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Motive- and appearance awareness-based explanations for body (dis)satisfaction following exercise in daily life

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Objective. Although exercise is typically found to improve body satisfaction, this effect may be reduced or even reversed for trait body-dissatisfied individuals. The reasons for this remain unclear. This study tested the possibility that these effects are due to appearance-related motives and/or increased appearance awareness post-exercise.

Method. Participants included 178 women who completed baseline measures of trait body dissatisfaction, and then completed an experience sampling phase in which they self-reported state body satisfaction and appearance awareness levels, and recent exercise experiences at six time-points daily for 10 days.

Results. Trait body-dissatisfied individuals were more likely to exercise for appearance-related reasons, and experienced less of an increase in state body satisfaction post-exercise. Appearance-motivated exercise also increased appearance awareness. After controlling for appearance motives, the moderating effect of trait body dissatisfaction on the exercise–state body satisfaction relationship reduced to non-significance.

Conclusions. Collectively, the present findings offer some support for both motive- and appearance awareness-based explanations for the reduced benefits of exercise on body satisfaction exhibited in individuals with trait body dissatisfaction. Targeting the reasons for exercise and what one focuses on during exercise may be viable ways to overcome potential negative impacts of exercise on body image for these individuals.

Statement of contribution

What is already known on this subject?

While the physical and psychological benefits of exercise are well established, recent findings suggest that these benefits for body satisfaction may be reduced (and possibly reversed) for individuals with elevated trait body dissatisfaction. The reasons for this moderating effect remain unclear.

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What does this study add?
- Trait body-dissatisfied individuals more often engaged in exercise for appearance-related reasons.
- Appearance motives for exercise are associated with smaller body satisfaction gains post-exercise.
- Reduced body satisfaction was also linked to increased appearance awareness post-exercise.

In general, individuals benefit physically and psychologically from exercise (Gebel *et al.*, 2015; Hausenblas & Fallon, 2006; Verburgh, Königs, Scherder, & Oosterlaan, 2014). Body satisfaction is one such psychological construct typically shown to improve following a bout of exercise or an intensive exercise-based intervention (Hausenblas & Fallon, 2006). However, emerging evidence suggests that this positive effect on body satisfaction may be less pronounced or even absent for some individuals. Individuals who exhibit stable, negative body image may experience less benefit in terms of body satisfaction from exercise (Fuller-Tyszkiewicz, Skouteris, & McCabe, 2013; LePage & Crowther, 2010; Martin Ginis, Prapavessis, & Haase, 2008) and may even have negative appearance-related reactions to exercise (Martin Ginis, Jung, & Gauvin, 2003). The present study proposes two non-mutually exclusive mechanisms by which exercise may lead to state body dissatisfaction among trait body-dissatisfied individuals: appearance motives for exercise and appearance awareness.

Appearance motives explanation

Findings from cross-sectional studies suggest that trait body-dissatisfied individuals more regularly engage in exercise for appearance-related reasons than for fitness or health (Furnham, Badmin, & Sneade, 2002; Strelan, Mehaffey, & Tiggemann, 2003; Tiggemann & Williamson, 2000). Prospective findings within daily life also suggest that exercise for appearance-related reasons is associated with decreased body satisfaction. However, this effect was found regardless of level of trait body dissatisfaction, and the authors did not report whether trait body-dissatisfied individuals more often reported exercising for appearance-related reasons (LePage & Crowther, 2010). Thus, it is possible that trait body-dissatisfied individuals experience less benefit from exercise because they more often engage in exercise for reasons that reduce the positive body image effects of exercise (namely, appearance-related reasons). Insofar as this explanation is correct, we may anticipate that (1) post-exercise body satisfaction levels are lower following exercise for appearance-related motives than for other exercise motives; (2) trait body-dissatisfied individuals more regularly engage in exercise for appearance-related reasons; and hence, (3) the moderating effect of trait body dissatisfaction on the exercise–state body satisfaction relationship should reduce when instances of appearance-motivated exercise are removed from analysis.

