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Efficacy of Eat Breathe Thrive: A randomized controlled trial of a yoga-based program

Esther E.E. Estey[a,b,1], Chelsea Roff[a,b,1], Michael B. Kozlowski[a,b,2], Stephanie Rovig[a,b,1], Wendy M. Guyker[a,b,1], Catherine P. Cook-Cottone[a,b,*,1]

[a] University at Buffalo, State University of New York, the United States of America
[b] University of Wisconsin-Milwaukee, the United States of America

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ABSTRACT

Evidence positions yoga as a promising intervention for enhancing positive embodiment and supporting the prevention of, and recovery from, eating disorders (EDs) by reducing ED symptomatology and building skills that facilitate an ongoing, embodied sense of wellbeing. However, yoga-based programs are few and rigorous literature on their efficacy is limited. This study examined the efficacy and feasibility of a yoga-based program called *Eat Breathe Thrive* (EBT) which aims to prevent EDs and support embodiment. Participants (N = 168, 93.5 % women) from a community sample in the United States and United Kingdom, ages 18–65, were randomly allocated to a 2-h, 7-week EBT program or waitlist-control condition. Compared to controls, EBT participants experienced significant decreases in ED behaviors, depression, and difficulties regulating emotions. They reported significantly greater use of mindfulness skills, such as interoceptive awareness, mindful self-care, and mindful eating. After a single session, participants reported immediate improvement in their sense of well-being, indicating increased state positive embodiment. Most effects were sustained at 6-month follow-up. The majority of individuals attended most sessions. Self-reported treatment integrity was excellent. Directions for future research are proposed. Results support the efficacy and feasibility of an integrated yoga intervention that fosters positive ways of inhabiting the body.

1. Introduction

Anorexia nervosa (AN), bulimia nervosa (BN), and binge eating disorders (BED) are a complex set of mental health disorders in which an individual's relationship with food, eating, and their body—how they experience it, perceive it, judge or appreciate it, and relate to it—becomes pathologically complicated and dysfunctional (American Psychiatric Association (APA, 2013; Cook-Cottone, 2020; Treasure et al., 2020). They are considered difficult to treat and are characterized by dysregulation of the self, which manifests as aberrant eating (Cook-Cottone, 2020); interoceptive deficits (i.e., impaired ability to sense and interpret physiological processes; Lattimore et al., 2017; Pollatos et al., 2008; Treasure et al., 2020); lack of attunement to, and care of, the body (Cook-Cottone & Guyker, 2018; Cook-Cottone, 2015a, 2015b; Douglass 2010); and emotional dysregulation (i.e., depression, difficulties regulating emotions; O'Brien et al., 2017; Prefit et al., 2019). Diagnostic criteria for AN include food restriction, weight loss or being persistently underweight, feeling disturbed by one's body's weight or shape, significant fear of gaining weight, undue influence of body weight and shape on self-evaluation, and/or lack of acknowledgement of the severity of low body weight (APA, 2013; Treasure et al., 2020). BN involves recurrent episodes of binge eating and recurrent compensatory behaviors to prevent weight gain, and self-evaluation is unduly influenced by body weight and shape (APA, 2013; Treasure et al., 2020). Distinct from BN, BED involves recurrent episodes of binge eating often followed by feelings of guilt or disgust, associated with marked distress regarding the binge eating. Globally impacting embodiment, eating disorders (EDs) result in significant adverse cognitive, physiological, emotional, relational, and vocational effects (APA, 2013; Treasure et al., 2020).

* Correspondence to: Department of Counseling, School, and Educational Psychology, University at Buffalo, 424 Baldy Hall, Buffalo, NY 14260, the United States of America.
E-mail address: cpcook@buffalo.edu (C.P. Cook-Cottone).
[1] Department of Counseling, School, and Educational Psychology, University at Buffalo, State University of New York, the United States of America.
[2] Department of Educational Psychology, University of Wisconsin–Milwaukee, the United States of America.

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Thought to be protective and healing, positive embodiment is defined as a way of being in which one has an experience of residing in and manifesting from the body while connected and attuned to the internal aspects of self (i.e., physiological, emotional, and cognitive) and external aspects of self (i.e., interpersonal, social, and cultural; Cook-Cottone, 2020). This working definition encompasses several models and theories of positive embodiment, including Piran's (2017) developmental theory of embodiment (DTE) and Cook-Cottone's (2020) embodied self model (for more on these and other models and theories, see Perey & Cook-Cottone, 2020). The embodied self model posits that the self is composed of, and greater than the internal and external aspects of embodiment as described above (Cook-Cottone, 2020). With the body being the center of lived experience, the self manifests through levels of awareness of, and relationships with, each aspect of self as one negotiates internal and external attunement as well as meaning in life (Cook-Cottone, 2020). A broad and evolving theoretical construct, positive embodiment is sometimes considered a pathway, state, and/or a trait, with intrapersonal, interpersonal, sociocultural, and sociopolitical influences (Cook-Cottone, 2020; Launeanu & Kwee, 2018; Menzel & Levine, 2011; Perey & Cook-Cottone, 2020; Piran, 2017). It can be contrasted with the self-destructive embodiment and uncanniness experienced within the context of disordered eating, trauma symptomatology, and substance use (Cook-Cottone, 2020). Positive embodiment is believed to be the fundamental framework for positive body image (Menzel & Levine, 2011).

The presence of positive embodiment, or engagement on the path toward positive embodiment, can be assessed via theoretically and/or empirically associated constructs and behaviors such as in-the-moment embodied subjective well-being, interoceptive awareness, emotion regulation, mindful eating, mindful self-care, and the absence of eating disordered behaviors (Borden & Cook-Cottone, 2020; Cox & Tylka, 2020). To illustrate, those with positive embodiment are believed to experience less stress, more relaxation, and greater connection to the body within the present moment; have a good sense of the inner experiences, sensations, and needs of the body (interoception); are aware of and respond to their emotions in effective ways (emotion regulation); eat with attention to the smell, taste, texture, and enjoyment of food (mindful eating); and have an awareness of and responsiveness to the daily needs of the self-in-context (mindful self-care; Cook-Cottone, 2020; Cox & Tylka, 2020; Launeanu & Kwee, 2018; Menzel & Levine, 2011; Perey & Cook-Cottone, 2020; Piran, 2017).

Mind-body practices, such as yoga, have been added to ED prevention and treatment approaches to provide opportunity for those at-risk to experience, connect with, and appreciate their bodies and increase positive embodiment (Allen, 2016; Cook-Cottone & Douglass, 2017; Cramer et al., 2013; Douglass, 2010; Halliwell et al., 2019; Kramer & Cuccolo, 2019; Levine, 2020). Specifically, yoga is a practice that integrates mind and body; it typically includes the practices of yoga postures and sequences (asana), breathing techniques, relaxation, mindfulness, and meditation (Anderson & Sovik, 2000; Cook-Cottone, 2015a; Cook-Cottone, 2020; Douglass 2010; National Center for Complementary and Integrative Health (NCCI, 2022). It is theorized that yoga supports positive embodiment by promoting positive ways of experiencing the body (Cook-Cottone & Douglass, 2017; Douglass, 2010; Perey & Cook-Cottone, 2020). Further, there is empirical support for yoga's potential ability to improve individuals' sense of, and connection to, their body (e.g., Alleva et al., 2020; Ariel-Donges et al., 2019; Halliwell et al., 2019). A typical yoga session may involve intentional practices in which participants are encouraged to bring awareness to the body as it moves, integrate breath and movement, and move in and out of yoga postures at levels of depth, intensity, and ease determined by awareness (i.e., interoceptive, physiological, kinesthetic) and proprioception (i.e., attention to body signals communicating the inner and outer experience of the body as it moves in space; Anderson & Sovik, 2000; Cook-Cottone, 2015a, 2020; Douglass, 2010; Price & Hooven, 2018). Yoga has the capacity to develop skills of interoception and mindfulness; in this way, it may foster a person's capacity to turn inward and listen to the body, and attend to it as it is in the moment without trying to change or control it (Kabat-Zinn, 2017; Khoury, 2017). In yoga, a person can practice aspects of positive embodiment such as self-determination and personal agency, appreciating their body's functionality, responsiveness to the body, and inhabiting the body as a subjective site (vs. objectification; Douglass, 2010; Piran & Neumark-Sztainer, 2020).

