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Examining the effects of mindfulness-based yoga instruction on positive embodiment and affective responses

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ABSTRACT

Empirical evidence provides support for the inclusion of yoga as part of eating disorder prevention efforts through its positive impact on positive embodiment and experience of positive core affect. However, there is a need to identify the specific instructional strategies that will more consistently support positive embodiment and positive affect. We examined the effect of teaching a single yoga class using mindfulness-based instruction compared to appearance-based and neutral instruction alternatives on embodiment (i.e., state body surveillance, state body appreciation, pleasure during yoga) and changes in affect from before to after class. Female participants ($N = 62$; $M_{\text{age}} = 23.89$, $SD = 6.86$) were randomly assigned to a yoga class that emphasized: being mindfully present in one's body, changing one's appearance, or just getting into yoga poses. ANOVAs revealed significantly higher body surveillance ($\eta_p^2 = .10$) and lower forecasted pleasure ($\eta_p^2 = .21$) in the appearance class compared to the other two classes. Participants in the mindfulness class experienced greater improvement in affect ($\eta_p^2 = .08$) from before to after class and higher remembered pleasure during the yoga class ($\eta_p^2 = .19$) compared to those in the appearance class. Emphasizing changes to appearance in yoga instruction may place participants at risk for less positive affect and less positive experiences of embodiment compared to mindfulness-based or even neutral yoga instruction.

Clinical Implications

- Participating in a mindfulness-infused or neutrally instructed yoga class may confer greater experiences of pleasure and embodiment compared to appearance-focused instruction.

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Contact the corresponding author for additional details on the specific robust analyses that were run for each variable.

- Emphasizing changes to appearance in yoga instructions puts participants at risk for less positive experiences of embodiment.

Introduction

Yoga has become increasingly recommended as a practice that may aid in the prevention of eating disorders (Klein & Cook-Cottone, 2013; Osterman et al., 2019). In their systematic review, Klein and Cook-Cottone found that yoga was associated with either lower or no change in eating disorder symptoms and reduced eating disorder risk factors (e.g., negative body image). Understanding how characteristics such as the type, or amount of yoga practiced or how instructors use language to deliver yoga influence core mechanisms of risk will lead to the development of more effective eating disorder prevention interventions. Two likely mechanisms include the cultivation of better emotion regulation and increased positive embodiment as suggested by research findings among yoga practitioners in general (Mahlo & Tiggemann, 2016), yoga practitioners with trauma-histories (Rhodes, 2015), and individuals diagnosed with disordered eating assigned to a yoga intervention (Carei et al., 2010). Eating disorder prevention research suggests that positive embodiment (Levine & Smolak, 2016; Tylka & Kroon Van Diest, 2015) and positive affect (Fredrickson, 2013) may serve as protective factors that serve to disrupt the development of negative body image and emotional dysregulation that are characteristic of eating disorders. Whereas, negative body image and negative affect are consistently associated with the clinical presentation of eating disorders (e.g., Kitsantas et al., 2003; Stice, 2002; Stice & Shaw, 2002).

In practice, yoga may help cultivate these protective factors by providing repeated opportunities to experience the body from an internal, subjective perspective, appreciate one's unique physical characteristics, and notice body sensations and emotional experiences as they come and go (Cook-Cottone, 2020). These experiences are thought to be facilitated by using breath and mindful awareness to simply be with the body and feelings rather than reacting to or attempting to suppress or avoid experience (Cook-Cottone, 2020). Examining how the characteristics of yoga instruction optimize increases in positive embodiment and positive affect may inform the development of more effective interventions aimed at preventing eating disorders in the general population.

Positive embodiment

Embodiment is a complex and multi-faceted construct. Piran (2016, 2017) has developed the Developmental Theory of Embodiment (DTE) to describe five dimensions of positive embodiment: (1) body connection and comfort, (2) agency and functionality, (3) experience and expression of desire, (4) attuned self-care, and (5) inhabiting the body subjectively rather than

objectively. We focus on two dimensions that have received empirical support in the yoga context (e.g., Mahlo & Tiggemann, 2016): *inhabiting the body subjectively* and *body connection/comfort*. The DTE also describes both risks and protective processes that impact one's experience of embodiment (Piran, 2016, 2017, 2019). Physical activity participation that is characterized by being joyfully immersed and not engaging for the purpose of changing the shape or appearance of the body represents one such process (Calogero et al., 2019). Therefore, we also explore the pleasure participants experience during yoga participation as an indicator of positive embodiment.

