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The effects of yoga on functionality appreciation and additional facets of positive body image

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ABSTRACT

This study investigated the effects of yoga on functionality appreciation, and the potential mechanisms that could explain the impact of yoga on additional facets of positive body image. Young adult women ($N = 114$; $M_{age} = 22.19$) were randomised to a 10-week Hatha yoga programme or waitlist control group. Participants completed measures of functionality appreciation, body appreciation, body compassion, appearance evaluation, self-objectification, and embodiment at Pretest, Midtest, Posttest, and 1-month Follow-Up. Follow-up data could not be analysed due to high levels of attrition. The remaining data showed that, compared to the control group, women in the yoga programme experienced lower self-objectification at Midtest and greater embodiment over time. Further, all participants experienced improvements in body appreciation, body compassion, and appearance evaluation over time, regardless of their assigned group. Lower self-objectification contributed to improvements in body appreciation and body compassion. In addition, greater embodiment contributed to improvements in body appreciation, body compassion, and appearance evaluation. Contrary to our expectations, yoga did not lead to increased functionality appreciation, nor was functionality appreciation a mediator of the impact of yoga on positive body image. Instead, lower self-objectification, and greater embodiment, drove improvements in positive body image.

1. Introduction

Positive body image is a multifaceted construct, which broadly captures an "overarching love and respect for the body" (Wood-Barcalow, Tylka, & Augustus-Horvath, 2010, p. 112; Tylka & Wood-Barcalow, 2015b). In response to findings that positive body image extends beyond appearance satisfaction and calls to investigate diverse positive body image constructs, more research has begun to emerge on the concept of body functionality (Alleva, Martijn, Van Breukelen, Jansen, & Karos, 2015; Rubin & Steinberg, 2011; Webb, Wood-Barcalow, & Tylka, 2015). *Body functionality* refers to everything that the body is able to *do*, encompassing the domains of physical capacities (e.g., walking), internal processes (e.g., digesting food), bodily senses and sensations (e.g., hearing), creative endeavours (e.g., singing), communication with others (e.g., via body language), and self-care (e.g., sleeping; Alleva, Martijn et al., 2015).

One dimension of body functionality that has accrued empirical support is functionality appreciation. *Functionality appreciation* is a key facet of positive body image and refers to appreciating, respecting, and honouring the body for what it *can* do (Alleva, Tylka, & Kroon Van Diest, 2017). Functionality appreciation extends beyond awareness of body functionality (e.g., a particular woman may focus on her legs and leg muscles as she walks) to emphasise gratitude for body functionality (e.g., she is grateful that her legs and leg muscles allow her to walk). Importantly, functionality appreciation is not contingent on ability and health – individuals can appreciate their body's ability to function in some areas even though their bodies have limited functionality in other areas (Bailey, Gammage, Van Ingen, & Ditor, 2015).

Overall, body functionality and functionality appreciation are valuable constructs because they complement the body image research to date – which has focused predominantly on how individuals think, feel, and behave with regard to their physical appearance or societal appearance ideals (Cash & Smolak, 2011)

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– thereby contributing to a more complete and holistic understanding of body image. One particularly promising contribution of this emerging research concerns the improvement of body image. Namely, experiments have shown that focusing on one's body functionality in an appreciative manner can contribute to increases in facets of positive body image (e.g., body appreciation) and reductions in facets of negative body image (e.g., body dissatisfaction; Alleva, Diedrichs, Halliwell, Martijn et al., 2018; Alleva, Diedrichs, Halliwell, Peters et al., 2018; Alleva, Veldhuis, & Martijn, 2016; Dunaev, Markey, & Brochu, 2018; Mulgrew, Stalley, & Tiggemann, 2017). Integrating body functionality into body image interventions could be valuable, given that extant intervention techniques tend to predominantly address aspects relating to physical appearance, and the effects of interventions tend to be modest (see Alleva, Sheeran, Webb, Martijn, & Miles, 2015, for a review).

To date, experiments that have trained participants to focus on their body functionality have used cognitive, writing-based exercises, wherein participants are typically asked to write about the various functions of their body and why they are personally meaningful (Alleva, Diedrichs, Halliwell, Martijn et al., 2018; Alleva, Diedrichs, Halliwell, Peters et al., 2018; Alleva, Martijn et al., 2015; Dunaev et al., 2018; Mulgrew et al., 2017; Stern & Engeln, 2018). Although these exercises have been effective at improving various aspects of body image in predominantly female samples, it is important to also explore alternative strategies for enhancing a functionality-based focus and functionality appreciation. Speculatively, some individuals might prefer behaviour-based exercises, whereby body functionality is experienced rather than reflected on. Experiencing one's body functionality with an appreciative mind-set could be a powerful strategy as one is immersed in a physical activity and witnesses their body functioning in the present moment. Having a broader 'toolkit' of functionality-based strategies could also be useful to interventionists and reinforce a functionality-based focus that is practiced via other means.

Considering the foregoing discussion, the primary aim of this research was to investigate whether *yoga practice*, as one specific behavioural activity, could be an effective means to enhance functionality appreciation in women. A secondary aim was to investigate the potential mechanisms – including functionality appreciation – that could explain the benefits of yoga for body image.

1.1. Yoga practice and its potential relationship to functionality appreciation

Yoga is a mind-body practice that originated in India over 4,000 years ago, originally comprising spiritual, moral, and physical dimensions aimed at attaining self-awareness (Impett, Daubenmier, & Hirschman, 2006). Hatha is the most common form of yoga practiced in the West, and involves physical postures (i.e., *asanas*), breathing exercises (i.e., *pranayama*), and meditation (i.e., *dhyana*; Riley, 2004). Yoga practice has become extremely popular in Western societies (Ipsos Public Affairs, 2016), with nearly 37 million adults in the U.S. alone having reported practicing yoga within the past six months (Ipsos Public Affairs, 2016).

We propose that yoga practice has the potential to foster functionality appreciation. To illustrate, a primary overarching aim of yoga practice is to "unify mind and body, in part by immersing oneself in subtle sensations of the body" (Daubenmier, 2005; p. 208). Yoga practitioners are encouraged to attend to their bodily sensations before, during, and after a physical posture, and learn to move their body based on an awareness of their bodily functions and sensations, rather than based on an attention to their outward physical appearance (Cox & McMahon, 2019; Cox & Tylka, 2020; Cox, Ullrich-French, Howe, & Cole, 2017; Daubenmier, 2005; Piran & Neumark-Sztainer, 2020). In addition to body awareness, yoga practice also teaches body responsiveness, whereby practitioners are encouraged to listen to and appreciate their bodily functions and sensations, rather than trying to change their body or push its physical limits (Cox & Tylka, 2020; Cox et al., 2017; Daubenmier, 2005; Piran & Neumark-Sztainer, 2020). Collectively, these features of yoga practice could help practitioners to become more appreciative of their body functionality (Piran & Neumark-Sztainer, 2020). In support of this idea, qualitative research has revealed that individuals who practice yoga experience the shift toward a functionality-based focus and cultivating functionality appreciation as key benefits of yoga practice for their body image overall (e.g., "yoga is what brought me around to this idea that my body serves a purpose and a function to bring me through the day;" Neumark-Sztainer, MacLehose, Watts, Pacanowski, & Eisenberg, 2018, p. 161; Dittmann & Freedman, 2009; McIver, Mcgartland, & Halloran, 2009). This is the first study to experimentally test the impact of yoga on functionality appreciation.

1.2. Potential mechanisms to explain the benefits of yoga for body image

We propose that improvements in functionality appreciation resulting from yoga practice could contribute to further improvements in additional facets of positive body image. For example, cultivating functionality appreciation could help individuals to realise all of the reasons that their body is meaningful, valuable, and beautiful to them, many of which may often be taken for granted and/or minimised given the unrealistic appearance ideals promulgated by the media. Improved functionality appreciation may thereby foster greater overall feelings of *body appreciation* (Avalos, Tylka, & Wood-Barcalow, 2005; Tylka & Wood-Barcalow, 2015a) as well as greater *appearance evaluation*. Similarly, developing functionality appreciation could enhance *body compassion* (Altman, Linfield, Salmon, & Beacham, 2017): If individuals recognise the meaningful and valuable functions that their body performs for them, they might be more likely to treat their body with compassion, rather than with criticism and judgement when confronting a body image-related threat or stressor. Until now, the mediating role of functionality appreciation has not been investigated within the context of yoga practice.

We also considered two additional pertinent mechanisms that could explain the impact of yoga on body image: self-objectification and embodiment. First, according to *objectification theory* (Fredrickson & Roberts, 1997), women are routinely valued based on their physical appearance. In turn, women can be socialised to engage in *self-objectification*, which is a tendency to view one's *own* body based predominantly on its physical appearance rather than its functionality or internal qualities. In turn, self-objectification can have adverse consequences, including a more negative body image (see Roberts, Calogero, & Gervais, 2018, for a review). Numerous scholars have proposed that yoga practice can be an effective means to resist cultural pressures to engage in self-objectification because, as described above, it helps orient practitioners away from an outward, appearance-based focus toward their body (e.g., Cook-Cottone, Kane, Keddie, & Hauqli, 2013; Cox et al., 2017; Cox & Tylka, 2020; Daubenmier, 2005; Impett et al., 2006; Klein, 2018; Klein & Guest-Jelley, 2014; Piran & Neumark-Sztainer, 2020; Tylka & Augustus-Horvath, 2011). Following objectification theory, reductions in self-objectification should result in improvements to body image.

The *developmental theory of embodiment* (Piran, 2002, 2015, 2016, 2017; Piran & Teall, 2012) proposes that engaging in embodying activities – "those that are situated in the body, encourage awareness of and attentiveness to the body, and involve absorption in one's current activity" (Swami, 2017, p. 65) – can directly foster a more positive *embodiment* (i.e., the lived-in experiences of

Table 1
Participants' Demographic Characteristics and Experience with Yoga and Physical Activity.