Cox and Tylka (2020) propose that positive embodiment through yoga practice involves a pathway in which the practitioner engages in embodied experiences during the yoga class such as reduced *state* objectification and body surveillance, mindfulness, self-compassion, joyful immersion, and flow. Over time, when repeatedly embodied and practiced, the state experiences develop into more stable characteristics such as *trait* mindfulness, self-compassion, body acceptance and appreciation, and joyful immersion in everyday life as evidenced by engagement in mindful self-care, intuitive eating, and attuned exercise (Cox & Tylka, 2020). There is some evidence to support this model. Yoga has been shown to increase in-the-moment subjective well-being immediately after sessions (Bennett et al., 2015; Park et al., 2020; Tibbitts et al., 2021) as well as to increase indicators of state positive embodiment (i.e., body satisfaction and esteem, positive perceptions of the body, reduced self-objectification; Bak-Sosnowska & Urban, 2017; Domingues & Carmo, 2019; Mahlo & Tiggemann, 2016).

A recent review (43 studies) and meta-analysis (11 trials, 754 participants) of yoga prevention and intervention studies indicates that yoga-based approaches to prevention may help reduce ED symptoms (overall ED psychopathology, binging, and bulimic symptoms) and risk factors (e.g., body dissatisfaction, body surveillance, self-objectification), as well as enhance protective constructs such as body awareness, emotion regulation, mindful eating, and mindful self-care (Borden & Cook-Cottone, 2020). The review also detailed the risk inherent in practicing yoga in settings that promote thinness ideals, support restrictive eating practices, are not openly inclusive of all body shapes and sizes, use mirrors, and utilize yoga cueing protocols that emphasize thinness and fitness over mindfulness-based cues (Borden & Cook-Cottone, 2020). Borden and Cook-Cottone (2020) concluded that more research is critical to better understand the best ways to deliver yoga to effectively promote ED recovery and reduce risk; they also indicated specific protocols that orient to the needs of those at risk for and exhibiting ED behaviors are imperative. Despite literature which demonstrates preliminary efficacy of yoga-based interventions (Borden & Cook-Cottone, 2020), there are few standardized programs; a rigorous examination of universal, mind-body interventions for non-acute food and body image challenges is needed (Cook-Cottone, Cox et al., 2020). A yoga-based program called Eat Breathe Thrive (EBT; Roff, 2016) may add to the literature as a valuable, integrative intervention for ED prevention in a community setting.

Aligned with Embodied Self Model (Cook-Cottone, 2020), EBT supports the development of the self as an embodied, attuned, and integrated being through engagement in program content through didactic and group-based, experiential content delivered via four pillars, the practices of yoga and mindfulness, and completion of a service project. The internal experience of self (i.e., physiological, emotional and cognitive) is developed through the pillars of *inner awareness* (i.e., interoceptive awareness, mindful eating; Cox & Tylka, 2020; Mehling, Acree, Stewart, Silas, & Jones, 2018; Yu et al., 2020), *functional action* (i.e., body functionality, Alleva & Tylka, 2021; Guest et al., 2019), and *self-regulation* (Roche et al., 2017; Tomlinson et al., 2017), along with the practice of yoga and meditation in each session (Cook-Cottone, 2020). The inner awareness work includes

meditations specific to inner awareness prior to eating (i.e., the *Interoceptive Meditation*) and mindful eating practice with ground rules (e.g., no talk of diets or "food shaming"). The practices of yoga and mindfulness emphasize a moment-by-moment, non-judgemental awareness of, and connection to, the mind and body through movement, breathing, and meditation (Iyengar, 1977; Kabat-Zinn, 2017; Pascoe et al., 2017). The external aspects of self (i.e., family, community, and culture) are cultivated through psychoeducation on the sociocultural causes of eating disorders, the pillar of *embodied intimacy* (Cook-Cottone, 2015b; Park et al., 2015; Piran, 2016a) and completion of a service project. The didactic, cognitive elements are focused around increasing individuals' awareness and critical thinking of societal pressures to attain ideals of attractiveness and fostering life skills for improved functioning (i.e., media literacy, stress management, self-regulation; Cook-Cottone, Beck, & Kane, 2008; Cook-Cottone et al., 2017; Scime & Cook-Cottone, 2008; Starkman, 2016; Talebkhah & Cook-Cottone, 2020). The reflective, activity-based, and discussion aspects of the group deepen the internalization of learning (Cook-Cottone et al., 2017). The service activity in EBT targets the cultivation of a prosocial orientation, self-awareness, and values-based living, which has been found to be effective in decreasing ED symptomatology (Fogelkvist et al., 2020). Researchers posit that the integration of these components provides a novel, all-encompassing program framework that increases the acceptability, effect, and scope of interventions oriented towards preventing EDs and aligns with the comprehensive and highly integrative positive embodiment construct (Cook-Cottone et al., 2017; Cook-Cottone, 2020; Neumark-Sztainer, 2016; Starkman, 2016). For more about EBT see www.eatbreathethrive.org.

EBT stands to contribute to the growing number of prevention programs in several ways. First, the integration of its program components addresses concerns in literature on the limitations of cognitive treatments in their ability to help individuals acquire the skills necessary to relate to their body in a positive, healthy way (Perey & Cook-Cottone, 2020). It also fulfills the noted need for interventions to combine yoga with cognitive dissonance, education, media literacy, reflective processing before and after yoga, and supplemental activities (i.e., home practices, journaling) for a more targeted, impactful, and holistic approach to fostering positive embodiment (Ariel-Donges et al., 2019; Cook-Cottone et al., 2017; Pacanowski et al., 2020; Talebkhah & Cook-Cottone, 2020). For an extensive discussion on the rationale for the investigation of EBT, the theoretical and empirical basis of its components, and its potential contribution to literature on embodiment, see Estey (2021).

In general, the EBT teaches positive embodiment skills that both address the key instigators of ED behaviors and symptoms, as well as create a predictable experience of health and well-being. While EBT has been implemented extensively across diverse contexts with positive outcomes, it has yet to be empirically validated. This step is a critical one given the gap in efficacy and effectiveness studies in prevention science in recent years (Levine, 2020). The purpose of the current randomized controlled trial (RCT) is to examine whether the EBT program is effective as a prevention program in reducing affective and regulatory factors that increase risk for EDs and increasing indicators of positive embodiment as a state (in-the-moment) and as traits (more enduring outcomes). Compared to waitlist control participants, those participating in EBT were anticipated to show (1) an increased in-the-moment embodied, subjective well-being immediately following each session; (2) a decrease in ED behaviors and symptoms; (3) decreases in central drivers of EDs, specifically emotional dysregulation manifesting through (a) depression and (b) difficulties in emotion regulation; and (4) increases in indicators of positive embodiment, specifically (a) interoceptive awareness, (b) mindful eating, and (c) mindful self-care. These questions were investigated among an international sample of community-dwelling adults between the ages of 18–65.

2. Method

2.1. Participants

Ethics approval for this study was acquired from the University at Buffalo's (UB) Institutional Review Board (IRB) and was registered on www.clinicaltrials.gov with the ID NCT03348345, protocol ID EBTC01. With regard to the partnership between EBT and UB's research team, the Organization (founded and operated by Roff) maintained a collaboration with the research team throughout the course of the study, providing trained facilitators for the study. For privacy and confidentiality reasons, neither Roff nor any of the members of the Organization had access to the data or study results. Recruitment materials included flyers and social media campaigns targeting community members who self-identified as at-risk for eating disorder behavior. Specific flier wording stated, "You will learn skills that may help you eat mindfully, transform your emotions, and feel better in your body." Participants were recruited from communities across 10 sites in the US and United Kingdom (UK) via advertisements posted around the community, emails and listservs through systems of higher education, community boards, and referrals from providers. Inclusion criteria were consenting individuals between the ages of 18 and 65, who could speak English, were not pregnant, and had never taken EBT. Individuals were excluded if they were diagnosed with an ED and/or were currently in ED treatment. Recruitment materials had IRB information, a description of the study, and noted that participants would be compensated. A priori power analysis using G*Power (Faul et al., 2007) revealed that a sample of at least 114 participants was necessary to detect an effect size of 0.50 (Cohen, 1988). Our final sample consisted of 266 individuals (see Fig. 1, CONSORT flow diagram). The population utilized for our sample (i.e., ages of participants) was informed by literature which suggest that the presence of eating pathology and influence of sociocultural ideals in early to later adulthood is predictive of a more complex, longer duration of illness and a shorter lifetime (Dakanalis et al., 2016; Fichter & Quadflieg, 2016; Jenkins & Price, 2017; Mangweth-Matzek & Hoek, 2017). Moreover, Piran (2016b) found later adulthood (age 50–70) to be a period during which individuals endeavored to push back against rigid stereotypes and ideals of attractiveness in an effort to experience positive embodiment (e.g., physical freedom, comfort, safety, agency). On a practical level, our age range of 18–65 is inclusive of adults and excludes children and older adults who may have different needs and risks associated with the practice of yoga and the experience of EDs.