Inhabiting the body subjectively refers to paying attention to one's internal experience of their body including a range of physical sensations while resisting the pressure to view one's body as an object from an external perspective (Piran, 2016, 2017). There is evidence that supports the relationship between yoga participation and inhabiting the body subjectively. For example, those who participate in yoga (vs. those who do not) have higher body awareness, stronger mind-body connection, and lower self-objectification/body surveillance (i.e., concern about the appearance of one's body; Daubenmier, 2005; Mahlo & Tiggemann, 2016). Body surveillance also declines over the course of sustained yoga participation (Cox, Ullrich-French, Cole, et al., 2016; Cox et al., 2017, 2019; Impett et al., 2006). *Body connection and comfort* means that one feels comfortable, connected, and positive towards their body as they move through the world (Piran, 2016, 2017). Body appreciation is one indicator of this dimension and refers to having respect, appreciation, and acceptance for the unique characteristics of the body (Avalos et al., 2005; Tylka & Wood-Barcalow, 2015). Higher body appreciation was observed in those who practice yoga compared to those who do not (Mahlo & Tiggemann, 2016), and significant increases in body appreciation were observed over the course of 16 weeks of yoga participation (Cox et al., 2019).

Finally, positive embodiment may be enhanced by joyful immersion, or experiencing pleasure during physical activity (Calogero et al., 2019; Piran, 2016, 2017, 2019). There is evidence that yoga practice supports the experience of pleasure while engaged in this form of physical activity. For example, Mackenzie et al. (2014) found that the experience of pleasure in female cancer survivors increased linearly across the duration of an 80-minute yoga class. The extent to which participants are joyfully immersed in the yoga context can be assessed by the degree of pleasure they remember experiencing during yoga participation and the degree to which they expect to experience pleasure during yoga in the future (i.e., forecasted pleasure; Kahneman et al., 1997). Remembered and forecasted pleasure are also critical for supporting future positive embodied experiences since they are predictive of physical activity behavior intentions and behavior generally (Conner et al., 2015; Kwan et al., 2017). Thus, more positive remembered and forecasted pleasure may increase the probability that individuals will seek out future yoga experiences.

Change in affect

Another pathway by which yoga may help reduce eating disorder risk is through better regulation of stress-response systems (Pascoe & Bauer, 2015), which can lead to improvements in affect. Enhanced self-regulation leads to improvements in core affect or the most basic, fundamental assessment of the degree of pleasantness or unpleasantness that one is experiencing (Ekkekakis & Petruzzello, 2000) and is one of the features underlying specific emotions such as anxiety or sadness (Russell & Barrett, 1999). Empirical evidence supports improvements in affect associated with yoga participation. For example, adults participating in a week-long yoga camp demonstrated a 13% increase in positive affect and 47% decrease in negative affect from the first to last day of the camp (Narasimhan et al., 2011). In a randomized controlled trial in a residential eating disorder treatment program, patients demonstrated lower negative affect immediately following participation in a single yoga class session compared to a control group (Pacanowski et al., 2017).

The yoga context

The research on positive embodiment and affective responses in the yoga context all point to the potential for yoga to play a role in supporting pathways to eating disorder prevention and recovery. While a majority of yoga participants have discussed the positive impacts of yoga on their body image and embodiment, a minority also voiced that practicing yoga actually prompted social comparison and negative self-talk about their body (Neumark-Sztainer et al., 2018). The variability in yoga participants' experiences underscores the importance of identifying the elements of the yoga context, such as the instruction provided, that support or undermine positive embodiment and improvement in affect. For instance, a yoga instructor may make comments regarding weight loss, body change, and body shape throughout the class (e.g., "Engage those glutes to burn the fat"). Such comments could detract from participants' ability to immerse themselves fully and joyfully in the practice, experience the body subjectively, and appreciate one's body.