Appearance awareness explanation

While the appearance motives explanation appears plausible, it is unlikely to be the only factor to predict reduced body satisfaction post-exercise. For instance, although LePage and Crowther (2010) found that appearance-motivated exercise reduced body satisfaction for all participants, trait body-dissatisfied individuals also showed reduced body satisfaction following exercise for health and fitness reasons. Further, experimental studies support the notion that salience of one's appearance during an exercise session may account for reduced effects of exercise on body satisfaction. Martin Ginis *et al.*

(2003) showed that while the presence of a mirror when exercising increased appearance anxiety for their sample overall, trait body-dissatisfied individuals reported post-exercise appearance anxiety even in a non-mirrored context. In a subsequent study, Martin Ginis *et al.* (2008) found lower body satisfaction and higher appearance anxiety post-exercise for individuals who perceived a greater negative discrepancy between their appearance and that of the instructor. Hence, it is possible that the act of exercise encourages focus on one's appearance, in turn triggering thoughts about appearance. For trait body-dissatisfied individuals (who are characterized by strong negative views about their appearance), this focus on appearance may lead to reduced body satisfaction. If this appearance awareness explanation is correct, then it may be expected that (1) exercise increases appearance awareness; (2) increases in appearance awareness are associated with lower post-exercise body satisfaction; and (3) these effects for the prior two propositions would be strongest for trait body-dissatisfied individuals.

Potential integrability of these explanations

Although the two explanations are presented separately above, it is likely that they are integrable. For instance, appearance motives for exercise may have an adverse effect on body satisfaction because individuals focus more heavily on their appearance during such episodes of exercise relative to exercise motivated by other reasons. Evidence for this would be demonstrated by increased appearance awareness for appearance-motivated exercise sessions. An alternative form of integrability would entail that appearance motives and awareness are distinct, yet compatible processes that tend to be more common for some individuals (e.g., those with trait body dissatisfaction) than others. By this account, we would expect to find that trait body-dissatisfied individuals engage in appearance-motivated exercise more often *and* report greater appearance awareness post-exercise. However, we would not necessarily expect that the relationships between motives and appearance awareness are stronger for trait body-dissatisfied individuals.

While there is some evidence to support each of the proposed explanations separately, much of this evidence comes from cross-sectional and experimental, laboratory-based studies rather than examinations in daily life. Further, we are unaware of any studies that have evaluated both explanations within the same sample. Hence, this study tests within the context of daily life the potential roles of appearance motives and appearance awareness – both independently and in combination – in accounting for post-exercise body satisfaction effects among trait body-dissatisfied individuals.

The plausibility of these explanations was tested across several hypotheses, as illustrated conceptually in Figure 1. This study first sought to replicate earlier findings, predicting that exercise would be associated with increased body satisfaction for the sample overall (Hypothesis 1a). Furthermore, exercise was predicted to be associated with decreased body satisfaction (Hypothesis 1b) for individuals with higher trait body dissatisfaction. Subsequent analyses were designed to evaluate the two explanations separately and in combination.

Consistent with the *appearance motives explanation*, it was predicted that individuals with elevated trait body dissatisfaction would be more likely to engage in exercise for appearance-related motives (Hypothesis 2a). It was also predicted that appearance motives would be associated with lowest state body satisfaction (Hypothesis 2b) relative to other exercise motives (fun, social, goal-focused, stress/mood, and health-related). By extension, it was hypothesized that the moderating effect of trait body

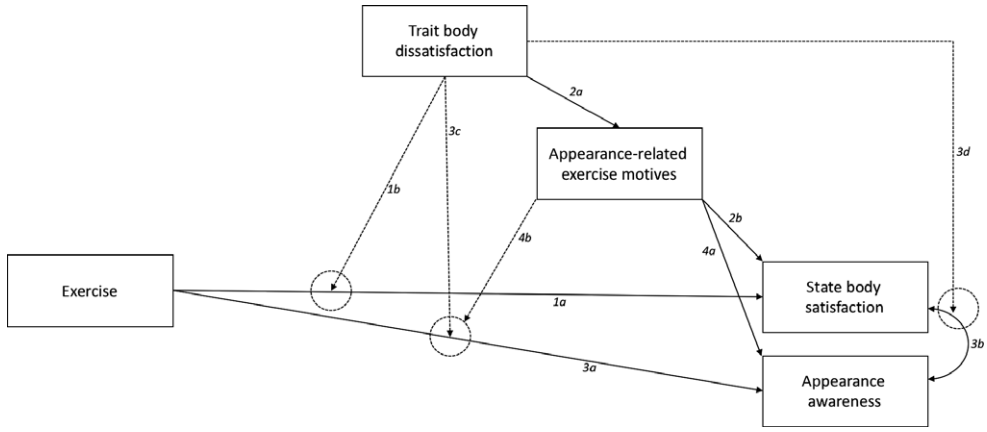

Figure 1. Conceptual model of proposed relations among exercise and body image. Perforated lines and circles reflect moderation effects; hard lines indicate direct relationships. Hypothesis 2c is not shown in the figure above as it reflects comparison of the moderation effect (see Hypothesis 1b) for all exercise instances versus only exercise instances for non-appearance-related reasons.

dissatisfaction for the exercise–body satisfaction relationship should be weaker when just modelling non-appearance-motivated exercise data (Hypothesis 2c).