2.2. Description of intervention

The manualized intervention consisted of 7 weekly sessions (of 2 h each session) aligned with the aforementioned pillars of EBT. Each session consisted of approximately one hour of psychoeducation and interactive activities, followed by one hour of yoga and meditation. See Table 1 for a detailed description of each session and its theme.

The psychoeducational content addressed embodiment, body image, body functionality, interoceptive awareness, self-regulation, and related topics. The interactive activities provided an opportunity for experiential practice with the psychoeducational content, as well as discussion time to foster insight and connection with others. The yoga practices invited participants to embody and explore the themes of the session in their bodies somatically. Each session incorporated a different type of yoga, which was designed to align with the psychoeducational content and supported by empirical literature to accomplish this aim (see Table 1). Styles included: (a) hatha yoga, a low-impact, dynamic style of yoga that emphasizes connection between postures, breathing practices, and mindful

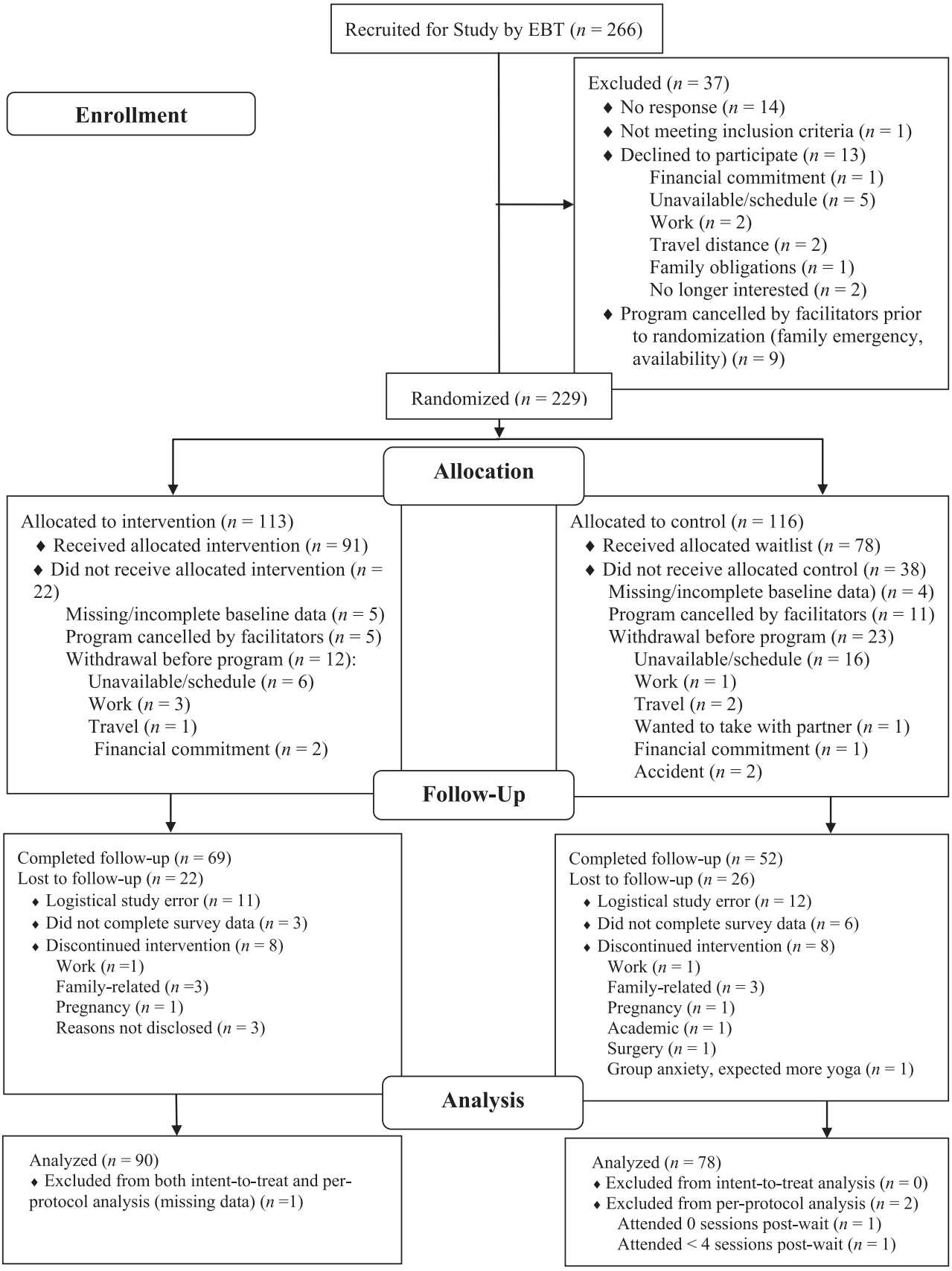

Fig. 1. CONSORT flow.

Table 1
EBT program, constructs measured, and description of class content.

Session	Constructs	Description
Build Connection	Interpersonal relationships Trust and safety	Facilitators introduce the Eat Breathe Thrive curriculum and discuss its role in eating disorder prevention and sustained recovery. Participants engage in a discussion about the biological, psychological, and sociocultural causes of eating disorders. Participants engage in group activities designed to build trust, inspire self-reflection, and foster a safe and positive environment within the group. The yoga and meditation practice emphasizes connection between breath, movement, and awareness.
Set the Stage	Body Image Diet Culture	Facilitators invite participants to consider the sociocultural forces that have shaped their relationship to food, body, and self. Participants engage in a discussion about messages they have received from family, peers, and media about food and body. Facilitators encourage participants to think critically about these messages in an exercise called "The Good Body" and invite participants to challenge internalized beliefs that equate the appearance of their body with their value and worth. This session is designed to "set the stage" for the four pillars covered in the next several sessions, which focus on positive ways to inhabit the body and nourish oneself. The yoga and meditation practice emphasizes moving and breathing with intentionality.
Functional Action	Eating Disorder Behaviors Mindful Self-Care	Facilitators introduce the concept of functional action, which encourages participants to eat and engage in activities that promote functionality, rather than to change their body's appearance. Specifically, participants discuss five categories of functionality (physical, emotional, cognitive, social, creative) and explore ways of eating, exercising, and acting to support all five dimensions of their life. The yoga and meditation practice invites participants to explore functional movement, using cues that emphasize the experience rather than form of each pose. At the end of the session, participants make self-care commitments focused on functionality for the forthcoming week.
Embodied Intimacy	Mindful Self-Care Interpersonal Relationships Healthy Communication	Facilitators introduce the concept of embodied intimacy, which encourages participants to explore the body as a vehicle for connection with self and others. Intimacy is defined as "making the innermost aspects of oneself known," and participants engage in discussion about what it means to be intimate with oneself and with others. The interactive exercises explore connection with self and others through eye contact and subtle forms of touch (optional). Participants are given the option to try a few partner yoga poses in the movement practice, with guidance to support the communication of needs and boundaries. Homework consists of a self-massage and journaling practice.
Inner Awareness	Interoceptive Awareness Mindful Eating	Facilitators introduce the concept of inner-awareness, which encourages participants to listen and respond to the body's needs. Participants learn about interoceptive awareness and how it can support intuitive eating. Interactive exercise explores physical and emotional hunger cues and includes an optional mindful meal or snack with meditation during the session. The yoga practice incorporates yin yoga, with cues that emphasize noticing sensations in the body. Homework consists of practicing the interoceptive meditation before and after meals during the week.
Self-Regulation	Depression and Anxiety Emotion Regulation	Facilitators introduce the concept of self-regulation, and the idea that the body can be an ally in generating positive states of mind. Interactive exercise includes psychoeducation on the autonomic nervous system and discussion of activities which activate the sympathetic and parasympathetic branches, respectively. Yoga practice includes restorative poses and yoga nidra, which promotes use of the breath for full body relaxation.