Accordingly, many recommendations for supporting positive embodiment in the yoga context center on the nature of the yoga instruction participants receive (Cook-Cottone & Douglass, 2017; Piran & Neumark-Sztainer, 2020). Consistent with the DTE (Piran, 2019) and research findings (e.g., Neumark-Sztainer et al., 2018), researchers have suggested that positive embodiment can be facilitated by encouraging participants to be present in the moment and focus on the way their body feels (i.e., interoceptive cues), emphasizing a connection with the body (e.g., through the use of breath), and making references to noticing one's experience rather than changing or fixing it as

well as refraining from negative body talk, fat talk, and weight loss or fitness references (Cook-Cottone, 2020; Cook-Cottone & Douglass, 2017). Despite these theoretically grounded recommendations on how to create yoga settings that support positive embodiment, tests of the effectiveness of implementing such approaches are rare. Examining potential mechanisms that explain why or how yoga facilitates improvements in positive embodiment and affective responses is a critical step towards the development of effective yoga interventions or programs that support the prevention or treatment of eating disorders.

A potential unifying theme for the practical recommendations for facilitating embodiment in yoga is mindfulness. Mindfulness refers to open, accepting, nonjudgmental attention and awareness to what is occurring in the present moment (Bishop et al., 2004; Tanay & Bernstein, 2013). Mindful attention to the body during yoga participation has shown particular relevance to embodiment variables. For example, body surveillance and state mindfulness of the body during yoga participation are inversely related (Cox, Ullrich-French, & French, 2016; Cox et al., 2017). The results of a latent growth curve analysis illustrated a positive association between growth in trait mindfulness and growth in body appreciation during 16 weeks of yoga participation in a university sample (Cox & McMahan, 2019). More rigorous experimental designs are needed to build on these observational findings to determine if manipulating mindfulness-based yoga instruction impacts participants' experiences of embodiment and affect.

The purpose of this study was to experimentally test the effect of different instructional cues in a single yoga class on positive embodiment variables and change in affect among women. Dependent variables included core affect before and after the yoga class and post-class assessments of state mindfulness, state body surveillance, state body appreciation, remembered pleasure experienced during the yoga class, and forecasted pleasure during a future yoga class. Participants were randomly assigned to one of three experimentally manipulated yoga classes: (a) mindfulness-based, (b) appearance-based, or (c) neutral. The appearance-based class was selected as a comparison class since thinking about one's outward physical appearance represents a state of low mindfulness and has been theorized to undermine positive embodiment (Cook-Cottone, 2020; Cook-Cottone & Douglass, 2017; Piran, 2016, 2017). Including a neutral class in which participants were simply instructed into the poses provided a strong test of the potential added benefit of including specific mindfulness-based instruction. We hypothesized that state mindfulness during the yoga class, positive embodiment variables, and changes in core affect would be most adaptive in the mindfulness-based class, followed by the neutral condition, and least adaptive in the appearance-based class.

Method

Participant recruitment

Participants were recruited from large representative undergraduate classes and sororities at a mid-sized university in the Northwest region of the United States. Flyers were also posted around campus and on social media.

Measures

Descriptive variables

Participants were asked to report their race, age, and whether or not they were a student. They were also asked if they were a regular exerciser (i.e., at least three times per week for at least 20 minutes at a time; yes/no), regular meditator (yes/no), or were regularly engaging in a yoga practice (yes/no). They reported their level of yoga proficiency on a scale from 1–5, with higher scores indicating greater proficiency (see Daubenmier, 2005).

Baseline variables

Key variables that were relevant to the outcome variables were assessed in order to test for baseline differences. These included trait mindfulness, physical activity motivation, and indicators of positive (i.e., body appreciation) and negative body image (i.e., body preoccupation). These variables were assessed with the Short Inventory for Mindfulness Capabilities (SIM-C; Duan & Li, 2016), the Behavioral Regulation in Exercise Questionnaire-3 (BREQ-3; Markland & Tobin, 2004), the Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015), and the Body Shape Questionnaire-R-10 (BSQ-R-10; Mazzeo, 1999), respectively.

