after the 6 IE sessions were examined with scores above 1.96 indicating change not solely due to instrument reliability (e.g., Wise, 2004). Global EDE-Q and the Restraint, Weight Concern, and Shape Concern scales demonstrated reliable change (RCI = 9.33, 2.69, 3.32, 5.78, respectively, $P's < .05$). Eating Concern failed to reach this cutoff (RCI = 0.91).

Given that the intervention targeted tolerance of disgust, we measured global disgust sensitivity using the Disgust Scale-Revised (DSR; Olatunji, Forsyth, & Cherian, 2007; Olatunji et al., 2007), which evaluates how disgusting one finds several situations (e.g., smelling spoiled milk) in addition the likelihood of engaging with potentially disgusting situations (e.g., eating monkey meat). Global disgust increased from pre (77) to post (80), which is consistent with the aims of the intervention (i.e., increase tolerance to the experience of disgust to allow for increased feeding behavior).

7 | DISCUSSION

This report details an intervention directly targeting disgust within AN. The inclusion of ABIE within FBT affords many potential benefits, such as providing another opportunity for parents to model to their children how to cope with distressing visceral sensations and the ability to tolerate uncertainty. The inclusion of distress tolerance skills resonated well with the family and patient, potentially increasing the patient's ability to tolerate visceral discomfort from food. This is particularly important given the uncomfortable sensations that arise within the refeeding phase of treatment during which natural reinforcers do not yield positive associations and providing that contingencies are not sufficient reinforcers alone.

There are several limitations to the ABIE module. Although the present case responded well to the intervention, it is essential to prioritize weight gain during this phase in treatment. The therapist should ensure that families do not rely on the client utilizing skills as a sole strategy for recovery but rather use these strategies to achieve weight gain via tolerance of disgust and increased parental control of feeding. Our research seeks to understand whether the IAVS sub-network via imaging as well as behavioral reports of disgust in a larger sample demonstrate changes supporting this proposed mechanism, including experiencing heightened awareness of disgust during this module. Future refinement of this module is planned, particularly determining additional pharmacological and psychological targets that can enhance the effects of exposure on visceral disgust. Overall, ABIE provides families with practice overcoming a frequently observed response during refeeding and is designed to fit within established FBT.

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TABLE 1

Participant characteristics

Measure	Baseline	Post intervention	Treatment termination
Weight	98.5	106	115
BMI	15.4	16.6	18
YEDE-Q global	3.28	0.20	
YEDE-Q restraint	3.2	1.4	
YEDE-Q eating concern	3	2.25	
YEDE-Q weight concern	3.5	1.2	
YEDE-Q shape concern	3.4	1.26	
Calories consumed at meal	50.97	116.12	
DSR	77	80	

Note. BMI = Body Mass Index. YEDE-Q = Youth-Eating Disorder Examination Questionnaire. DSR = Disgust Scale-Revised. The YEDE-Q is adapted for adolescent populations from the Eating Disorder Examination Questionnaire (Fairburn & Beglin, 1994). The calories consumed at meal refer to a test meal presented to the participant prior to and following the intervention.

TABLE 2

Acceptance-based interoceptive exposure module: Session content for sessions 1–6 (90 min for sessions 1 and 2; 60 min thereafter)

Session (time)	Content	Topics discussed
1 (90 min)	Psychoeducation Acceptance-based interoceptive exposure	• Review of differences between fear, worry, and disgust (Hildebrandt, Bacow, Markella, & Loeb, 2012), emphasize failure of disgust to habituate or extinguish. • Create hierarchy of somatic situations inducing disgust while eating. • Generate coping strategies for tolerating disgust. • Exposure with shake of unknown content and caloric density (~30 min). • Parental review of refeeding strategies and homework planning.
2 (90 min)	Mindfulness: Observing and describing Acceptance-based interoceptive exposure	• Review of experience with ABIE homework. • Teaching mindfulness skill: Observing and describing versus judging. • Utilize an exercise of eating a raisin and practicing a non-evaluative description of the experience. • Exposure with shake of unknown content and caloric density practicing mindfulness skill (~30 min). • Homework planning.
3 (60 min)	Mindfulness: Present moment Acceptance-based interoceptive exposure	• Review of experience with ABIE homework. • Discuss mindfulness skill of staying in the present moment. • Exercise to practice focusing on breathing without exerting control. • Use a finger trap to elicit the experience of greater control inducing more discomfort. • Exposure with shake of unknown content and caloric density practicing mindfulness skill (~30 min). • Homework planning.
4 (60 min)	Willingness to experience discomfort Acceptance-based interoceptive exposure	• Review of experience with ABIE homework. • Introduce willingness to experience discomfort to manage negative experiences and interoceptive disgust. • Examples of life events where pain must be endured to arrive at a positive and/or valued outcome. • Consider benefits of willingness to experience discomfort. • Exposure with shake of unknown content and caloric density (~30 min). • Homework planning.
5 (60 min)	Positive coping Acceptance-based interoceptive exposure	• Review of experience with ABIE homework. • Expand use of value-based activities as active coping tools. • Elicit and list positive activities that correspond to values.

Session (time)	Content	Topics discussed
		• Translate abstract values into a concrete coping strategy. • Use positive coping strategies for the in-session ABIE and with any distressing events outside session. • Exposure with shake of unknown content and caloric density (~30 min). • Homework planning.
6 (60 min)	Active acceptance Acceptance-based interoceptive exposure	• Review of experience with ABIE homework. • Reviewed of progress with tolerating aversive somatic symptoms and attempts at counter-conditioning. • Active acceptance introduced to acknowledge current difficulties followed by an active intention to continue living life in a valued-based way. • Consider values in the context of difficulties incorporate the skill of acceptance into ABIE. • Exposure with shake of unknown content and caloric density (~30 min).