Note. Week 7 consists of a closing ritual and service project activity.

awareness (Gupta & Gupta, 2021); (b) Thai yoga, a style of yoga that can be practiced alone or with a partner that emphasizes dynamic stretching, deep breathing, meditation, and acupressure (Kongkaew et al., 2018); (c) restorative yoga, which invokes calm and reduced stress via greater blood flow and oxygen while participants are in supine postures supported by props (Fischer-White et al., 2014; Lin et al., 2018); (d) yin yoga, a reflective practice which encourages awareness of thoughts, emotions, and sensations while participants are in seated or prone/supine postures for a sustained period (Hylander et al., 2017); and (e) yoga nidra, a systematic approach to the induction of relaxation and reduction of stress via the shifting of attentional awareness throughout the body while participants are conscious yet in a state of non-REM sleep (Moszeik et al., 2020).

At the end of every session, participants were guided through a four-step meditation referred to as the *Interoceptive Meditation* in which they were invited to breathe deeply, notice sensations in the belly (e.g., emptiness, tightness, pain), reflect on their needs (e.g., hunger, rest, comfort), and consider actions they can take to meet their needs (e.g., eat a nourishing meal). In the final session of the program, participants deliver a group service project that they collaboratively work to plan and execute as a group in their local community. Examples of projects included the facilitation of a yoga class for teen girls; writing of letters to detained, undocumented immigrants; and preparation as well as delivery of food to families of patients undergoing chemotherapy. Class size typically consisted of 10 participants.

2.3. Intervention facilitators

Each program was led by two facilitators, one of whom was a mental health professional (i.e., a licensed professional clinical counselor), and the other a certified yoga teacher or yoga therapist. All facilitators completed the Eat Breathe Thrive Facilitator Training, which includes a three-day experiential immersion course followed by an extensive six-month training with practicum and supervision. The EBT Facilitator Training includes instructional videos, a comprehensive facilitator manual, calls with a supervisor, and practicum teaching experience. It provides detailed instruction on how to lead each session in the curriculum (including all activities and yoga practices), and covers topics such as group facilitation skills, ethics and scope of practice, inclusivity/cultural considerations, EDs (etiology, symptoms, and treatment), trauma sensitivity, and adapting yoga/meditation practices to meet different participants' needs. For access to training and materials see www.eatbreathethrive.org. In addition, facilitators completed specific training on the ethics of conducting research and the study process through the Collaborative Institutional Training Initiative (CITI; see https://about.citiprogram.org).

2.4. Process evaluation, fidelity, and treatment integrity

Facilitators implemented the program according to the EBT protocol (Roff, 2016), using training materials that included a facilitator manual, instructional and demonstrative videos, and one-to-one coaching calls with a mentor. Participants received workbooks to encourage program adherence. Considering research which indicates that assessment of intervention integrity is critical to the attribution of positive outcomes to a program and translation of research into practice (and vice a versa; Crane & Hecht, 2018), facilitators completed weekly integrity measures after every session which were submitted to the lead researcher at the conclusion of the groups. The items in the measure were aligned with the protocol and

Table 2
Demographics.

	EBT $n = 90$	Control $n = 78$	Total $N = 168$
Age (mean, *SD*)	24.73 (14.37)	28.19 (16.29)	26.34 (15.34)
Gender			
Cisgender Women	84 (93.3 %)	73 (93.6 %)	157 (93.5 %)
Cisgender Men	6 (6.7 %)	5 (6.4 %)	11 (6.5 %)
Nationality			
United States	53 (59.6 %)	47 (60.3 %)	100 (59.9 %)
United Kingdom	25 (28.1 %)	26 (33.3 %)	51 (30.5 %)
Other	11 (12.4 %)	4 (6.4 %)	16 (9.6 %)
Ethnicity			
White	72 (80.0 %)	66 (84.6 %)	138 (82.1 %)
Asian	4 (4.4 %)	4 (5.1 %)	8 (4.8 %)
Hispanic/Latino	4 (4.4 %)	1 (1.3 %)	5 (3.0 %)
Black/African American	2 (2.2 %)	–	2 (1.2)
Multiracial/Other	8 (8.9 %)	7 (9 %)	15 (8.9 %)
Sexual Orientation			
Heterosexual	68 (76.4 %)	64 (82.1 %)	132 (79 %)
Homosexual/Gay/Lesbian	6 (6.7 %)	3 (3.8 %)	9 (5.4 %)
Bisexual	11 (12.4 %)	7 (9.0 %)	18 (10.8 %)
Questioning	2 (2.2 %)	1 (1.3 %)	3 (1.81 %)
Queer	2 (2.2 %)	3 (3.8 %)	5 (3.0 %)
Highest Education			
High school graduate	5 (5.6 %)	1 (1.3 %)	6 (3.6 %)
Some college	10 (11.1 %)	8 (10.3 %)	18 (10.7 %)
College degree	32 (35.6 %)	26 (33.3 %)	58 (34.5 %)
Graduate/professional degree	43 (47.8 %)	42 (53.9 %)	85 (50.6 %)
Religion/Spirituality			
Not religious/spiritual	44 (48.9 %)	33 (43.4 %)	77 (46.4 %)
Buddhist	–	2 (2.6 %)	2 (1.2 %)
Christian	13 (14.4 %)	14 (18.4 %)	27 (16.3 %)
Jewish	3 (3.3 %)	3 (3.9 %)	6 (3.6 %)
Hindu	–	1 (1.3 %)	1 (0.6 %)
Muslim	1 (1.1 %)		1 (0.6 %)
Spiritual/but not religious	26 (28.9 %)	17 (22.4 %)	43 (25.9 %)
Other	3 (3.3 %)	6 (7.8 %)	9 (5.4 %)
Relationship Status			
Single	36 (40.0 %)	19 (24.4 %)	55 (32.7 %)
Committed/long-term	16 (17.8 %)	20 (25.6 %)	36 (21.4 %)
Married/domestic partnership	33 (36.7 %)	31 (39.7 %)	64 (38.1 %)
Divorced	1 (1.1 %)	4 (5.1 %)	5 (3.0 %)
Other	4 (4.4 %)	4 (5.1 %)	8 (4.8 %)
Children			
No children	59 (65.6 %)	47 (60.3 %)	106 (63.1 %)
1 or more children	31 (34.4 %)	31 (39.7 %)	62 (36.9 %)
Employment Status			
Employed	69 (76.7 %)	67 (85.9 %)	136 (81.0 %)
Not employed	21 (23.3 %)	11 (14.1 %)	32 (19.0 %)
Student Status			
Student	19 (21.1 %)	16 (20.5 %)	35 (20.8 %)
Not student	71 (78.9 %)	62 (79.5 %)	133 (79.2 %)

Note. No significant differences were found between groups on demographic variables Percentages for multiracial and "other" were combined in this Table 1 participant (0.6 %) did not complete high school. In the nationality of origin category, participants identified as originating from Spain, Italy, Poland, Romania, Philippines, Canada, Japan, China, Slavia, Brazil, or Russia. In religion/spirituality "other" category, participants identified as utilitarian, agnostic, occult, or unsure. In the relationship "other" category, participants identified their relationship status as separated, newly committed, polyamorous, or open.

referenced program components (i.e., environment setup, activities, practices, homework assignment) that are integral to upholding the integrity of the EBT program. Examples of questions included: *Did you lead the interoceptive meditation? Did you discuss confidentiality and community agreements? Lead the Good Body exercise?* In addition, contact was maintained with each site by the lead investigator and the EBT Organization to maintain consistency across programs.

2.5. Measures

Measures used in this study examined baseline, immediate (state), and long-term change (trait) across ED symptoms and behaviors, drivers of EDs, and indicators of positive embodiment. Other data collected included demographics (see Table 2), attendance, participants' in-the-moment subjective embodied well-being before and after class, and treatment integrity.