	M (SD)	Range
Age	22.19 (2.42)	18.00–30.00
Body mass index	21.38 (3.22)	15.39–39.04
	n	%
Education level		
Bachelor student	77	67.54
Master student	27	23.68
PhD student	2	1.75
Post-doctoral student	1	0.88
Other	7	6.14
Ethnic background		
German	37	32.46
Dutch	12	10.53
Other Western European	15	13.16
Eastern European	14	12.28
Southern European	14	12.28
North American	7	6.14
Mixed	4	3.51
South American	3	2.63
Asian	2	1.75
Northern European	2	1.75
African	1	0.88
Australian	1	0.88
Caribbean	1	0.88
Central American	1	0.88
Prior experience with yoga		
No	58	50.88
Yes	56	49.12
Months of prior regular yoga practice		
NA (no prior yoga experience)	58	50.88
Prior yoga experience, but no regular practice	43	37.72
1–6 months	6	5.26
6–12 months	5	2.28
> 12 months	2	1.75
Hours of prior yoga practiced per week		
NA (no prior (regular) practice)	101	88.60
30 min to 1h	4	3.51
1–4h	9	7.89
Yoga proficiency level		
Beginner	82	71.93
Beginner-intermediate	23	20.18
Intermediate	7	6.14
Intermediate-advanced	1	0.88
Advanced	1	0.88
Frequency of other physical activity		
Never	3	2.63
Less than once per month	7	6.14
Once a month	5	4.39
2–3 times a month	15	13.16
Once a week	21	18.42
Several times a week	60	52.63
Daily	3	2.63
Time spent on other physical activity per occasion		
NA (no other physical activity)	3	2.63
< 30min	7	6.14
30 min to 1h	61	53.51
1–2h	39	34.21
> 2h	4	3.51

the body and how it engages with the world; Piran, 2002, 2016). Embodied individuals experience their body as a positive, integral part of their self-expression and power (Mahlo & Tiggemann, 2016; Piran, 2015), and this positive relationship between the body and self is proposed to contribute to a more positive body image (Piran, 2002, 2015, 2016, 2017; Piran & Teall, 2012). Many scholars and practitioners have suggested that yoga practice is a particularly embodying activity, as also demonstrated by the characteristics of yoga practice described above (i.e., developing an adaptive, respectful connection between the body and self; Cook-Cottone & Douglass, 2017; Cox & Tylka, 2020; Impett et al., 2006; Mahlo & Tiggemann, 2016; McIver et al., 2009; Piran & Neumark-Sztainer, 2020; Tylka & Augustus-Horvath, 2011). According to the developmental theory of embodiment, increases in embodiment should result in improvements to body image.

In support of objectification theory and the developmental theory of embodiment, research has shown that participation in yoga is related to reductions in self-objectification and to improvements in embodiment and body image (Cox & McMahon, 2019; Cox, Ullrich-French, Tylka, & McMahon, 2019; Daubenmier, 2005; Delaney & Anthis, 2010; Mahlo & Tiggemann, 2016; Neumark-Sztainer et al., 2018; Prichard & Tiggemann, 2008). Experiments have also shown that participation in yoga can cause reductions in self-objectification and improvements in body image (Ariel-Donges, Gordon, Bauman, & Perri, 2018; Cox & McMahon, 2019; Cox, Ullrich-French, Cole, & D'Hondt-Taylor, 2016, Cox et al., 2017, Cox et al., 2019; Impett et al., 2006; Gammage, Drouin, & Lamarche, 2016; Ranjbar, Moghddam, & Pasand, 2016). To the best of our knowledge the mediating role of self-objectification between yoga practice and body image has not been directly tested yet. Cross-sectional research has supported the mediating role of embodiment in the relationship between yoga practice and body image (Mahlo & Tiggemann, 2016), though this is the first study to test these relationships within an experimental design.

1.3. The present research

This study investigated whether yoga practice can enhance functionality appreciation. We predicted that women randomised to a yoga programme, compared to women randomised to a waitlist control group, would experience improvements in functionality appreciation from Pretest to Midtest and Posttest, and that these improvements would persist at 1-month Follow-Up. We also predicted that women randomised to a yoga programme would experience improvements in additional facets of positive body image (body appreciation, appearance evaluation, body compassion) and embodiment, as well as reductions in self-objectification, compared to women in a waitlist control group.

This study also investigated the potential mechanisms that could explain the benefits of yoga practice on (additional) facets of positive body image. Specifically, we tested whether yoga practice would contribute to improvements in facets of positive body image (body appreciation, appearance evaluation, body compassion) via (a) greater functionality appreciation, (b) lower self-objectification, and (c) greater embodiment.

2. Method

2.1. Participants and procedure

This study was approved by the Ethics Review Committee Psychology and Neuroscience (Maastricht University) and was preregistered on AsPredicted; no changes were made to the study design, hypotheses, or analyses after preregistration.[1] Sample size calculations (G*Power; Faul, Erdfelder, Lang, & Buchner, 2007) indicated a required sample size of $N = 107$, assuming a small effect size, a two-sided 5% significance level, 80 % power, and a repeated measures design. This sample size is considered sufficient for reliable estimation of multilevel models (Maas & Hox, 2005), as per our planned analyses. Participants were 114 women between 18 and 30 years old. Their demographic information and prior experience with yoga and other physical activities are summarised in Table 1. Fig. 1 shows participant flow through the study.

The participants were recruited via flyers on campus, social media (e.g., local event pages), throughout the city (e.g., cafés), and face-to-face (e.g., in the university cafeteria). Potential participants

[1] The link to our preregistration on AsPredicted is https://aspredicted.org/a4yg9.pdf.

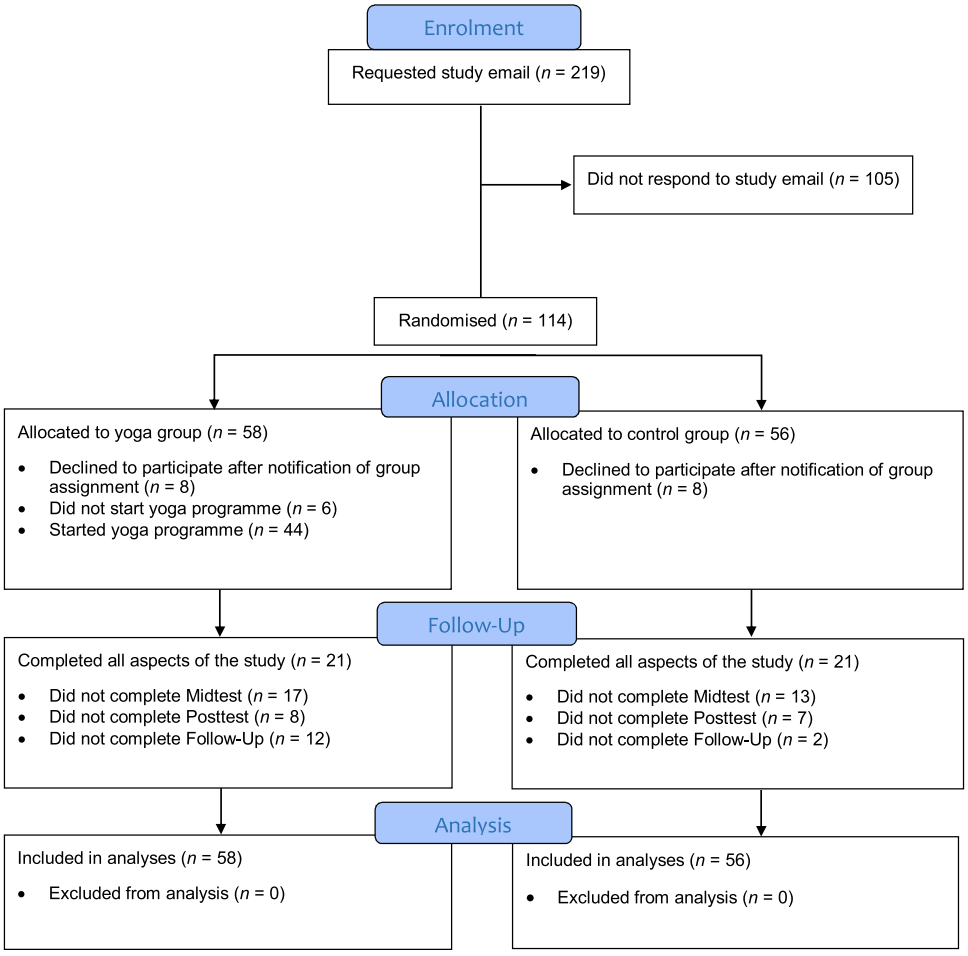

Fig. 1. Participant Flow Throughout the Study.

received an information letter with details about the study. They were told that the study would investigate the effects of yoga on well-being (body image was not mentioned), and that they would be randomised to the "yoga group" or the "comparison group." Inclusion criteria were that participants must be women between 18 and 30 years old, who were not currently practicing yoga, were not pregnant, and did not have a medical condition that prevented them from practicing yoga (examples given were high blood pressure, recent head or eye surgery, or active inflammation in the joints). Potential participants were also informed that they must be able to attend all of the yoga classes if assigned to the yoga group or, if assigned to the comparison group, they must agree to not practice yoga for the duration of the study. They were informed that participants assigned to the yoga group would receive the yoga programme for free and would be entered into a raffle to win a yoga-mat carrier if they attended all classes, and that participants in the comparison group would receive a €7.50 gift voucher and could take part in a free yoga workshop after study completion.