State mindfulness

The body subscale (6 items) from the State Mindfulness Scale for Physical Activity (SMS-PA; Cox, Ullrich-French, & French, 2016) assessed how mindful participants were of their physical sensations (mindfulness of the body; e.g., “I focused on the movement of my body”) throughout the yoga class. Participants respond to each of the items using a response scale ranging from 0 (*not at all*) to 4 (*very much*). Items are averaged and higher scores represent higher mindfulness of the body. There is evidence of the internal consistency reliability (current study $\alpha = .79$) and construct validity of the SMS-PA with college samples (e.g., Cox, Ullrich-French, & French, 2016).

Affective responses

The Feeling Scale (FS; Hardy & Rejeski, 1989) was used to assess basic affective valence immediately before and after the yoga class. The single item scale ranges from 5 (*very good*) to –5 (*very bad*) with additional scale descriptors at 3 (*good*), 1 (*fairly good*), 0 (*neutral*), –1 (*fairly bad*), and –3

(*bad*). Studies provide concurrent validity evidence of the FS (Hardy & Rejeski, 1989; Van Landuyt et al., 2000).

Remembered and forecasted pleasure during yoga participation

Participants' memory of how pleasant the yoga class had been was assessed with a visual analogue scale (see Zenko et al., 2016). They were asked, "Using the scale below please CIRCLE the ONE number that best represents the overall amount of pleasantness or unpleasantness that you felt during the yoga class today." They responded on a 21-point scale from -10 (*Very unpleasant experience*) to 10 (*Very pleasant experience*) with 0 in the middle representing *neutral*. Zenko et al. provided evidence of construct validity using a similar scale in their study on responses to exercise. The Empirical Valence Scale (EVS; Lishner et al., 2008) was used to assess participants' forecasted pleasure. Participants were asked, "If you repeated this yoga session again (in the future), how do you think it would make you feel?" They responded by circling one descriptor on a scale from *most unpleasant imaginable* (-100) to *most pleasant imaginable* (100), with 13 additional descriptors in between. There is evidence of construct validity for the use of this scale within the context of exercise (Zenko et al., 2016).

State body appreciation

The degree to which participants experienced body appreciation immediately following the yoga class was assessed with the state version of the Body Appreciation Scale-2 (Homan, 2016). This measure captures acceptance of, opinions towards, and respect of one's body in the present moment. Participants answer nine items about how they feel at "this very moment" (e.g., "Right now, I respect my body," "At this moment, I feel good about my body") on a 5-point scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Items were averaged to represent a score for state body appreciation in the main analyses. There is evidence of internal consistency reliability (current study $\alpha = .93$) and construct validity in adult samples (e.g., Homan, 2016).

State body surveillance

State body surveillance was assessed using the Body Surveillance subscale of the Objectified Body Consciousness Scale (OBC; McKinley & Hyde, 1996). Participants responded to seven items that were modified to refer to their experience in the yoga class (e.g., "I rarely thought about how I looked," "I thought more about how my body felt than how my body looked") on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). One item from the original scale was not included because it was not relevant or easily modified to the state experience (i.e., "I think it is more important that my clothes are comfortable than whether they look good on me"). So that higher scores reflect higher body surveillance, five items are reverse coded and then all are averaged. Empirical

evidence supports the use of this state version in physical activity settings (e.g., Cox, Ullrich-French, & French, 2016; current study $\alpha = .82$).

Manipulation check items

Two manipulation check items were used to assess the degree to which the participants perceived a class focus on appearance or on being in one's body (i.e., mindfulness of the body). Participants responded on a 5-point scale (1 = *very slightly or not at all*; 2 = *a little*; 3 = *moderately*; 4 = *quite a bit*; 5 = *extremely*): 1. "The teacher in the yoga class I just completed focused on changing one's physical appearance through yoga"; 2. "The teacher in the yoga class I just completed focused on the way our body felt during the yoga class."