2.5.1. In-the-moment, subjective embodied well-being

Participants' in-the-moment, subjective embodied well-being before and after EBT sessions was assessed using Eat Breathe Thrive Pre-Post Class Questions (Cook-Cottone, 2017). The measure consisted of 3 subscales (Stress, Embodiment, Relaxation), with one question assessing each aspect of well-being. Participants were asked, "How much stress do you feel right now?", "How embodied do you feel right now?", and "How relaxed do you feel right now?" Responses were anchored on a 5-point scale ranging from 1 = *I don't feel stressed/relaxed/connected to my body* to 5 = *I feel extremely stressed/completely relaxed/completely embodied*. Responses to the stress variable were reverse-coded to reflect lower levels or absence of stress. Items were summed for a total score, with higher scores reflected greater levels of in-the-moment, subjective embodied well-being. When filling out the survey, participants were provided with a definition of embodiment (i.e., "connection to my body"). During the course of the program, they received further explanation, examples, and anecdotes concerning embodiment per the EBT protocol. These questions were developed in line with literature which posits that attunement to the body's sensation and bodily states is vital for emotional and psychological well-being (as cited in Hefferon, 2015). These questions, aiming at capturing participant's subjective sense of embodied well-being, are in concordance with theoretical and qualitative literature on embodying experiences during yoga (Cox & Tylka, 2020; Rhodes, 2015) and research investigating immediate, pre-post effects of a single yoga class (Bennett et al., 2015; Park et al., 2020; Tibbitts et al., 2021). Cox et al. (2020) provided evidence of construct validity for use of a similar assessment in their study. Internal consistency ranged from poor to good across sessions ($\alpha = 0.62–0.83$, respectively).

2.5.2. ED behaviors and symptoms

ED behaviors were measured using the Eating Disorder Examination Questionnaire (EDE-Q; Fairburn & Beglin, 2008). The EDE-Q is a 36-item self-report measure that examines various aspects of EDs and their severity (i.e., behaviors, features, internal processes). Using a 7-point Likert rating scale, participants indicate on how many of the past 28 days have they engaged in ED behaviors (0 = *no days*, 6 = *every day*) and extent of ED-related cognitions and emotions experienced (0 = *not at all*, 6 = *markedly*). In addition to a global scale, the EDE-Q provides 4 subscale scores, including: Dietary Restraint (e.g., "Have you tried to exclude from your diet any foods that you like in order to influence your shape or weight [whether or not you have succeeded?]"), Eating Concern (e.g., "Have you had a definite fear of losing control over eating?"), Shape Concern (e.g., "Have you had a definite desire to have a totally flat stomach?"), and Weight Concern (e.g., "Has your weight influenced how you think about [judge] yourself as a person?"). Higher scores on the global score indicate greater ED symptomatology, with scores of 4 or higher severity within a clinical range. In prior studies, the EDE-Q has demonstrated internal consistency ($\alpha = 0.93$ total score, $\alpha = 0.68–0.83$ subscales) and test-retest reliability ($rs = 0.81–0.94$; Luce & Crowther, 1999; Mond et al., 2004). In the current study, internal consistency ranged from good to excellent ($\alpha = 0.79–0.93$).

2.5.3. Emotional dysregulation

Emotional dysregulation was examined using a measure of depression and difficulties in emotion regulation.

2.5.3.1. Beck Depression Inventory, second edition (BDI-2). The BDI-2 (Beck et al., 1996) is a 21-item inventory designed to measure severity of depressive symptoms. Items are on a 4-point scale from 0 = *absence of symptoms* to 3 = *severe symptoms.* Symptoms addressed include cognitive (e.g., "I am worried that I am looking old or unattractive"), somatic (e.g., "I am too tired to do anything"), and vegetative (e.g., "I don't get real satisfaction out of anything anymore"), in accordance with DSM-IV criteria for major depression. Higher scores demonstrate a probable depressive episode in the last two weeks, with a score above 20 indicating depression. In other studies, the internal consistency of the BDI has been found to range from .83 to .92 (Campo-Arias et al., 2018; Haynos et al., 2018). In the present study, internal consistency was excellent (α = 0.90–0.94).

2.5.3.2. Difficulties in Emotion Regulation Scale (DERS). DERS (Gratz & Roemer, 2004) is a 36-item multidimensional assessment of emotion regulation and dysregulation. Items are rated on a 5-point Likert scale ranging from 1 = *almost never* to 5 = *almost always*. Positively worded items are reverse-scored. Higher scores suggest more difficulties regulating emotions. The measure yields a total score as well as scores on six subscales: Non-accept (inability to accept emotional distress; e.g., "When I'm upset, I become angry with myself for feeling that way"), Goals (challenges engaging in goal-directed behavior when emotionally upset; e.g., "When I'm upset I have difficulty getting work done"), Impulse (difficulty controlling oneself when upset; e.g., "When I am upset, I become out of control"), Awareness (lack of emotional awareness; e.g., "I pay attention to how I feel" [reversed]), Strategies (limited access to functional, self-regulating emotional strategies; e.g., "When I'm upset, I believe that I will remain that way for a long time"), and Clarity (lack of affectual understanding and clarity of emotions; e.g., "I have no idea how I am feeling"). The DERS has demonstrated internal consistency (α = 0.93 total score, α > 0.80 subscales), good test-retest reliability (ρI = 0.88; ρI = 0.57–89 for subscales), and associations with measures of experiential avoidance, negative mood regulation, and emotional expressivity (Gratz & Roemer, 2004). As in prior studies (Brennan et al., 2020; Obeid et al., 2021), in this study, the internal consistency ranged from good to excellent (α = 0.88–0.96).

2.5.4. Indicators of positive embodiment

Indicators of positive embodiment were measured by interoceptive awareness, mindful eating, and mindful self-care.

2.5.4.1. Multidimensional Assessment of Interoceptive Awareness (MAIA). The MAIA (Mehling et al., 2012) is a 32-item measure of interoceptive awareness, which assesses aspects of interoceptive awareness across 8 subscales: Noticing (e.g., "I notice changes in my breathing, such as whether it speeds up or slows down"), Non-Distracting (e.g., "I distract myself from sensations of discomfort"), Not-Worrying (e.g., "I start to worry that something is wrong if I feel any discomfort"), Attention ("I can pay attention to my breath without being distracted by things happening around me"), Emotional Awareness (e.g., "I notice how my body changes when I feel happy/joyful"), Self-Regulation (e.g., "When I am caught up in my thoughts, I can calm my mind by focusing on my body/breathing"), Body Listening (e.g., "When I am upset, I take time to explore how my body feels"), and Trusting (e.g., "I trust my body sensations"). Items are ranked on a 6-point Likert scale from 0 = *never* to 5 = *always*. Higher scores are indicative of higher levels of interoceptive body awareness. The MAIA demonstrated internal consistency (α =0.66 to.82), and convergent as well as discriminant validity through its correlations with constructs related to body awareness (Mehling et al., 2012). Due to low internal consistency of the Not-Distracting subscale found in this study (α = 0.68) and noted in prior literature (Todd et al., 2019), it was not used, nor was Noticing subscale (α = 0.67). Similar to other studies (Brown et al., 2017; Mehling, 2016), for all other subscales, internal consistency ranged from fair to excellent (α = 0.72–0.94).

2.5.4.2. Mindful Eating Questionnaire (MEQ). The MEQ (Framson et al., 2009) is a 28-item measure of 5 subscales that assess mindful eating on a Likert scale that ranges from *never/rarely* to *usually/always*. The scale is made up of 5 subscales which assess: Disinhibition (e.g., "If there are leftovers I like, I take a second helping even when full"), Awareness (e.g., "Before I eat, I take a moment to appreciate the colors and smells of my food"), External Cues (e.g., "I notice when just going into a movie theater makes me want to eat candy and popcorn"), Emotional Response (e.g., "When I am sad, I eat to feel better"), and Distraction (e.g., "I think about things I need to do while I am eating"). The MEQ demonstrates internal consistency and construct validity (associations with yoga practice and independence from cognitive restraint; Framson et al., 2009). In this study, the Distraction and External subscales were not used due to weak internal consistency (α = 0.63–0.72; α = 0.39–56, respectively). The MEQ has been used with adults (Felske et al., 2020). The internal consistency in this study ranged from fair to good (α = 0.73–85).