Potential participants then received a link to the electronic informed consent sheet and Pretest measures. They were told that they would only be included in the study and randomised to group if they fully completed the Pretest. The Pretest was completed within two weeks prior to the start of the yoga programme. Within one week of the start of the yoga programme, participants were notified whether they had been randomised to the yoga group or the comparison group. Within the yoga group, participants were randomised to Class 1 (Tuesdays at 9:30–10:30) or Class 2 (Tuesdays at 11:00–12:00). Randomisation was determined by a randomisation list generated by Random.Org.

Participants assigned to the yoga group completed the 10-week yoga programme (see below). After the fifth class, and after the last class, they received an e-mail invitation to complete the Midtest and Posttest measures, respectively. Participants in the comparison group received a link to the Midtest and Posttest at the same time as the participants in the yoga group. Participants in both groups completed the Follow-Up one month after the yoga programme ended. After data collection was completed, they were emailed a debriefing letter with details about the background and hypotheses of the study. Participants in the comparison group then received their gift voucher and were invited to take part in a free yoga workshop.

2.2. Measures

2.2.1. Functionality Appreciation Scale (FAS; Alleva et al., 2017)

The FAS comprises seven items (e.g., "I appreciate my body for what it is capable of doing"), rated from 1 = *strongly disagree* to 5 = *strongly agree*. Scores on the FAS items are averaged; higher scores reflect higher levels of functionality appreciation. FAS scores have demonstrated internal consistency, 3-week test-retest reliability, and construct validity among U.S. community women (Alleva et al., 2017). Cronbach's alphas at Pretest, Midtest, Posttest, and Follow-Up were .87, .91, .92, and .92, respectively.

2.2.2. Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015a)

The BAS-2 contains 10 items (e.g., "I feel love for my body") rated from 1 = *never* to 5 = *always*. Scores on the BAS-2 items are averaged; higher scores reflect higher levels of body apprecia-

tion. BAS-2 scores have demonstrated internal consistency, 21-day test-retest reliability, and construct validity among U.S. community and undergraduate women (Tylka & Wood-Barcalow, 2015a). Cronbach's alphas at Pretest, Midtest, Posttest, and Follow-Up were .93, .95, .96, and .95, respectively.

2.2.3. Body Compassion Scale (BCS; Altman et al., 2017)

The BCS contains 23 items, rated from 1 = *almost never* to 5 = *almost always*. BCS items can be divided into the Defusion (9 items; e.g., "When I feel frustrated with my body's inability to do something, I tend to feel separate and cut off from other people;" reverse-scored), Common Humanity (9 items; e.g., "I try to see my body's failings as something everyone experiences in one way or another"), and Acceptance (5 items; e.g., "I am tolerant of my body's flaws and inadequacies") Subscales. Sum scores can be calculated based on those for the three subscales separately, or based on the overall score. In this study, scores on the 23 BCS items were summed, with higher scores demonstrating higher levels of body compassion. Scores on the BCS items have shown internal consistency and construct validity among undergraduate women in the U.S. (Altman et al., 2017). Cronbach's alphas at Pretest, Midtest, Posttest, and Follow-Up were .89, .93, .94, and .92, respectively.

2.2.4. Multidimensional Body-Self Relations Questionnaire – Appearance Evaluation Subscale (Brown, Cash, & Mikulka, 1990; Cash, 2000)

The Appearance Evaluation Subscale comprises seven items (e.g., "I like my looks just the way they are"), rated from 1 = *definitely disagree* to 5 = *definitely agree*. Item scores are averaged; higher scores demonstrate a more positive appearance evaluation. Scores on the items of this subscale have demonstrated internal consistency, 3-week test-retest reliability, and construct validity among samples of U.S. community women (Cash, 2000). Cronbach's alphas at Pretest, Midtest, Posttest, and Follow-Up were .90, .93, .94, and .93, respectively.

2.2.5. Self-Objectification Beliefs and Behaviors Scale (SOBBS; Lindner & Tantleff-Dunn, 2017)

The SOBBS comprises 14 items, rated from 1 = *strongly disagree* to 5 = *strongly agree*. They can be divided into the Observer Perspective (7 items; e.g., "I often think about how my body must look to others") and Body-as-Self (7 items; e.g., "My physical appearance is more important than my physical abilities") Subscales. Mean scores can be calculated for the subscales separately, or for the overall scale. In this study, scores on the 14 SOBBS items were averaged, with higher scores reflecting higher levels of self-objectification. Scores on the SOBBS have demonstrated internal consistency, 2-week test-retest reliability, and construct validity among US community and undergraduate women (Lindner & Tantleff-Dunn, 2017). Cronbach's alphas at Pretest, Midtest, Posttest, and Follow-Up were .87, .88, .88, and .88, respectively.

2.2.6. Physical Body Experiences Questionnaire (PBE; Menzel, 2010)

The PBE comprises 18 items (e.g., "I have developed a connection between my body, my mind, and myself"), rated from 1 = *not at all true about me* to 7 = *very true about me*. Scores on the PBE items are averaged; higher scores reflect higher levels of embodiment during physical activity. PBE scores have demonstrated internal consistency and construct validity among U.S. female undergraduates (Menzel, 2010). Cronbach's alphas at Pretest, Midtest, Posttest, and Follow-Up were .88, .91, .92, and .94, respectively.

2.2.7. Demographic items

Participants reported their age, ethnic background, current education level, and weight and height (to calculate their body mass index; BMI).

2.2.8. Prior experience with yoga and physical activity

For descriptive purposes, participants were asked to indicate their level of yoga proficiency, how many months they had regularly (at least once per two weeks) been practicing yoga, and how many hours per week they practiced (Cox et al., 2016, 2017). To provide an estimate of participants' levels of other physical activity, they were asked to indicate how frequently they engaged in physical activities other than yoga (1 = *never*, 7 = *daily*), how long they usually spent on those activities per occasion (1 = *less than* 30 min, 4 = *more than* 2 h), and what those physical activities were (Prichard & Tiggemann, 2008).

2.2.9. Evaluation of the yoga programme

Participants in the yoga group evaluated the yoga programme using visual analogue scales (VAS), based on (a) how much they enjoyed taking part in the programme (0 = *not at all*, 100 = *very much*); (b) what they thought about the number of classes (0 = *too few*, 100 = *too many*); (c) what they thought about the length of each class (0 = *too short*, 100 = *too long*), (d) how comfortable they felt while practicing yoga (0 = *not at all*, 100 = *very much*), (e) whether they felt the urge to compare their body to the bodies of the other participants (0 = *not at all*, 100 = *very much*), (f) whether they thought the yoga instructor helped them to appreciate their body (0 = *not at all*, 100 = *very much*), and (g) to what extent the programme helped them to value the function of their body more than the way their body looks (0 = *not at all,* 100 = *very much*). Participants were also asked to indicate whether they planned to continue practicing yoga after the end of the programme (*yes*, *no*, *not sure yet*).

2.3. Assessment schedule

At Pretest, participants completed (in order): (a) the demographic items and prior experience with yoga and physical activity; (b) FAS; (c) BAS-2; (d) PBE; (e) Appearance Evaluation Subscale; (f) SOBBS; (g) BCS; and (h) additional questionnaires.[2] At Midtest, Posttest, and Follow-Up, they completed the same questionnaires as at the Pretest (b-h, above), but the Posttest also included the evaluation questions for participants in the yoga group.

2.4. Yoga programme

The yoga programme comprised 10 weekly 60 min classes. Hatha yoga was chosen, given that this form is most commonly practiced in Western societies (Riley, 2004) and its emphasis on body function, body awareness, and body responsiveness (Impett et al., 2006). Classes were led by the third author, a Hatha yoga instructor with 10 years of yoga experience, including 5 years of teaching experience. The location of the classes was a yoga studio with no mirrors (see Frayeh & Lewis, 2018). Yoga mats and blankets were provided, and soft instrumental music was played during

[2] For a separate study with separate aims (unrelated to body image), participants completed the 15-item Five Facet Mindfulness Questionnaire (Gu et al., 2016), the Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983), the Patient-Reported Outcomes Measurement Information System – Depression Short Form (http://www.healthmeasures.net), the Satisfaction with Life Scale (Diener, Emmons, Larsen, & Griffin, 1985), and the 6-item Gratitude Questionnaire (McCullough, Emmons, & Tsang, 2002). This separate study was also described as part of our preregistration on AsPredicted (see https://aspredicted.org/a4yg9.pdf).

Table 2
Group Differences in the Study Variables across Time.

	Yoga Group	Comparison Group	Effect of Time	Effect of Group × Time
Constructs	*M(SD)*	*M(SD)*	η^2_P; *F* tests	η^2_P; *F* tests
Embodiment			0.13; 9.75***	0.05; 3.91*
Pretest	4.88(0.82)	4.73(0.89)		
Midtest	5.32(0.74)	4.82(0.98)		
Posttest	5.36(0.84)	4.82(0.91)		
Self-Objectification			0.03; 1.70	0.001; 0.09
Pretest	2.48(0.42)	2.67(0.59)		
Midtest	2.46(0.50)	2.69(0.61)		
Posttest	2.37(0.52)	2.60(0.66)		
Functionality Appreciation			0.02; 1.71	0.03; 2.41
Pretest	4.08(0.60)	3.82(0.80)		
Midtest	4.30(0.44)	3.80(0.80)		
Posttest	4.34(0.45)	3.80(0.64)		
Body Appreciation			0.18; 14.82***	0.03; 2.03
Pretest	3.47(0.68)	3.30(0.84)		
Midtest	3.68(0.70)	3.40(0.86)		
Posttest	3.86(0.65)	3.48(0.84)		
Body Compassion			0.12; 9.13***	0.002; 0.16
Pretest	69.09(11.65)	69.11(16.01)		
Midtest	73.33(14.10)	71.83(18.44)		
Posttest	75.36(15.16)	74.49(16.90)		
Appearance Evaluation			0.12; 8.79***	0.04; 2.61
Pretest	3.48(0.68)	3.30(0.91)		
Midtest	3.76(0.65)	3.35(1.01)		
Posttest	3.73(0.81)	3.46(0.94)		

Note. $N_{yoga} = 58$, $N_{control} = 56$; *F* tests for main effect of Time and for interaction of Time × Group; *$p < .05$, two-tailed; **$p < .01$, two-tailed; ***$p < .001$, two-tailed.

class. The first class began with an introduction of the yoga instructor and participants, a brief introduction to Hatha yoga, and a check of any physical complaints (e.g., should modifications be needed). Each class comprised: (a) seven to eight seated (e.g., owl) or 'table-top' (e.g., cat/cow) asanas, including downward-facing dog; (b) two to five standing asanas (e.g., Warrior I); (c) one or two balance asanas (e.g., tree); (d) two core asanas (e.g., dolphin) or additional seated or table-top asanas; (e) one hip-opener asana (e.g., pigeon); (f) two to three back asanas (e.g., happy baby); and (g) at least five minutes of relaxation asana (e.g., savasana).