Procedures

A between-subjects randomized experimental design was used for this study. IRB approval was obtained from the participating university. Participants provided informed consent and then completed baseline measures via an online survey. Only those participants who identified as female, reported no more than moderate yoga proficiency (i.e., '3' on a scale from 1–5), and who answered 'no' to currently engaging in a "regular" yoga practice were invited to participate in the yoga class portion of the study. We specifically recruited less experienced participants so that they were less likely to have been influenced by previous yoga instruction which could have carry-over effects into the manipulation.

Participants were randomly assigned to one of three yoga class conditions: mindfulness-based, appearance-based, or neutral. A 45-minute yoga sequence was created for an all-levels class. The physical postures or asanas as well as the basic language used to get participants into the poses were held constant across all three conditions. A script was created for each condition and used by the yoga instructor to teach the class. The mindfulness-based and appearance-based conditions contained language for each pose that helped them be present in their body or focus on how the yoga practice would change the appearance of their body, respectively. [Table 1](#) includes examples from each condition. To enhance the ecological validity, we allowed for some variability in the exact wording of the yoga instruction rather than having the instructor read verbatim from the script. To assess the internal validity of each condition, two research assistants independently rated the frequency of cues related to mindfulness or appearance in each class and the average number of cues was calculated by condition. The same yoga instructor taught all classes and had 200-hour certifications in Anusara Yoga and from the Yandara Institute.

On the day of their assigned yoga class, upon arrival participants completed a consent form and the Physical Activity Readiness Questionnaire

Table 1. Examples of yoga poses and instruction for the three conditions.

Pose	Mindful Instruction	Appearance Instruction	Neutral Instruction
Child's Pose	Shift your pelvis back over your feet and reach your torso and arms forward for child's pose. Soak in the feeling of being grounded and held in this restful pose.	Shift the pelvis back over the feet and reach the torso and arms forward for child's pose. Here, you can tone those arms towards one another on the mat ... working on slimming the upper arms.	Shift the pelvis back over the feet and reach the torso and arms forward for child's pose.
Downward Facing Dog	Press through your feet, lift your tail into downward dog pose. Alternate bending your knees and pressing your heels into the ground to warm up your legs. Notice the feeling of strength in your shoulders and back. Allow thoughts that arise to come and go ... Breathe.	Press through the feet, lift the tail into downward dog pose. Alternate bending the knees and pressing the heels into the ground to warm up the legs. Downward dog is great for getting that muscular definition in the shoulders and back and losing excess fat there.	Press through the feet, lift the tail into downward dog pose. Alternate bending the knees and pressing the heels into the ground to warm up the legs.
Side Angle	Plug your elbow into the stability of your knee and feel the connection in side angle. From your foundation of strength, what do you notice along the right side of your body?	Lower the front elbow to knee for side angle. To increase the calorie burn, engage the legs and firm the core.	Lower the front elbow to the knee for side angle.

(PAR-Q; Warburton et al., 2014), which includes questions about one's general health and is used to determine if participants are healthy enough to safely participate in physical activity. If they answered 'yes' to any questions on the PAR-Q, it indicates that they have a health risk that may make physical activity unsafe and they were excluded. Participants were then given a survey packet to take with them and directed to sit on a mat and wait for the class to begin. Just prior to the start of class, a research assistant asked participants to complete the FS for current affective valence from the survey packet. Then the yoga instructor taught for 38 to 45 minutes in the assigned condition. At the end of the class, participants immediately completed measures of affect, state body appreciation, state mindfulness of the mind and body, state body surveillance, remembered and forecasted pleasure, and a subsample completed additional manipulation check items. Participants then turned in their survey packets and received a 5.00 USD gift card for their participation. When participants did not show up for their assigned yoga class (0–5 per session), research assistants were standing by to serve as confederates to make the class environment more realistic. Up to three confederates participated in each class session and classes. There were a total of five mindfulness-based ($n = 19$), five appearance-based ($n = 23$), and seven neutral ($n = 20$) yoga class sessions with two to eight participants per session for a total of 62 participants.

Data analyses

We first tested for assumptions of normality, homogeneity of variance, and outliers followed by a series of one-way ANOVAs and chi-square tests to test for differences in baseline variables. In order to test for differences in the primary dependent variables across the three conditions a series of one-way ANOVAs was conducted. For affective valence from the FS, change scores were created by subtracting the baseline affect scores from the post-class affect scores and used in the analysis. When the results of an ANOVA were significant, pairwise comparisons using least significant difference (equal variance assumed) were examined to determine which groups differed.