2.5.4.3. Mindful Self-Care Scale-Short (MSCS-S). The MSCS-S (Cook-Cottone & Guyker, 2018) is a 33-item scale that measures the self-reported frequency of self-care behaviors over the past week on a 5-point Likert scale of 0 = *never* to 6–7 = *regularly*. Items in each domain are averaged, with higher scores indicating greater self-care behaviors. The MSCS is based on the embodied self model with domains of self-care designed to address each aspect of self (Cook-Cottone, 2020: Cook-Cottone & Guyker, 2018). The 6 domains of self-care are: Physical Care (e.g., "I practiced yoga or another mind/body practice"); Supportive Relationships (e.g., "I scheduled/planned time to be with people who are special to me"); Mindful Awareness (e.g., "I had calm awareness of my feelings"); Self-Compassion (e.g., "I engaged in supportive and comforting self-talk"); Mindful Relaxation (e.g., "I sought out images to relax"); and Supportive Structure (e.g., "I maintained a comforting and pleasing living environment"). The items assessing individuals' general/global practices were not utilized in this study. The measure demonstrates internal consistency (α = 0.89 for the total score, .69–0.92 for subscales) and construct validity via a positive correlation with body esteem and negative correlation with ED symptoms (Cook-Cottone & Guyker, 2018). In accordance with other literature (Depner et al., 2021), the internal consistency in the present study ranged from good to excellent (α = 0.71–0.94).

2.6. Procedures

Due to the prevention and community-based focus of this study, participants completed an initial screening process per EBT protocol. The EBT Organization requires all participants to complete an initial screening questionnaire to ensure they are safe and stable enough for the program. Specifically, EBT's community programs are not for individuals who: have a BMI of less than 18.5, have engaged in dangerous behaviors (purging, laxative abuse, self-harm) in the last 30 days, or have felt suicidal in the last 3 months. If an applicant indicates any disqualifying criteria, the EBT Organization schedules a call to refer the client to affordable mental health treatment in their local area. After completing the screening process, potential participants had a telephone call with the research assistant who

confirmed their eligibility for the study and provided study information (e.g., length of study, survey completion requirements). Potential participants were given an opportunity to ask questions, disclose limitations or requests (e.g., need for additional support or adaptations for physical capabilities), and decline or consent to participation. They also received an email with a link to the consent form and a randomized study code specific to their program location allocating them to either the intervention (n = 113) or waitlist control (n = 116). Randomization was conducted using a permuted block method performed on a computer system that generated random codes used as participant IDs (Dallal, 2008). Similar to other studies on the efficacy of yoga-based interventions (Alleva et al., 2020; Brennan et al., 2020), waitlist controls were used as an acceptable comparison group in establishing initial efficacy and feasibility of EBT; further, this study was not sufficiently funded to utilize active controls. Participants in the waitlist control condition began the EBT program 2 months after completing the baseline assessments. Participants assigned to the EBT condition were asked to attend at least 6 of the 7 sessions and complete all assessments.

All participants completed the survey assessments online at four time points. Note that the assessment points are 'staggered' for participants in the waitlist control condition, who began the EBT program at Time 2. The assessment points included: Time 1 (baseline for both groups), Time 2 (posttest for the intervention group; repeated pretest for control group; 2 months post-Time 1), Time 3 (follow-up for the intervention group; posttest for waitlist control group; 4 months post baseline), and Time 4 (6-month follow-up). Compensation was provided for completion of measures and attendance to 6 out of the 7 sessions (i.e., rebate of registration fee and a $50 gift card made available by a grant awarded by the Give Back Yoga Foundation).

2.7. Analysis

Data analyses were conducted using SPSS® 26.0 for Mac. Data were screened for missing values, normality, and outliers. Means as well as standard deviations were computed for all variables across time points and separately by group (see Table 3). There was less than 1 % missing data across variables in data sets of both completers and non-completers. Completers were those who had completed all assessments and attended 5 out of 7 sessions. Non-completers were those who attended fewer than 5 out of 7 sessions and/or did not complete all assessments. One case was deleted due to missing data of full-scale measures (more than 3 %). A nonsignificant Little's test (1998), x^2 (8523) = 8661.08, p = .15, found data to be missing completely at random. Expectation-Maximization was used to address missing data. Of all attendance and pre-post class data, data of 4 individuals (2.38 %, non-completers) were missing due to no-shows or absences at sessions.

Visual inspection of the histogram and plots, as well as the Shapiro-Wilk test, suggested that there were minor departures from normality on the EDE-Q, BDI-2, and MSCS-S. Log and squared transformations were computed, resulting in no change. Since the Shapiro-Wilk test has been suggested to not be the best indicator of normality for large sample data (Nosakhare & Bright, 2017) and deviations from normality in such samples do not cause significant problems (Piovesana & Senior, 2016), we continued with analyses using untransformed data. Bootstrapping procedures were applied to protect against Type II error.

Several analyses were conducted to examine differences in groups at baseline and changes across timepoints. Baseline characteristics of the both conditions were compared using chi-square tests for categorical variables, independent samples t-tests for continuous and ordinal variables, Mann-Whitney nonparametric tests for variables not normally distributed, and the Welch F test for unequal variances as well as unbalanced sample sizes. Independent samples t-tests were performed to assess potential differences across outcome variables between completers and non-completers.

To assess for Group × Time effects, repeated measures ANOVAs were conducted with Time as the within group factor comparing pre- to posttest scores and Group (EBT vs. waitlist control) as the between factor, and an intent-to-treat (ITT) approach was used (Table 3). Significant interactions were examined to confirm indication of a treatment effect. For the EBT group, individual paired samples t-test analyses were conducted to see whether changes noted were maintained at 6-months follow-up (comparison of pretest to 6-month follow-up; see also Table 3). Cohen's (1998) standards for interpreting partial eta squared effect size (η^2) were used, as well as Cohen's d guidelines. Feasibility was assessed and presented via the CONSORT flow diagram (see Fig. 1) and the

Table 3
Group differences in the study variables across time.

Measures		EBT group M(SD)	Control group M(SD)	Effect of Group × Time η_p^2; F test	For EBT group, was change maintained at 6 mos follow-up? Y/N; follow-up score M(SD); Cohen's d; t-test
EDE-Q T	Pretest	2.55(1.33)	2.31(1.28)	.06; 7.57**	Yes; 1.82(1.30)
	Posttest	2.08(1.34)	2.26(1.25)		1.00; 6.04***
EDE-Q R	Pretest	1.83(1.50)	1.88(1.41)	.001;0.104	Yes; 1.26 (1.25)
	Posttest	1.54(1.38)	1.66(1.43)		1.27; 3.73***
EDE-Q EC	Pretest	1.82(1.62)	1.28(1.43)	.05; 6.23*	Yes; 1.27 (1.39)
	Posttest	1.47(1.52)	1.37(1.39)		1.34; 3.42**
EDE-Q SC	Pretest	3.57(1.61)	3.18(1.59)	.002;0.273	Yes; 2.44 (1.75)
	Posttest	2.84(1.73)	2.57(1.54)		1.24; 6.94***
EDE-Q WC	Pretest	3.00(1.54)	2.91(1.49)	.02; 3.46	Yes; 2.29(1.63)
	Posttest	2.55(1.65)	2.80(1.49)		1.31; 4.47***
BDI	Pretest	15.72(8.83)	10.54(8.97)	.01; 13.01***	Yes; 10.25(10.8)
	Posttest	12.22(10.17)	11.75(8.44)		9.03; 5.00***
DERS	Pretest	86.91(24.31)	81.10(23.30)	.09; 10.95**	Yes; 72.67(22.77)
	Posttest	79.62(21.63)	83.40(22.66)		.21.1; 5.56***
MAIA	Pretest	2.45(0.74)	2.66(0.65)	.21; 30.34***	Yes; 3.27(0.64)
	Posttest	3.11(0.62)	2.69(0.67)		.78; 8.68***
MEQ	Pretest	2.36(0.51)	2.51(0.48)	.05; 5.83*	Yes; 2.66(0.56)
	Posttest	2.54(0.56)	2.53(0.46)		.40; 6.16***
MSCS-S	Pretest	3.15(0.59)	3.36(0.55)	.07; 8.67**	Yes; 3.52(0.66)
	Posttest	3.37(0.56)	3.35(0.58)		.61; 5.10***

Note. N *for intent-to-treat analyses* = 168 (90 intervention group, 78 waitlist control group). EDE-Q = Eating Disorder Examination Questionnaire; EDE-Q T = EDE-Q Total. EDE-Q subscales: R = Restraint; EC = Eating Concern; SC = Shape Concern, WC = Weight Concern; BDI = Beck Depression Inventory; DERS = Difficulties in Emotional Regulation Scale; MAIA = Multidimensional Assessment of Interoceptive Awareness; MEQ = Mindful Eating Questionnaire; MSCS-S = Mindful Self-Care Scale-Short; *p < .05; **p < .01; ***p < .001.

percentages of completers vs. non-completers. Program attendance and treatment integrity were analyzed via frequencies and descriptive analyses.