The yoga instructor's language intentionally emphasised acceptance, empowerment, connecting, respecting boundaries, compassion, and relinquishing control. Further, each class revolved around two themes, such as "being gentle" and "everybody's body is different." The yoga instructor kept track of the themes that were covered in each class, to ensure they were all covered by the end of the programme. In addition, the fifth and sixth author attended the yoga classes (one per class); they audio-recorded the instructor during each class, and later checked that all themes were in fact covered by the end of the programme (which they were). The yoga programme was inspired by the programme designed by Carei, Fyfe-Johnson, Breuner, and Brown (2010), which was developed for women with an eating disorder. We also consulted the yoga instructor, as well as the prior literature on yoga, positive body image, and embodiment (described in the Introduction). The yoga instructor was informed that the research concerned body image and well-being, but she was not familiar with the field of body image. Relatedly, although the language and themes broadly emphasised developing a positive body-self connection, the yoga instructor did not explicitly direct participants to focus more on their body functionality or to focus less on their physical appearance. The present yoga programme can be found in the Supplementary Materials.

2.5. Statistical analyses

First, bivariate correlations were examined among the Pretest scores of the variables (i.e., functionality appreciation, body appreciation, body compassion, appearance evaluation, self-objectification, and embodiment). Second, mixed ANOVAs were conducted to explore the effects of Group, Time, and Group × Time on each variable. Third, the scores of self-objectification, functionality appreciation, and embodiment at Midtest were included in mediational structural equation models (Bryan, Schmiege, & Broaddus, 2007) to explore the active ingredients of Group effects on the remaining variables at Posttest (i.e., body appreciation, body compassion, and appearance evaluation). Full information maximum likelihood (FIML) estimation was utilized (c.f., Schafer & Graham, 2002) to account for missing data.

3. Results

3.1. Descriptive information and data preparation

Of the 114 participants who completed the Pretest, 58 were randomised to the yoga group, and 56 were randomised to the control group (see Fig. 1). After completing the Pretest and receiving notification of group assignment, eight participants in each group informed us that they declined to participate in the remainder of the study because they were disappointed about their assigned group. A further six participants assigned to the yoga group did not show up to any classes and did not notify the research team. As a result, 44 participants actually started the yoga programme ($n_{class1} = 21$, $n_{class2} = 23$). At the remaining time points, 84 participants completed the Midtest ($n_{yoga} = 41$, $n_{control} = 43$), 69 participants completed the Posttest ($n_{yoga} = 33$, $n_{control} = 36$), and 55 participants completed the 1-month Follow-Up ($n_{yoga} = 21$, $n_{control} = 34$). The analyses concerned the Pretest, Midtest, and Posttest data only because the high level of attrition at Follow-Up exceeded ~50 %, which is the maximum level of missingness allowable using FIML to account for missing data (c.f. Graham & Schafer, 1999).

A series of ANOVAs on functionality appreciation, body appreciation, body compassion, appearance evaluation, self-objectification, and embodiment at Pretest using Group and Retention (retained vs. not retained) as the independent variables were conducted to test for differential attrition (Bryan, Aiken, & West, 1996). There were no Group × Retention effects for any of the variables (*ps* > .05). The results of these analyses indicated no

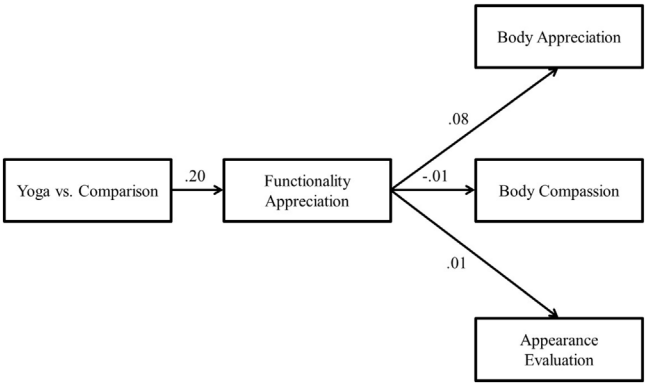

Fig. 2. Functionality Appreciation as Mediator.
Note. Coefficients are standardised.

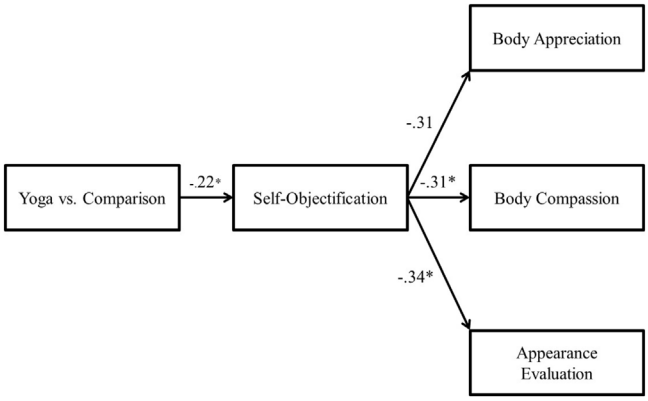

Fig. 3. Self-Objectification as Mediator.
Note. *p < .05, two-tailed; coefficients are standardised.

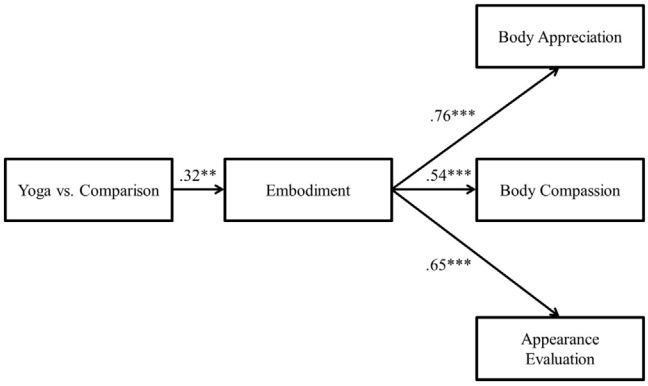

Fig. 4. Embodiment as Mediator.
Note. **p < .01, two-tailed; ***p < .001, two-tailed; coefficients are standardised.

differential attrition occurred by group (see Supplementary Materials).

Participants' scores on the questionnaires across time are presented in Table 2. The data were examined for skewness and kurtosis, and these tests did not substantially depart from normality. Outliers were considered those values that were ± 3 *SD* the group mean. At Pretest, Midtest, and Posttest, two, three, and one outliers were identified, respectively. These concerned scores on the FAS and PBE, in all cases but one (Appearance Evaluation Subscale). Outlier values were replaced with the boundary values identified (i.e., ± 3 *SD* the group mean).

3.2. Pretest relationships between the study variables

Correlations between the variables at Pretest are displayed in Table 3. Almost all of the variables were significantly associated with one another. However, self-objectification was not significantly associated with functionality appreciation or embodiment.

3.3. Group differences in the study variables across time

Pre-, Mid-, and Posttest means are given in Table 2 by Group, along with mixed ANOVAs (i.e., Group × Time) for each variable. There was a significant Group × Time effect for embodiment. Simple effects of Time within Group were investigated to determine in which group the time differences existed. Specifically, embodiment significantly increased in the yoga group between Pretest and Midtest and between Pretest and Posttest (*ps* < .001; see Table 2 for means). Participants in the control group did not experience any significant changes in embodiment across time (*ps* > .05).

No other significant Group × Time effects were found. However, there was a significant effect of Time for body appreciation, body compassion, and appearance evaluation, showing that participants experienced improvements on these facets of positive body image over time, regardless of their assigned group.

3.4. Linking yoga practice to improved body image

We estimated a series of mediational models via path analysis (Bryan et al., 2007) using Mplus version 7.3 wherein one exogenous variable representing one planned contrast, yoga vs. control group, was used (See Figs. 2–4). Mediators were the Midtest values of each mediational construct (Bryan et al., 1996). With the exception of functionality appreciation there were no significant differences at Pretest between groups. A difference score (functionality appreciation at Midtest – functionality appreciation at Pretest) was used to test the functionality appreciation mediator within the context of the model. Full information maximum likelihood estimation, which allowed for robust estimation of standard errors, was utilised to account for the missing data at Posttest (Schafer & Graham, 2002).

3.4.1. Functionality appreciation as mediator

The fit of this model was adequate, $\chi^2(3, N = 114) = 8.21$, $p = .04$, RMSEA (90 % CI .21–.23) = .12, CFI = .97, SRMR = .06. The path from the yoga vs. control group contrast to functionality appreciation was nonsignificant (see Fig. 2). Furthermore, the paths from functionality appreciation to body appreciation, body compassion, and appearance evaluation were nonsignificant.