Results

Participants

There were 62 female participants ages 18–54 ($M_{\text{age}} = 23.89$, $SD = 6.86$). They mostly self-reported as Caucasian (74.2%), and 51 were students (11 graduate students). Thirty-two self-reported being at a beginner level of yoga, 25 at a beginning-intermediate level, and five at an intermediate level. Six reported having a regular meditation or mindfulness practice.

Preliminary analyses

Manipulation checks

One-way ANOVAs examining the observed frequency of cues related to mindfulness and appearance across the three conditions illustrated clear patterns that support the intended condition content. The mindfulness condition had the highest number of mindfulness cues ($M = 87.1$) compared to the appearance ($M = 16.75$) and neutral ($M = 8.92$) conditions, $F(2) = 94.07$, $p < .001$, $\eta_p^2 = .86$. The appearance condition had the highest number of appearance cues ($M = 21.42$) compared to the mindfulness ($M = 0.00$) and neutral ($M = 6.42$) conditions, $F(2) = 6.24$, $p = .005$, $\eta_p^2 = .29$. The neutral condition did not differ from the mindfulness condition on appearance cues and did not differ from the appearance condition on mindfulness cues. A subsample of participants ($n = 4$ from neutral, $n = 6$ from appearance, $n = 7$ from mindfulness) completed the participant manipulation check items. One-way ANOVAs revealed significant ($p < .05$) differences. For the degree of focus on changing one's appearance, $F(2) = 241.10$, $p < .001$, $\eta_p^2 = .97$, the appearance condition participants reported a significantly ($p < .001$) higher emphasis ($M = 4.83$) compared to both neutral ($M = 1.25$) and mindfulness conditions ($M = 1.00$). For the degree of focus on the way their body felt, $F(2) = 5.64$, $p = .016$, $\eta_p^2 = .45$, the mindfulness condition participants reported significantly ($p = .013$) greater emphasis ($M = 5.00$) compared to the

appearance condition ($M = 3.33$) and was higher but was not significantly different from the neutral condition ($M = 4.00$).

Testing assumptions

There was one outlier ($z > |3.5|$) in the appearance condition on forecasted pleasure. The analysis for forecasted pleasure was conducted with and without this outlier and the interpretation of results did not change. Therefore, all participants were retained in all main analyses. In addition, several of the dependent variables violated assumptions related to normality (i.e., core affect, remembered and forecasted pleasure, state mindfulness of the body) and homogeneity of variance (i.e., remembered and forecasted pleasure, body appreciation). In these cases, appropriate robust analyses (e.g., for normality: Welsh, Brown-Forsyth; for homogeneity: Kruskal Wallis; for follow ups Man-Whitney U and Games Howell¹) were performed to address the specific violations. In most cases, these additional analyses confirmed the traditional ANOVA results. However, we have noted the instances where this is not the case.

Hypothesis testing

There were no baseline differences in positive or negative body image, physical activity motivation, yoga proficiency or trait mindfulness across the three groups of participants ($p > .05$). Nor were there differences in meditation or mindfulness practice. These findings suggest that random assignment was successful in establishing group equivalency on these variables. Descriptive statistics and main results for all dependent variables appear in Table 2.

Table 2. Descriptive statistics for the neutral, appearance, and mindfulness yoga conditions.