3. Results

3.1. Preliminary analyses

Demographic information is presented in Table 2. The majority of participants were female (93.5 %, $n = 157$), with an age range of 18–63 ($M_{age} = 26.34$, $SD = 15.34$). There were no significant differences in demographics between conditions or completers and non-completers (all $p > .05$). There were significant differences between conditions on two measures at baseline on the BDI and the MSCS-S. The EBT group had higher baseline depression scores by 5.18 points than the control group ($p < .001$), and also had lower self-care scores by .21 points ($p = .02$).

The attrition rate was 15 % ($n = 25$) which is comparable to some yoga-based prevention studies (18 %, Mitchell et al., 2007; 15 %, Pacanowski et al., 2020), and lower than others (26.5 %, Kramer & Cuccolo, 2019). Twenty-three participants ($n = 11$ intervention, $n = 12$ waitlist control) were lost to follow-up as their program commenced before they received baseline surveys. While they continued on to attend the EBT program, no further data was collected from them for this study and they were allocated to a qualitative study on EBT after consenting. Reasons for withdrawal were unrelated to the intervention except for one individual who expected more yoga. Data was collected across 8 sites, 2 in the UK and 6 in the US; 16 programs were facilitated (8 intervention, 8 controls). Most individuals (76.6 %, $n = 108$) attended 6–7 sessions. Participants in both conditions missed a similar number of classes, $t(139) = 1.47$, $p = .14$, 95 % CI [− 0.14,.94]. Mean attendance was 5.75 sessions ($SD = 1.65$). Treatment integrity was analyzed and found to be excellent (95–100 %) across sites.

3.2. Primary Analysis

Descriptive statistics are presented in Table 3, along with results of the repeated measures ANOVAs (for the analyzes including both groups) and of the follow-up t-tests (for the EBT group only). Assumptions were met for homogeneity of variance, Levene's test, except for the MAIA and MEQ (Table 4).

3.2.1. In-the-moment, subjective embodied well-being

Across sessions, there was a statistically significant change of 1.06 points ($SD = 0.48$) in pre-class ($M = 2.77$, $SD = 0.55$) to post-class scores ($M = 3.84$, $SD = 0.54$); $t(124) = 24.87$, $p = .001$, $d = 1.94$. As expected, EBT participants reported experiencing immediate changes in stress, relaxation, and sense of embodiment. As we sought to analyze the immediate change in participants' subjective embodied well-being after taking a single EBT class, no effects were assessed at follow-up. Effect sizes were large according to Cohen's (1998) convention ($d > 0.80$).

3.2.2. ED behaviors and symptoms

We found partial support for our hypothesis that there would be a decrease in disordered eating symptomatology among participants in the EBT intervention in comparison to those in the waitlist control condition. Specifically, the intervention condition showed a statistically significant decrease in their Global score, as well in Eating Concern at posttest; and these decreases were maintained within the EBT group when measured six-months later; however, there were no significant differences in Dietary Restraint, Weight Concern, or Shape Concern.

3.2.3. Emotion regulation difficulties

Support was found for our second hypothesis that those in the EBT intervention condition would report decreased depression and fewer difficulties regulating emotion than control participants. Similarly, at posttest, participants in the EBT group experienced significantly greater decreases in depression and difficulties with emotion regulation compared to the waitlist control group, as well as a significant downward trend for both at follow-up for the EBT group.

3.2.4. Indicators of positive embodiment

Our third hypothesis that those in the EBT intervention would report increases in indicators of positive embodiment in contrast to control participants was also supported. Likewise, at posttest, those in the EBT group reported experiencing increases in interoceptive awareness, mindful eating, and mindful self-care compared to the waitlist control group; all of these effects for the EBT group were maintained at follow-up.

4. Discussion

A randomized controlled trial comparing EBT, a 7-week, yoga-based ED prevention program to waitlist controls was conducted in the community setting among individuals self-identifying as having eating and body image concerns. Our findings suggest that participating in EBT enhances positive embodiment, believed to be the fundamental framework for positive body image (Cook-Cottone et al., 2017; Cook-Cottone, 2015a, 2015b, 2016, 2020; Menzel & Levine, 2011; Piran & Teall, & Counsell, 2020; Piran, 2016a, 2016b, 2017).

Critically, consistent with prevention literature (Kramer & Cuccolo, 2019), our findings suggest immediate reductions in global disordered eating and eating concern, but not other aspects of ED behaviors, on account of participating in EBT compared to controls (with the reductions sustained in the EBT group over time). Further, as predicted, participants randomly assigned to the EBT group showed significant decreases in factors associated with ED risk such as depressive symptoms and difficulties with emotion regulation as well as increases in skills associated with positive embodiment (i.e. interoceptive awareness, mindful eating, mindful self-care) when compared to controls, with evidence in the EBT group of these positive changes maintained at 6-month follow-up. Our findings also support Cox and Tylka's (2020) state to trait model of protection and recovery. First, EBT program participants experienced immediate improvement in their sense of well-being after a single session of EBT indicating greater state positive embodiment. They reported feeling less stressed, more relaxed, and more embodied compared to before class. Our results are consistent with studies which demonstrate the usefulness of a single yoga session in promoting positive changes in mood and psychological, emotional well-being (Bennett et al., 2015; Park et al., 2020; Tibbitts et al., 2021).

Participating in EBT was associated with reduction in behaviors inconsistent with positive embodiment such as ED behaviors (e.g., global disordered eating, eating concern) and associated factors (i.e., depressive symptoms, difficulties with emotion regulation). Our results demonstrate a decrease in emotional dysregulation (i.e., reduced depression, fewer difficulties in emotion regulation) after EBT that was maintained over time in the treatment group, and are unique in highlighting the potential of yoga-based programs to improve emotional functioning and reduce ED risk. Despite theoretical literature on the effect of yoga on emotion regulation (Cook-Cottone, 2016; Menezes et al., 2015) and the established association between dysregulation and EDs (Prefit et al., 2019), there are no yoga-based, ED prevention programs that target emotion regulation difficulties among adults. As ED behaviors themselves can serve as a means of regulating emotions (Ahrberg, Trojca, Nasrawi, & Vocks, 2011), yoga-

Table 4
Group differences in the study variables across time.