3.4.2. Self-objectification as mediator

The fit of this model was adequate, $\chi^2(3, N = 114) = 8.68$, $p = .03$, RMSEA (90 % CI .03–.23) = .13, CFI = .97, SRMR = .04.[3] The path from the yoga vs. control group contrast to self-objectification was significant, such that the yoga group experienced lower scores in self-objectification than the control group. Lower self-objectification predicted body compassion and appearance evaluation, but not body appreciation (see Fig. 3).

Note that these path analyses suggest that the yoga group did in fact experience differences in self-objectification (at Midtest) compared to the control group, whereas the mixed ANOVAs had not revealed any significant effects of Group or Group × Time. How-

[3] While an RMSEA = .13 is slightly above Hu and Bentler's (1999) guidelines for acceptable fit, it should be noted that the RMSEA performs better with larger sample sizes (our sample size was on the smaller side for estimating RMSEA; Kline, 2016). Furthermore, researchers have contested the adequacy of determining model fit by focusing on one fit index and instead advocate for a more holistic approach to determining model fit (Marsh, Hau, & Wen, 2004). Given that the remainder of fit indices suggested good fit, this model was determined to be adequate.

Table 3
Intercorrelation Matrix for the Study Variables at Pretest among the Full Sample.

	1.	2.	3.	4.	5.	6.
1. Embodiment	–					
2. Self-Objectification	−.17	–				
3. Functionality Appreciation	.66***	−.11	–			
4. Body Appreciation	.74***	−.31**	.69***	–		
5. Body Compassion	.56***	−.36***	.46***	.69***	–	
6. Appearance Evaluation	.58***	−.34***	.51***	.81***	.63***	–
M	4.81	2.59	3.99	3.38	68.37	3.41
SD	0.83	0.60	0.65	0.73	14.27	0.76

Note. *$p < .05$, two-tailed; **$p < .01$, two-tailed; ***$p < .001$, two-tailed.

ever, the results of the path analyses are likely to be more reliable, as they take the additional factors of the model into account, thus providing a more nuanced analysis of the data.

3.4.3. Embodiment as mediator

The fit of this model was adequate, $\chi^2(3, N = 114) = 4.65$, $p = .20$, RMSEA (90 % CI 0.00−0.19) = .07, CFI = .99, SRMR = .03. The path from the yoga vs. control group contrast to embodiment was significant, such that the yoga group experienced higher levels of embodiment than the control group. Embodiment predicted body appreciation, body compassion, and appearance evaluation (see Fig. 4).

3.5. Evaluation of the yoga programme

Participants in the yoga group who completed the Posttest ($n = 33$) reported high levels of enjoyment of the yoga programme ($M = 94.73$, $SD = 9.66$). Their scores indicated that they thought that the number of yoga classes were neither too few nor too many ($M = 45.82$, $SD = 22.34$), nor were the classes too short or too long ($M = 55.97$, $SD = 20.81$). Participants also reported high levels of comfort while practicing yoga ($M = 92.61$, $SD = 10.85$), and a moderate urge to make body comparisons with other participants ($M = 39.30$, $SD = 31.29$). They perceived that the yoga instructor helped them to appreciate their body ($M = 77.82$, $SD = 28.36$) and that the yoga programme helped them to value the function of their body more than its physical appearance ($M = 75.09$, $SD = 24.53$). The majority of participants ($n = 27$) indicated that they planned to continue practicing yoga, whereas five were not yet sure and one did not plan to continue practicing yoga.

4. Discussion

The primary aim of this study was to investigate whether yoga could be a potential practice for enhancing functionality appreciation, as an alternative or complement to other approaches that foster functionality appreciation via cognitive-, writing-based exercises (e.g., Alleva, Martijn et al., 2015; Dunaev et al., 2018; Mulgrew et al., 2017). In addition, we investigated whether yoga practice would lead to improvements in additional facets of positive body image and embodiment, and to reductions in self-objectification, and tested potential mechanisms that could explain the benefits of yoga practice on (additional) facets of positive body image. Contrary to our hypotheses, women who completed the yoga programme did not experience improvements in functionality appreciation compared to women assigned to the control group. However, women in the yoga programme did experience lower self-objectification at Midtest (according to the path analyses), as well as greater embodiment across time, whereas those in the control group did not. Interestingly, all women experienced improvements in body appreciation, body compassion, and appearance evaluation across time.

With respect to the potential mechanisms underlying the impact of yoga practice on positive body image, we found that functionality appreciation did not emerge as a significant mediator of the effects of yoga practice on the additional facets of positive body image. However, as expected, lower levels of self-objectification predicted body compassion and appearance evaluation (but not body appreciation). Further, as we also expected, higher levels of embodiment predicted body appreciation, body compassion, and appearance evaluation. To the best of our knowledge, this is the first study to have experimentally tested the impact of yoga practice on functionality appreciation and embodiment, and whether functionality appreciation, self-objectification, and embodiment could explain the effects of yoga on (additional) facets of positive body image. The findings raise several important points, which we discuss in turn below.

4.1. Yoga practice and its relationship to functionality appreciation

First, it is surprising that the yoga programme did not lead to improvements in functionality appreciation, nor did functionality appreciation mediate the impact of yoga practice on further aspects of positive body image, as would have been expected based on prior theory and literature related to body functionality (e.g., Alleva, Diedrichs, Halliwell, Martijn et al., 2018; Alleva, Diedrichs, Halliwell, Peters et al., 2018; Dunaev et al., 2018; Fredrickson & Roberts, 1997; Mulgrew et al., 2017; Piran, 2002, 2015, 2016, 2017; Piran & Teall, 2012; Piran & Neumark-Sztainer, 2020; Stern & Engeln, 2018). Further, one of the proposed benefits of yoga is its propensity to help women to focus on their body functionality, more so than their physical appearance (e.g., Cook-Cottone et al., 2013; Cox et al., 2017; Cox & Tylka, 2020; Impett et al., 2006; Klein, 2018; Klein & Guest-Jelley, 2014; Piran & Neumark-Sztainer, 2020; Tylka & Augustus-Horvath, 2011).

The lack of significant findings with respect to functionality appreciation is especially interesting in light of women's evaluations of the yoga programme: They reported that the yoga instructor helped them to appreciate their body and focus more on valuing its functionality than its physical appearance. Interestingly, however, the women also reported a moderate urge to compare their body with other women in the class (even though the space did not contain mirrors, which have been shown to enhance social comparisons; Frayeh & Lewis, 2018). These findings could suggest that social comparisons – either with respect to physical appearance or aspects of body functionality (e.g., flexibility) – may have undermined the potential benefits of focusing on one's body functionality (Mulgrew et al., 2017; Vinoski Thomas et al., 2019). Other scholars have suggested that the opportunity to make upward social comparisons could be a potential 'risk' of yoga practice for some (e.g., Cox & Tylka, 2020; Neumark-Sztainer et al., 2018), and research has shown that social comparisons within the context of physical activity can undermine its benefits for women's body image (e.g., Frayeh & Lewis, 2018). Relatedly, prior experiments have shown that focusing on the body functionality of *other women* can lead to worsened body image, especially among

women who have a stronger tendency to make functionality-based social comparisons (Mulgrew & Tiggemann, 2018; Mulgrew et al., 2017). However, if social comparison processes did undermine the benefits of yoga practice in the present study, it is puzzling that women in the yoga programme still experienced higher embodiment and lower self-objectification. Nevertheless, future research should explore social comparison tendencies as a moderator of the effect of yoga practice on functionality appreciation and additional facets of positive body image and embodiment.

There are other potential reasons why we did not find improvements in functionality appreciation among women in the yoga programme. It may be crucial to not only foster a focus on *awareness* of body functionality but, more importantly, to *appreciate* one's body functionality. Bringing awareness to body functionality is likely to be an important first step in moving away from an appearance-based focus toward the body. But, as also noted by other scholars, merely being aware of one's body functionality will not be beneficial if this focus elicits upward social comparisons, an emphasis on what one's body cannot do (well), or an emphasis on only few domains/aspects of body functionality (Alleva, Diedrichs, Halliwell, Peters et al., 2018; Alleva et al., 2017; Neumark-Sztainer et al., 2018; Piran & Neumark-Sztainer, 2020; Rubin & Steinberg, 2011; Vinoski Thomas et al., 2019; Webb et al., 2015). Notably, although women in the yoga programme reported that the instructor helped them to value their body functionality more than its physical appearance, these evaluations were completed only by participants who took the Posttest. Perhaps women who dropped out of the study beforehand had only developed functionality awareness, but not yet appreciation. That is, functionality appreciation may develop only *after* functionality awareness. Future research could tease apart these relationships, and their directionality, by also assessing functionality awareness.

Another potential reason why improvements in functionality appreciation did not emerge may have to do with our measure of functionality appreciation. The FAS (Alleva et al., 2017) assesses functionality appreciation in a broad sense. In contrast, the measure used to assess embodiment – the PBE (Menzel, 2010) – assesses the experience of embodiment within the context of physical activity specifically. Although the majority of PBE items are phrased in a general way (e.g., "I feel good inside of my body"), many are specific to physical activity (e.g., "I feel uncomfortable pushing my body's physical limits"). A measure of functionality appreciation that is specific to the context of physical activity may better tap into more immediate changes in functionality appreciation throughout a yoga programme. In contrast, changes in broader functionality appreciation may take more time to develop. Again, these are ideas that should be tested in future research (though we are unaware of a measure of functionality appreciation that is specific to physical activity). Last, it is also possible that women in the yoga programme simply had high scores on the FAS to begin with. Indeed, their average score at Pretest was 4.08 on a scale from 1 = *strongly disagree* to 5 = *strongly agree*. This score is comparable to U.S. women's FAS scores in the parent studies (Alleva et al., 2017) but, regardless, ceiling effects may have occurred in this study.