	Total	Neutral ($n = 20$)	Appearance ($n = 23$)	Mindfulness ($n = 19$)
	Range	M (SD) Range	M (SD) Range	M (SD) Range
1. Mindfulness of Body	0 to 4	3.52 ^a (0.46) 2.67–4.00	3.57 ^a (0.48) 2.33–4.00	3.46 ^a (0.53) 2.17–4.00
2. Pre Affect	–5 to 5	2.30 (1.03) 1.00–4.00	2.17 (1.72) –1.00–5.00	2.16 (1.68) –2.00–5.00
3. Post Affect	–5 to 5	3.40 (0.75) 2.00–5.00	2.83 (2.01) –2.00–5.00	3.74 (1.33) 1.00–5.00
4. Change in Affect	–10 to 10	1.10 ^{ab} (0.97) –1.00–3.00	0.65 ^a (1.77) –4.00–4.00	1.58 ^b (1.07).00–3.00
5. Remembered Pleasure	–10 to 10	6.60 ^a (2.64) –2–10	3.87 ^b (5.49) –8–10	8.11 ^c (4.12) 5–10
6. Forecasted Pleasure	–100 to 100	58.10 ^a (16.90) 24.00–70.00	33.57 ^b (40.58) –70.00–70.00	66.33 ^a (13.89) 38.00–85.00
7. Body Surveillance	1 to 7	2.86 ^a (1.05) 1.00–5.14	3.70 ^b (1.36) 1.43–6.29	2.92 ^a (1.18) 1.00–5.86
8. Body Appreciation	1 to 5	3.98 ^a (0.39) 3.22–5.00	3.80 ^a (0.85) 2.00–5.00	3.98 ^a (0.72) 2.00–5.00

Different superscripts indicate significant ($p < .05$) differences between groups.

State mindfulness

There were no significant differences in state mindfulness of the body, $F(2) = 0.26$, $p = .78$, $\eta_p^2 = .01$.

Change in affect

The ANOVA showed a modest effect size for change in affect from before to after the yoga class, $F(2) = 2.45$, $p = .10$, $\eta_p^2 = .08$. Participants in the mindfulness condition reported a greater increase in affect (i.e., more positive; $p = .03$, $d = 0.63$) compared to participants in the appearance condition. The non-parametric Kruskal Wallis test showed similar results to the ANOVA ($p = .11$), with follow-up Mann-Whitney U test confirming a significant difference between mindfulness and appearance conditions ($p = .049$).

Remembered and forecasted pleasure

The ANOVA was significant for remembered pleasure, $F(2) = 6.86$, $p = .002$, $\eta_p^2 = .19$. Participants in the appearance condition reported lower remembered pleasure compared to participants in the neutral ($p = .02$, $d = 0.62$) and mindfulness ($p = .001$, $d = 1.01$) conditions. Due to violation of homogeneity of variance and normality, non-parametric robust tests were run and confirmed condition differences. Follow-up robust tests showed the mindfulness condition was higher (Games-Howell, $p = .004$) than the appearance condition and differences based on Mann-Whitney U were found for mindfulness and neutral ($p = .032$) and mindfulness and appearance ($p = .004$) conditions.

The ANOVA was significant for forecasted pleasure, $F(2) = 7.89$, $p = .001$, $\eta_p^2 = .21$. Participants in the appearance condition reported lower forecasted pleasure compared to participants in the neutral ($p = .006$, $d = 0.77$) and mindfulness ($p < .001$, $d = 1.04$) conditions. Non-parametric robust tests were run and confirmed the condition differences.

State body surveillance and body appreciation

The ANOVA for state body surveillance was significant, $F(2) = 3.27$, $p = .045$, $\eta_p^2 = .10$. Participants in the appearance condition reported higher body surveillance compared to participants in the neutral ($p = .03$, $d = 0.70$) and mindfulness ($p = .04$, $d = 0.61$) conditions. There were no significant differences in state body appreciation, $F(2) = 0.47$, $p = .63$, $\eta_p^2 = .02$.

Discussion

In this experiment, the content of yoga instruction was investigated as a potential explanation for the effect of yoga on positive embodiment and affect, thus playing a role in eating disorder prevention. In three distinct conditions, yoga instruction was delivered in a mindful manner that encouraged an open and receptive attention to bodily sensations and experiences, an

appearance-focused approach that focused on altering one's physical appearance, or in a neutral style that simply instructed participants into the poses. Overall, results suggest that appearance-based instruction may place participants at greater risk of less positive embodiment and lower positive affect compared to mindfulness-based and neutral instruction.