Measures		EBT group M(SD)	Control group M(SD)	Effect of group × Time η_p^2; F tests	For significant Group × Time effect, was effect significant for EBT Group at 6 mos follow-up? d; t tests
EDE-Q T	Pretest	2.53(1.33)	2.51(1.34)	.03; 4.95*	Yes
	Posttest	2.18(1.34)	2.45(1.31)		.59; 5.63***
EDE-Q R	Pretest	1.86(1.43)	2.01(1.50)	.003;0.495	
	Posttest	1.66(1.33)	1.70(1.54)		
EDE-Q EC	Pretest	1.82(1.62)	1.50(1.48)	.02; 4.03*	Yes
	Posttest	1.55(1.56)	1.51(1.43)		.36; 3.39**
EDE-Q SC	Pretest	3.48(1.63)	3.42(1.65)	.07; 12.17***	Yes
	Posttest	2.91(1.65)	3.48(1.68)		.67; 6.33***
EDE-Q WC	Pretest	2.95(1.57)	3.12(1.65)	.02; 3.79	
	Posttest	2.61(1.65)	3.10(1.63)		
TB	Pretest	5.71(7.87)	4.19(6.69)	.003;0.57	
	Posttest	4.86(7.27)	4.08(7.72)		
BD	Pretest	5.56(7.27)	3.53(5.89)	.007; 1.23	
	Posttest	4.80(6.28)	3.77(5.78)		
Purge	Pretest	1.12(2.27)	0.70(1.82)	.003; 1.23	
	Posttest	0.74(1.69)	0.50(1.34)		
BDI	Pretest	15.66(9.16)	11.77(8.99)	.11; 19.4***	Yes
	Posttest	12.91(10.05)	14.13(10.73)		.52; 4.90***
DERS	Pretest	86.82(24.60)	81.41(23.59)	.07; 12.71***	Yes
	Posttest	80.98(22.24)	83.58(23.31)		.57; 5.42***
MAIA	Pretest	2.40(0.76)	2.59(0.70)	.18; 35.5***	Yes
	Posttest	2.93(0.77)	2.58(0.72)		.85; 8.04***
MEQ	Pretest	2.39(0.52)	2.47(0.49)	.03; 4.51*	Yes
	Posttest	2.53(0.55)	2.50(0.49)		.63; 5.98***
MSCS-S	Pretest	3.14(0.66)	3.29(0.49)	.06; 11.24***	Yes
	Posttest	3.32(0.64)	3.25(0.64)		.51; 4.90***

Note. N for intent-to-treat analyses = 168 (90 intervention group, 78 waitlist control group). EDE-Q = Eating Disorder Examination Questionnaire; EDE-Q T = EDE-Q Total. EDE-Q subscales: R = Restraint; EC = Eating Concern; SC = Shape Concern, WC = Weight Concern; TB = Times Binge Eating; BD = Binge Days; Purge = Times Purged; BDI = Beck Depression Inventory; DERS = Difficulties in Emotional Regulation Scale; MAIA = Multidimensional Assessment of Interoceptive Awareness; MEQ = Mindful Eating Questionnaire; MSCS-S = Mindful Self-Care Scale-Short; *p < .05; **p < .01; ***p < .001.

based approaches may provide more adaptive methods for affect management (e.g., cognitive appraisal, deep breathing; Cook-Cottone, 2020). The reductions in depressive symptoms among the intervention group are consistent with systematic and meta-analytic findings (Brinsley et al., 2020). Research that elucidates the impact of yoga on depression is needed, given the inconsistencies in the literature noted by researchers (Halliwell et al., 2019; Vollbehr et al., 2018). These effects may be attributed to the meditative aspects of EBT that promote present-moment awareness (vs. rumination), as well as physiological components which recalibrate the nervous system and address underlying biological mechanisms (i.e., inflammation; Louie, 2014; Pascoe et al., 2017).

Improved positive embodiment was demonstrated through increased interoceptive awareness, mindful eating, and mindful self-care. Our findings suggesting that individuals experienced significant, sustained improvements in their ability to be aware of, and interpret, internal bodily sensations are novel given there are no studies on yoga interventions that target interoceptive awareness as a facet of positive embodiment. This is an important finding given the associations between low interoceptive awareness, EDs (Pollatos et al., 2008), and negative body image (Badoud & Tsakiris, 2017), as well as between aspects of interoceptive awareness and positive body image (Todd et al., 2019).

As hypothesized, EBT participants reported increased mindful eating behaviors, and these effects were sustained over time. These findings are consistent with intervention and cross-sectional literature on the link between yoga practice and mindful eating. In a study by Braun et al. (2021), adults reported significant improvements in intuitive, or mindful eating after participating in a 12-week yoga program. Similarly, Neumark-Sztainer et al. (2020) found that in a sample of 1568 young adults, yoga practitioners had higher levels of mindful eating than non-practitioners. Together, prior findings and our results suggest yoga practice supports individuals' ability to become aware of, and respond to, bodily cues of hunger and satiety. Our findings also may be attributed to EBT's specific focus on interoceptive awareness (e.g., pre-meal meditations, mindful eating, and body awareness cueing during yoga).

In line with our hypothesis, the intervention group reported greater mindful self-care than controls. To our knowledge, there are no yoga-based programs that promote self-care as a means to mitigate ED risk among adult populations. Thus, our findings present a novel contribution which supports theoretical literature on mindful self-care as a factor of positive embodiment (Cook-Cottone, 2020; Piran & Neumark-Sztainer, 2020).

4.1. Strengths, limitations, and future directions

The strengths of this study include an RCT design, a six-month follow-up, and low-to-moderate levels of attrition. Also, EBT is multifaceted in that it incorporates components identified by researchers in the field of embodiment (e.g., yoga and meditation, cognitive dissonance, media literacy; Ariel-Donges et al., 2019; Pacanowski et al., 2020). While there is a dearth of literature on the benefits of utilizing a variety of yoga styles within a yoga-based program, the range of yoga styles included in EBT are taught within the context of body responsiveness. For example, restorative yoga is practiced to teach emotional regulation and partner yoga is incorporated to facilitate connection and communication with others.

There are limitations to this study. First, due to the design of the study, researchers and participants were aware that the EBT group was the intervention and that the waitlist group was the comparison group, as this was disclosed on the consent forms. Consistent with Gangadhar's (2014) concerns that it is difficult to study yoga without participants inferring that the purpose of the research is to study yoga, it is possible and perhaps even likely that the participants in this study understood its purpose. Second, a wait list, rather than active control group, was used in order to conduct an affordable first-phase study on the efficacy of EBT with hopes of using

outcomes to support future, more robust funding opportunities that could support an active control trial design. It is recommended that future studies utilize an active control design in which the controls engage in physical activity as this has been found to be the study design most easily masked when researching yoga (Gangadhar, 2014). Analytically, the design of this study, whereby waitlist participants began the EBT program at Time 2, also held limitations in that only pre-post group differences were able to be meaningfully examined; as such, effects at 6-month follow-up were examined only within the EBT group. Third, the pre-post class measure of in-the-moment subjective embodiment (Cook-Cottone, 2017) used in this study was limited in its ability to both provide a comprehensive definition of embodiment as well as capture how participants were conceptualizing embodiment. The use of a measure that captures a broader range of embodiment experiences and ways individuals are understanding their connection with their body, such as the Experience of Embodiment Scale (Piran & Teall, & Counsell, 2020), would be important in future investigations. Fourth, the sample was a primarily white, cis-gendered, and female participant group of adults; investigation of EBT among more diverse samples is needed (e.g., teens, non-binary individuals). Lastly, the use of the EDE-Q among male participants may not have adequately captured symptoms that typically manifest in male populations. More to the point, despite literature that indicates the presence of lower levels of EDs among males and results that have established EDE-Q norms among male samples, both the EDE-Q and Eating Disorder Inventory (EDI) have been shown to be less reliable and indicative of lower pathology among men than women – unlikely to capture concerns that often emerge among males (e.g., musclarity concerns; Jennings & Phillips, 2017; Smith et al., 2017). Research is needed on the validity of newer measures of ED pathology among male-identifying individuals and on the efficacy of yoga-based programs for those who identify as male.

This study was the first investigation of the efficacy of EBT in a large, community-based sample in the US and UK as well as the utility and effectiveness of yoga-based programs in the development of both state and trait indicators of positive embodiment. Next steps include dismantling studies, research comparing EBT with information-only and active conditions, samples with a greater representation of diversity, inclusion of structured clinical interviews, and qualitative investigations. Relatedly, examination of mediators and program factors not investigated in this study (e.g., types of yoga, facilitator embodiment, group context) would afford a greater understanding of the impact of EBT.

CRediT authorship contribution statement

Esther E. E. Estey: Conceptualization, Methodology, Project administration, Investigation, Data curation, Formal analysis, Writing – original draft, Writing – review & editing, Visualization. **Chelsea Roff:** Funding acquisition, Conceptualization, Resources, Writing – review & editing. **Michael B. Kozlowski:** Formal analysis, Supervision. **Stephanie Rovig:** Conceptualization, Software. **Wendy Guyker:** Conceptualization, Formal analysis, Writing – review & editing. **Catherine P. Cook-Cottone:** Funding acquisition, Conceptualization, Methodology, Project administration, Validation, Writing – review & editing, Supervision.

Declaration of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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