Collectively, we must currently conclude that yoga practice does not seem to be an effective approach for improving functionality appreciation in its present broad-based and more inclusive conceptualization at least perhaps in a standalone fashion. Cognitive, writing-based techniques are preferable (e.g., Alleva, Martijn et al., 2015; Dunaev et al., 2018; Mulgrew et al., 2017; Stern & Engeln, 2018), as they have been shown to improve functionality appreciation and additional facets of body image, and potentially also because they encourage the individual to focus on appreciating her *own* body functionality, without the opportunity to make social comparisons. A promising and interesting direction for future research could be to explore whether the *combination* of yoga practice with cognitive, writing-based techniques is especially effective. For example, research has shown that asking women to write about the reasons they are grateful for their body, or how their body enabled them to get through each day, *in combination with* a 'yoga at every size' programme, led to improvements in functionality appreciation across the four-week period of the study (Webb et al., 2020). Other scholars have also called for the development of yoga scripts that more explicitly encourage participants to appreciate their body functionality (e.g., Neumark-Sztainer et al., 2018). The present yoga programme could be adjusted to more intentionally emphasise functionality appreciation, for example by having participants begin and end each class with an affirmation focused on functionality appreciation.

4.2. Yoga practice and its relationship to self-objectification and embodiment

Despite the lack of significant findings for functionality appreciation, the importance of the findings with respect to self-objectification and embodiment should not be overshadowed: The yoga programme led to lower self-objectification at Midtest, and greater embodiment over time, and self-objectification and embodiment were both found to mediate the impact of yoga on facets of positive body image.

With respect to self-objectification, the findings support objectification theory (Fredrickson & Roberts, 1997), which would propose that helping women to counteract an appearance-based orientation toward the body – for example via experiences that emphasise the opposite, their body functionality – should contribute to improvements in body image. Reflecting lower self-objectification as evidenced by participants' questionnaire scores, yoga participants also reported that the instructor helped them to value their body functionality more than their physical appearance. The present findings support other experiments that have also shown that yoga practice leads to improvements in body image (e.g., Ariel-Donges et al., 2018; Cox et al., 2016, 2017, 2019; Cox & McMahon, 2019; Gammage et al., 2016). Further, to the best of our knowledge this is the first study to test these relationships *experimentally*, and thus the current findings provide a valuable contribution to the literature. One important caveat is that self-objectification mediated changes in body compassion and appearance evaluation only, but not changes in body appreciation. It is unclear why this would be the case, but it would be interesting to explore these facets of positive body image over a longer period of yoga practice, to investigate whether some facets of positive body image need to be cultivated before others can develop. Research on the development of facets of positive body image over time, and their influence on one another, has not yet been published.

The findings with respect to embodiment support the developmental theory of embodiment (Piran, 2002, 2015, 2016, 2017; Piran & Teall, 2012), which proposes that embodying activities foster embodiment and, consequently, a more positive body image. In addition, these results support the proposition by various scholars that yoga, in particular, is an embodying activity (Cook-Cottone & Douglass, 2017; Cox & Tylka, 2020; Mahlo & Tiggemann, 2016; McIver et al., 2009; Piran & Neumark-Sztainer, 2020; Tylka & Augustus-Horvath, 2011). The findings are also important because they show, for the first time, that yoga practice *leads to* greater embodiment, and thereby complement prior correlational and qualitative research on the relationship between yoga and embodiment (Daubenmier, 2005; Delaney & Anthis, 2010; Mahlo & Tiggemann, 2016; Neumark-Sztainer et al., 2018; Prichard & Tiggemann, 2008). In support of the data derived from the questionnaires, participants reported experiencing high levels of comfort during the yoga class, and body comfort has been shown to be a key facet of embodiment (Piran, 2016). In contrast to self-

objectification, embodiment mediated changes in all three facets of positive body image that we assessed as outcomes (body compassion, appearance evaluation, *and* body appreciation).

Overall, we can conclude based on our data that yoga practice seems to be an effective strategy to reduce self-objectification and enhance positive embodiment among women, and could thereby help them to develop a more positive body image, including greater body appreciation, body compassion, and appearance evaluation. These findings are promising because they show that self-objectification and embodiment are important targets within body image interventions, as improving these facets is likely to engender improvements in various facets of positive body image. These findings are also promising because they identify an effective strategy to counteract pervasive social influences that typically hinder women's capacity to develop a positive body image. Optimistically, there is evidence that yoga is becoming more easily accessible and welcoming to all, such as via 'yoga at every size' programmes, and online or video variants that can overcome potential barriers (e.g., money) or 'risks' (e.g., social comparisons) of face-to-face classes (e.g., Stanley, 2017; Webb et al., 2020).

4.3. Limitations and additional future research directions

The following limitations of this study must be mentioned which help inform fruitful areas for future research to pursue. First, given high levels of attrition at Follow-Up, we were unable to include longer-term data in the analyses. It is an unanswered question whether the same pattern of findings would have emerged should these data have been included. Fortunately, there was no differential attrition between groups. One potential reason for the high levels of attrition at Follow-Up across both groups concerns the timing of the study, where Follow-Up data were collected during the summer holidays. Later analyses may consider how to optimise the timing of the programme so that it does not coincide with standard annual breaks or holiday periods. As noted previously, the opportunity to engage in social comparison processes may have led to some women dropping out due to personal discomfort. Future research would benefit from evaluating whether alternative modes of more flexibly delivering the yoga intervention (e.g., online, via video, etc.) would yield lower attrition rates.

Another potential reason for the high levels of attrition may be that some participants were motivated to take yoga classes as a means of "improving" their physical appearance. Indeed, yoga is often promoted and practiced as a method of appearance management, with an emphasis on (an idealised) physical appearance, especially in Western cultures (Vinoski, Webb, Warren-Findlow, Brewer, & Kiffmeyer, 2017; Webb, Vinoski, Warren-Findlow, Burrell, & Putz, 2017). With appearance-related goals in mind, yoga practitioners may disregard their bodily signals and push their body's limits, and may be less likely to experience embodiment during their practice (Cox & Tylka, 2020). The present programme, striving to adhere to the traditional teachings of Hatha yoga, and emphasising themes such as acceptance and compassion towards the body's limits, may not have met the expectations of participants with an appearance-focused mindset. Relatedly, almost half of the participants reported having prior experience with yoga, even if most had never practiced regularly. The present programme may have differed from what they were used to in the past. To address these potential issues in future research, it may be important to specifically recruit women who want to take part in a *body-positive* yoga programme. On the other hand, those who are specifically seeking to change their physical appearance may represent a particularly vulnerable group, who would stand the most to gain from yoga practice (Neumark-Sztainer et al., 2018).

Second, the present yoga programme concerned Hatha yoga. Other forms of yoga may have different effects on women's body image, and even the same type of yoga could potentially differ between instructors (Cox & Tylka, 2020; Delaney & Anthis, 2010; Piran & Neumark-Sztainer, 2020). Future research replicating this experiment with Hatha yoga, as well as other forms of yoga, will be valuable. Third, the present sample may have been limited in some respects. The present sample comprised 18 to 30-year old women, who had mainly university-level education, and BMI classified as 'average.' Future research on more diverse samples (e.g., in terms of gender, age, body size, and education level) is needed. As one example, researchers could investigate whether BMI moderates the effects of the yoga programme on the positive body image variables.[4] Relatedly, classes were held on Tuesday mornings, and many women may have not been able to participate due to other responsibilities. Future research could offer classes at wider variety of times to broaden the pool of potential participants. Further, we did not define what we meant by requesting that potential participants must not be "currently" practicing yoga. Participants who were already regularly practicing yoga might have taken part to access free yoga classes. Fourth, the questions assessing the evaluation of the yoga programme were answered by women who completed the Posttest. Those who dropped out of the yoga programme may have answered these questions differently, which could have provided valuable information about their reasons for dropping out, or the shortcomings of the programme. Future research could obtain ethics approval and have a protocol in place to contact participants who drop out of the study, to have them complete these evaluation questions after all, if willing.

Last, though not necessarily a limitation of this research, it is curious that all participants, regardless of group assignment, experienced improvements in body appreciation, body compassion, and appearance evaluation over time. Perhaps women in the control group anticipated receiving the yoga workshop, which may have led them to contemplate yoga and what they associated with the practice (e.g., self-acceptance). Alternatively, the findings may be an artefact of repeated measures analyses. Future research that replicates the present study will be valuable in determining whether these effects are reliable.

4.4. Conclusions

This study is valuable as it is the first to experimentally test the impact of yoga practice on functionality appreciation and embodiment, and to investigate functionality appreciation, embodiment, and self-objectification as potential mediators of the effects of yoga on (additional) facets of positive body image. Contrary to our expectations, women in the yoga group did not experience improvements in functionality appreciation, and functionality appreciation did not contribute to improvements in additional facets of positive body image. Instead, women in the yoga programme experienced lower self-objectification at midtest, and greater embodiment over time, which is what drove further improvements in positive body image. In line with objectification theory (Fredrickson & Roberts, 1997) and the developmental theory of embodiment (Piran, 2002, 2015, 2016, 2017; Piran & Teall, 2012; Piran & Neumark-Sztainer, 2020), the findings highlight the importance of targeting self-objectification and embodiment as factors that can contribute to improvements in women's positive body image.

[4] While we did collect data on participants' BMI, we did not preregister a hypothesis about how BMI may impact the model relationships. Furthermore, our sample lacked the body size variability needed to examine BMI in a meaningful way within the models.