Consistent with hypotheses, participants in the mindfulness condition exhibited greater improvements in core affect and reported greater remembered pleasure compared to participants in the appearance condition and neutral condition (only remembered pleasure). Forecasted pleasure was higher and body surveillance lower in participants in both the mindfulness and neutral conditions compared to those in the appearance-focused condition. Consistent with the DTE (Piran, 2019) and practice guidelines (Cook-Cottone & Douglass, 2017), the data indicate that participants in the mindfulness condition had the most positive experiences during the yoga class and those in the appearance-focused class had the least positive experiences, with medium to large effect sizes. In some cases, experiences in the mindful and neutral conditions were similar (e.g., forecasted pleasure, body surveillance) indicating no specific added benefits of adding mindfulness-based instruction over and above simply moving participants through the yoga poses (i.e., the neutral condition). There was, however, some evidence of the specific protective effects of intentional mindfulness-based instruction over neutral instruction (e.g., change in affect) and no indication of risk associated with adding mindful instruction.

These findings are highly consistent with the DTE (Piran, 2019) in that physical activity experiences that are experienced as joyful and support complete immersion in the movement can be protective of positive embodiment, whereas those that are objectifying or emphasize appearance or weight can undermine positive embodiment (Calogero et al., 2019). There were apparent benefits to positive embodiment variables in both the mindfulness and neutral class compared to the appearance class. Generally, these findings are consistent with the increases documented in positive embodiment that occur with yoga participation (e.g., Cox et al., 2019; Halliwell et al., 2019) as well as the general health benefits of a traditional Asana practice throughout its long history (Salmon et al., 2009). However, there are differences across studies in terms of which embodiment variables change, indicating the need for further investigation of different types of yoga. The results also echo studies showing the negative impact of exercise settings that emphasize appearance (e.g., mirrors, instruction) on body image variables and affect (Frayeh & Lewis, 2018; Raedeke et al., 2007).

There were no differences in how mindful participants were of the physical sensations across the three conditions. Regardless of how the yoga condition was instructed, they were equally aware of the experience of being in their body. This is certainly plausible given that in the appearance condition, there were cues directing participants to think about various parts of their body (e.g., abs). The measure of state mindfulness may not be sensitive enough to detect the

difference between paying attention to bodily sensations and being open and accepting of whatever sensations might arise. Therefore, future measurement development is needed to better capture these different components of mindfulness.

This initial investigation into the effects of mindfulness-based yoga instruction on participants' affective responses and experiences of embodiment provides preliminary data on how it might differ from appearance-focused instruction. However, this study was limited by a relatively small, homogenous sample and expanding to samples that are more diverse in terms of age, race, yoga experience, or body size are important future directions. In addition, larger samples would provide the opportunity to test for a number of potential moderating variables that could influence the relationship between different types of yoga instruction and affective/embodiment variables. We also included individuals who were mostly at a beginning to beginning-intermediate level of yoga proficiency. It is possible that differences in yoga skill (or even yoga experience or frequency of practice) moderated the effect of the yoga instruction and this will be important to test in future studies. Finally, although we used an experimental design with random assignment, it is important not to overstate results with absolute certainty and more studies are needed to replicate these findings. Building upon the current experimental study by testing longer yoga interventions would enable the examination of how mindfulness-focused yoga instruction may impact more trait-like variables (e.g., body appreciation, distress tolerance) and actual eating behavior over time.

Implications for practice

When it comes to protection or risk, it appears to matter how yoga is delivered. Consistent with the guidance provided by Cook-Cottone and Douglass (2017), therapists and community members interested in utilizing yoga as a pathway to positive embodiment and affect, reduction of eating disorder risk, or potentially, as an adjunct to treatment for disordered eating, should carefully vet the delivery of yoga before offering a referral. Approaches to yoga instruction that emphasize using yoga to change the appearance of the body may increase risk in the form of reinforcing an objectified or external experience of the body. The results of this study show how such an orientation can interfere with experiencing the protective aspects of yoga. More research is needed to further explore yoga instruction and other contextual influences (e.g., mirrors, images of notably thin/fit men and women doing advanced yoga poses on the walls, and the size and shape of the yoga instructor and students in the class; Cook-Cottone & Douglass, 2017). However, for now, careful referral to yoga instructors who are aware of the benefits of a mindful, embodied approach and the risk inherent to an objectifying approach is encouraged.

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