CRediT authorship contribution statement

Jessica M. Alleva: Conceptualization, Methodology, Formal analysis, Investigation, Writing - original draft. **Tracy L. Tylka:** Conceptualization, Methodology, Formal analysis, Writing - review & editing. **Kim van Oorsouw:** Conceptualization, Methodology, Investigation, Writing - review & editing. **Erika Montanaro:** Formal analysis, Writing - original draft. **Iris Perey:** Conceptualization, Methodology, Investigation, Writing - review & editing. **Cheyenne Bolle:** Conceptualization, Methodology, Investigation, Writing - review & editing. **Jantine Boselie:** Conceptualization, Methodology, Writing - review & editing. **Madelon Peters:** Conceptualization, Methodology, Writing - review & editing. **Jennifer B. Webb:** Conceptualization, Methodology, Formal analysis, Writing - review & editing.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.bodyim.2020.06.003.

References

Alleva, J. M., Veldhuis, J., & Martijn, C. (2016). A pilot study investigating whether focusing on body functionality can protect women from the potential negative effects of viewing thin-ideal media images. *Body Image*, *17*, 10–13. http://dx.doi.org/10.1016/j.bodyim.2016.01.007

Alleva, J. M., Tylka, T. L., & Kroon Van Diest, A. M. (2017). The Functionality Appreciation Scale (FAS): Development and psychometric evaluation in U.S. community women and men. *Body Image*, *23*, 28–44. http://dx.doi.org/10.1016/j.bodyim.2017.07.008

Alleva, J. M., Diedrichs, P. C. C., Halliwell, E., Martijn, C., Stuijfzand, B. G. G., & Treneman-Evans, G., et al. (2018). A randomised-controlled trial investigating potential underlying mechanisms of a functionality-based approach to improving women's body image. *Body Image*, *25*, 85–96. http://dx.doi.org/10.1016/j.bodyim.2018.02.009

Alleva, J. M., Diedrichs, P. C., Halliwell, E., Peters, M. L., Dures, E., & Stuijfzand, B. G., et al. (2018). More than my RA: Improving body image in women with rheumatoid arthritis using a functionality-focused intervention programme. *Journal of Consulting and Clinical Psychology*, *86*, 666–676. http://dx.doi.org/10.1037/ccp0000317

Alleva, J. M., Martijn, C., Van Breukelen, G. J. P., Jansen, A., & Karos, K. (2015). *Expand Your Horizon:* A programme that improves body image and reduces self-objectification by training women to focus on body functionality. *Body Image*, *15*, 81–89. http://dx.doi.org/10.1016/j.bodyim.2015.07.001

Alleva, J. M., Sheeran, P., Webb, T. L., Martijn, C., & Miles, E. (2015). A meta-analytic review of stand-alone interventions to improve body image. *PloS One*, *10*, Article e0139177 http://dx.doi.org/10.1371/journal.pone.0139177

Altman, J. K., Linfield, K., Salmon, P. G., & Beacham, A. O. (2017). The Body Compassion Scale: Development and initial validation. *Journal of Health Psychology*, 1–11. http://dx.doi.org/10.1177/1359105317718924

Ariel-Donges, A. H., Gordon, E. L., Bauman, V., & Perri, M. G. (2018). Does yoga help college-aged women with body-image dissatisfaction feel better about their bodies? *Sex Roles*, *80*, 41–51. http://dx.doi.org/10.1007/s11199-018-0917-5

Avalos, L., Tylka, T. L., & Wood-Barcalow, N. (2005). The Body Appreciation Scale: Development and psychometric evaluation. *Body Image*, *2*, 285–297. http://dx.doi.org/10.1016/j.bodyim.2005.06.002

Bailey, K. A., Gammage, K. L., Van Ingen, C., & Ditor, D. S. (2015). "It's all about acceptance": A qualitative study exploring a model of positive body image for people with spinal cord injury. *Body Image*, *15*, 24–34. http://dx.doi.org/10.1016/j.bodyim.2015.04.010

Brown, T. A., Cash, T. F., & Mikulka, P. J. (1990). Attitudinal body-image assessment: Factor analysis of the Body-Self Relations Questionnaire. *Journal of Personality Assessment*, *55*, 135–144. http://dx.doi.org/10.1207/s15327752jpa5501&2_13

Bryan, A. D., Aiken, L. S., & West, S. G. (1996). Increasing condom use: Evaluations of a theory-based intervention to prevent sexually transmitted diseases in young women. *Health Psychology*, *15*, 371–382. http://dx.doi.org/10.1037//0278-6133.15.5.371

Bryan, A., Schmiege, S. J., & Broaddus, M. R. (2007). Mediational analysis in HIV/AIDS research: Estimating multivariate path analytic models in a structural equation modeling framework. *AIDS and Behavior*, *11*, 365–383. http://dx.doi.org/10.1007/s10461-006-9150-2

Carei, T. R., Fyfe-Johnson, A. L., Breuner, C. C., & Brown, M. A. (2010). Randomized controlled clinical trial of yoga in the treatment of eating disorders. *Journal of Adolescent Health*, *46*, 346–351. http://dx.doi.org/10.1016/j.jadohealth.2009.08.007

Cash, T. F. (2000). *Multidimensional Body-Self Relations Questionnaire users' manual* (3rd rev.). Available from www.body-images.com

Cash, T. F., & Smolak, L. (2011). Future challenges for body image science, practice, and prevention. In T. F. Cash & L. Smolak (Eds.), *Body image: A handbook of science, practice, and prevention* (2nd ed., pp. 471–478). New York, NY: Guilford Press.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*, 386–396. http://dx.doi.org/10.2307/2136404

Cook-Cottone, C., & Douglass, L. L. (2017). Yoga communities and eating disorders: Creating safe space for positive embodiment. *International Journal of Yoga Therapy*, *27*, 87–93. http://dx.doi.org/10.17761/IJYT2017_Methods_Cook-Cottone_Epub

Cook-Cottone, C., Kane, L., Keddie, E., & Hauqli, S. (2013). *Girls growing in wellness sand balance: Yoga and life skills to empower*. Stoddard, WI: Schoolhouse Educational Services, LLC.

Cox, A. E., & McMahon, A. K. (2019). Exploring changes in mindfulness and body appreciation during yoga participation. *Body Image*, *29*, 118–121. http://dx.doi.org/10.1016/j.bodyim.2019.03.003

Cox, A. E., & Tylka, T. L. (2020). A conceptual model describing mechanisms for how yoga practice may support positive embodiment. *Eating Disorders*, 1–24. http://dx.doi.org/10.1080/10640266.2020.1740911

Cox, A. E., Ullrich-French, S., Cole, A. N., & D'Hondt-Taylor, M. (2016). The role of state mindfulness during yoga in predicting self-objectification and reasons for exercise. *Psychology of Sport and Exercise*, *22*, 321–327. http://dx.doi.org/10.1016/j.psychsport.2015.10.001

Cox, A. E., Ullrich-French, S., Howe, H. S., & Cole, A. N. (2017). A pilot yoga physical education curriculum to promote positive body image. *Body Image*, *23*, 1–8. http://dx.doi.org/10.1016/j.bodyim.2017.07.007

Cox, A. E., Ullrich-French, S., Tylka, T. L., & McMahon, A. K. (2019). The roles of self-compassion, body surveillance, and body appreciation in predicting intrinsic motivation for physical activity: Cross-sectional associations, and prospective changes within a yoga context. *Body Image*, *29*, 110–117. http://dx.doi.org/10.1016/j.bodyim.2019.03.002

Daubenmier, J. J. (2005). The relationship of yoga, body awareness, and body responsiveness to self-objectification and disordered eating. *Psychology of Women Quarterly*, *29*, 207–219. http://dx.doi.org/10.1111/j.1471-6402.2005.00183.x

Delaney, K., & Anthis, K. (2010). Is women's participation in different types of yoga classes associated with different levels of body awareness satisfaction? *International Journal of Yoga Therapy*, *20*, 62–71.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, *49*, 71–75. http://dx.doi.org/10.1207/s15327752jpa4901_13

Dittmann, K. A., & Freedman, M. R. (2009). Body awareness, eating attitudes, and spiritual beliefs of women practicing Yoga. *Eating Disorders*, *17*, 273–292. http://dx.doi.org/10.1080/10640260902991111

Dunaev, J., Markey, C. H., & Brochu, P. M. (2018). An attitude of gratitude: The effects of body-focused gratitude on weight bias internalization and body image. *Body Image*, *25*, 9–13. http://dx.doi.org/10.1016/j.bodyim.2018.01.006

Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, *39*, 175–191. http://dx.doi.org/10.3758/BF03193146

Frayeh, A. L., & Lewis, B. A. (2018). The effect of mirrors on women's state body image responses to yoga. *Psychology of Sport and Exercise*, *35*, 47–54. http://dx.doi.org/10.1016/j.psychsport.2017.11.002

Fredrickson, B. L., & Roberts, T.-A. (1997). Objectification theory: Toward understanding women's lived experiences and mental health risks. *Psychology of Women Quarterly*, *21*, 173–206. http://dx.doi.org/10.1111/j.1471-6402.1997.tb00108.x

Gammage, K. L., Drouin, B., & Lamarche, L. (2016). Comparing a yoga class with a resistance exercise class: Effects on body satisfaction and social physique anxiety in university women. *Journal of Physical Activity & Health*, *13*(11), 1202–1209. http://dx.doi.org/10.1123/jpah.2015-0642

Graham, J. W., & Schafer, J. L. (1999). On the performance of multiple imputation for multivariate data with small sample size. In R. Hoyle (Ed.), *Statistical strategies for small sample research* (pp. 1–29). Thousand Oaks, CA: Sage.

Gu, J., Strauss, C., Crane, C., Barnhofer, T., Karl, A., & Cavanagh, K., et al. (2016). Examining the factor structure of the 39-item and 15-item versions of the Five-Facet Mindfulness Questionnaire before and after Mindfulness-Based Cognitive Therapy for people with recurrent depression. *Psychological Assessment*, http://dx.doi.org/10.1037/pas0000263

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling*, *6*, 1–55. http://dx.doi.org/10.1080/10705519909540118

Impett, E. A., Daubenmier, J. J., & Hirschman, A. L. (2006). Minding the body: Yoga, embodiment, and well-being. *Sexuality Research and Social Policy Journal of NSRC*, *3*, 39–48. http://dx.doi.org/10.1525/srsp.2006.3.4.39
Ipsos Public Affairs. (2016). *The 2016 yoga in America study*.. Retrieved from https://www.yogaalliance.org/Portals/0/2016%20Yoga%20in%20America%20Study%20RESULTS.pdf
Klein, M. (2018). *Yoga rising: 30 empowering stories from yoga renegades for everybody*. Woodbury, MN: Llewellyn Publications.
Klein, M., & Guest-Jelley, A. (2014). *Yoga and body image: 25 personal stories about beauty, bravery & loving your body*. Woodbury, Minnesota: Llewellyn Publications.
Kline, R. B. (2016). *Methodology in the social sciences. Principles and practice of structural equation modeling* (4th ed.). New York, NY: Guilford Press.
Lindner, D., & Tantleff-Dunn, S. (2017). The development and psychometric evaluation of the Self-Objectification Beliefs and Behaviors Scale. *Psychology of Women Quarterly*, *41*, 254–272. http://dx.doi.org/10.1177/0361684317692109
Maas, C. J., & Hox, J. J. (2005). Sufficient sample sizes for multilevel modeling. *Methodology European Journal of Research Methods for the Behavioral and Social Sciences*, *1*, 86–92. http://dx.doi.org/10.1027/1614-2241.1.3.86
Mahlo, L., & Tiggemann, M. (2016). Yoga and positive body image: A test of the Embodiment Model. *Body Image*, *18*, 135–142. http://dx.doi.org/10.1016/j.bodyim.2016.06.008
Marsh, H. W., Hau, K. T., & Wen, Z. (2004). In search of golden rules: Comment on hypothesis-testing approaches to setting cutoff values for fit indexes and dangers in overgeneralizing Hu and Bentler's (1999) findings. *Structural Equation Modeling*, *11*, 320–341. http://dx.doi.org/10.1207/s15328007sem1103_2
McCullough, M. E., Emmons, R. A., & Tsang, J. (2002). The grateful disposition: A conceptual and empirical topography. *Journal of Personality and Social Psychology*, *82*, 112–127. http://dx.doi.org/10.1037//0022-3514.82.1.112
McIver, S., Mcgartland, M., & Halloran, P. O. (2009). "Overeating is not about the food": Women describe their experience of a yoga treatment program for binge eating. *Qualitative Health Research*, *19*, 1234–1245. http://dx.doi.org/10.1177/1049732309343954
Menzel, J. E. (2010). *The psychometric validation of the Physical Body Experiences Questionnaire* Retrieved from. http://scholarcommons.usf.edu/etd/1710
Mulgrew, K. E., & Tiggemann, M. (2018). Form or function: Does focusing on body functionality protect women from body dissatisfaction when viewing media images? *Journal of Health Psychology*, *23*(1), 84–94. http://dx.doi.org/10.1177/1359105316655471
Mulgrew, K. E., Stalley, N. L., & Tiggemann, M. (2017). Positive appearance and functionality reflections can improve body satisfaction but do not protect against idealised media exposure. *Body Image*, *23*, 126–134. http://dx.doi.org/10.1016/j.bodyim.2017.09.002
Neumark-Sztainer, D., MacLehose, R. F., Watts, A. W., Pacanowski, C. R., & Eisenberg, M. E. (2018). Yoga and body image: Findings from a large population-based study of young adults. *Body Image*, *24*, 69–75. http://dx.doi.org/10.1016/j.bodyim.2017.12.003
Piran, N. (2002). Embodiment: A mosaic of inquiries in the area of body weight and shape preoccupation. In S. Abbey (Ed.), *Ways of knowing in and through the body: Diverse perspectives on embodiment* (pp. 211–214). Welland, Ontario: Soleil Publishing.
Piran, N. (2015). New possibilities in the prevention of eating disorders: The introduction of positive body image measures. *Body Image*, *14*, 146–157. http://dx.doi.org/10.1016/j.bodyim.2015.03.008
Piran, N. (2016). Embodied possibilities and disruptions: The emergence of the Experience of Embodiment construct from qualitative studies with girls and women. *Body Image*, *18*, 43–60. http://dx.doi.org/10.1016/j.bodyim.2016.04.007
Piran, N. (2017). *Journeys of embodiment at the intersection of body and culture: The Developmental Theory of Embodiment*. San Diego, California: Elsevier Press.
Piran, N., & Neumark-Sztainer, D. (2020). Yoga and the experience of embodiment: A discussion of possible links. *Eating Disorders*, 1–19. http://dx.doi.org/10.1080/10640266.2019.1701350
Piran, N., & Teall, T. (2012). The developmental theory of embodiment. In G. McVey, M. P. Levine, N. Piran & H. B. Ferguson (Eds.), *Preventing eating-related and weight-related disorders: Collaborative research, advocacy, and policy change* (pp. 169–198). Ontario, Canada: Wilfrid Laurier University Press.
Prichard, I., & Tiggemann, M. (2008). Relations among exercise type, self-objectification, and body image in the fitness centre environment: The role of reasons for exercise. *Psychology of Sport and Exercise*, *9*, 855–866. http://dx.doi.org/10.1016/j.psychsport.2007.10.005
Ranjbar, Z., Moghddam, A., & Pasand, F. (2016). A comparative study of the impacts of strength training and yoga on female students' body awareness. *International Journal of Biology, Pharmacy and Allied Sciences*, *3*, 1942–1953.
Riley, D. (2004). Hatha yoga and the treatment of illness. *Alternative Therapies in Health and Medicine*, *10*, 20–21.
Roberts, T.-A., Calogero, R. M., & Gervais, S. J. (2018). Objectification theory's continuing contribution to feminist psychology. In J. White & C. Travis (Eds.), *APA handbook of the psychology of women* (pp. 249–271). Washington, DC: American Psychological Association.
Rubin, L. R., & Steinberg, J. R. (2011). Self-objectification and pregnancy: Are body functionality dimensions protective? *Sex Roles*, *65*, 606–618. http://dx.doi.org/10.1007/s11199-011-9955-y
Schafer, J. L., & Graham, J. W. (2002). Missing data: Our view of the state of the art. *Psychological Methods*, *7*, 147–177.
Stanley, J. (2017). *Every body yoga: Let go of fear, get on the mat, love your body*. NewYork: Workman Publishing.
Stern, N. G., & Engeln, R. (2018). Self-compassionate writing exercises increase college women's body satisfaction. *Psychology of Women Quarterly*, *42*, 326–341. http://dx.doi.org/10.1177/0361684318773356
Swami, V. (2017). Sketching people: Prospective investigations of the impact of life drawing on body image. *Body Image*, *20*, 65–73. http://dx.doi.org/10.1016/j.bodyim.2016.12.001
Tylka, T. L., & Augustus-Horvath, C. L. (2011). Fighting self- objectification in prevention and intervention contexts. In R. M. Calogero, S. Tantleff-Dunn & J. K. Thompson (Eds.), *Self-objectification in women: Causes, consequences, and counteractions* (pp. 187–214). Washington, DC: American Psychological Association.
Tylka, T. L., & Wood-Barcalow, N. L. (2015a). The Body Appreciation Scale-2: Item refinement and psychometric evaluation. *Body Image*, *12*, 53–67. http://dx.doi.org/10.1016/j.bodyim.2014.09.006
Tylka, T. L., & Wood-Barcalow, N. L. (2015b). What is and what is not positive body image? Conceptual foundations and construct definition. *Body Image*, *14*, 118–129. http://dx.doi.org/10.1016/j.bodyim.2015.04.001
Vinoski, E., Webb, J. B., Warren-Findlow, J., Brewer, K. A., & Kiffmeyer, K. A. (2017). Got yoga?: A longitudinal analysis of thematic content and models' appearance-related attributes in advertisements spanning four decades of yoga journal. *Body Image*, *21*, 1–5. http://dx.doi.org/10.1016/j.bodyim.2017.01.006
Vinoski Thomas, E., Warren-Findlow, J., Webb, J. B., Quinlan, M. M., Ladika, S. B., & Reeve, C. L. (2019). "It's very valuable to me that I appear capable": A qualitative study exploring relationships between body functionality and appearance among women with visible physical disabilities. *Body Image*, *30*, 81–92. http://dx.doi.org/10.1016/j.bodyim.2019.05.007
Webb, J. B., Wood-Barcalow, N. L., & Tylka, T. L. (2015). Assessing positive body image: Contemporary approaches and future directions. *Body Image*, *14*, 130–145. http://dx.doi.org/10.1016/j.bodyim.2015.03.010
Webb, J. B., Vinoski, E. R., Warren-Findlow, J., Burrell, M. I., & Putz, D. Y. (2017). Downward dog becomes fit body, inc.: A content analysis of 40 years of female cover images of yoga journal. *Body Image*, *22*, 129–135. http://dx.doi.org/10.1016/j.bodyim.2017.07.001
Webb, J. B., Padro, M. P., Vinoski Thomas, E., Etzel, L., Davies, A., & Rogers, C. B. (2020). *Yoga at Every Size: A preliminary evaluation of a brief online size-inclusive yoga and body gratitude writing intervention in college women of higher weight* In preparation.
Wood-Barcalow, N. L., Tylka, T. L., & Augustus-Horvath, C. L. (2010). "But I like my body": Positive body image characteristics and a holistic model for young-adult women. *Body Image*, *7*, 106–116. http://dx.doi.org/10.1016/j.bodyim.2010.01.001