As per the *appearance awareness explanation*, it was predicted that appearance awareness would be higher post-exercise (Hypothesis 3a). Change in appearance awareness post-exercise was expected to correlate with changes in body satisfaction post-exercise (Hypothesis 3b). The relationships between exercise and appearance awareness (Hypothesis 3c) and change in awareness and body satisfaction (Hypothesis 3d) were also predicted to be stronger for individuals with elevated trait body dissatisfaction.

Finally, if the two proposed mechanisms are interrelated, then we would expect to observe greater post-exercise appearance awareness for appearance-motivated exercise sessions than for other exercise sessions (Hypothesis 4a). Furthermore, this effect should be most pronounced for individuals with higher trait body dissatisfaction (Hypothesis 4b). In contrast, integrability in the form of compatible, yet distinct processes may be inferred from evidence in support of both explanations separately, but lack of association between appearance motives and appearance awareness post-exercise.

Method

Participants

Participants were recruited from three universities in Australia, as well as via the general community through online advertisements on social media and careers websites. Participation was limited to women aged 18 or above who had access to an iPhone or Android device to access the experience sampling method-based app component of the study. Participants were allocated to the control (n = 178) or Fitbit (n = 114) condition of a study exploring the effects of wearable devices on mood and disordered eating symptoms. Given the possibility of reactivity to wearable devices on reporting of and engagement in exercise, this study limited analyses to the control group. Prior simulation studies (e.g., Maas & Hox, 2005) suggest that this sample size of 178 is sufficiently powered to produce unbiased parameter estimates and standard errors for significance

testing. The present sample was adequately powered to detect effects of Cohen's $d > 0.2$ at $p < .05$ (two-tailed).

As shown in Table 1, participants in this control group had a mean age of 22.15 ($SD = 5.14$, range = 18–43) and tended to be within the normal BMI range ($M = 22.92$, $SD = 4.58$, range = 15.61–39.73). Most were Caucasian and spoke English as their primary language. Their highest current level of education was most often completing high school.

Materials

Baseline measures of trait variables

Trait body dissatisfaction. The Body Image Satisfaction subscale from the Body Image and Body Change Inventory (McCabe & Ricciardelli, 2004) was used to measure generalized body satisfaction. The scale consists of nine items that measure the level of satisfaction with weight, shape, muscle size, and various parts of the body (e.g., 'How happy are you with your legs?'). Items were rated using a 5-point scale from 1 (*very unhappy*) to 5 (*very happy*). Given the focus in this study on trait dissatisfaction, scores were reverse-coded and summed so that higher scores indicate greater body dissatisfaction. The scale met acceptable internal consistency in this study (Cronbach's alpha = .90).

Table 1. Demographic characteristics of the sample ($n = 178$)

Demographic variable	Statistic
Age ($M \pm SD$)	22.15 ± 5.14
BMI ($M \pm SD$)	22.92 ± 4.58
BMI category (*n*, %)	
Underweight	13 (7.3)
Normal weight	127 (71.3)
Overweight	20 (11.2)
Obese	17 (9.6)
Ethnicity (*n*, %)	
Asian	49 (27.5)
Caucasian	106 (59.6)
Hispanic	2 (1.1)
Middle Eastern	1 (0.6)
Other	20 (11.2)
Highest education completed (*n*, %)	
Year 12 or below	101 (56.7)
Certificate/diploma	19 (10.7)
Bachelor's degree	45 (25.3)
Postgraduate degree	13 (7.3)
Employment status (*n*, %)	
Employed	102 (57.6)
Unemployed	75 (42.4)
Primary language (*n*, %)	
English	145 (81.9)
Other	32 (18.1)

Note. Percentages are based on complete data for demographic variables.

Ecological momentary assessment measures of state variables

Appearance awareness. State appearance awareness was assessed by asking 'Since the last survey, how much have you been thinking about how you look to other people?' on a scale from 0 (*Not at all*) to 10 (*Very much*). This single-item approach was first used by Holland, Koval, Stratemeyer, Thomson, and Haslam (2017) and was adapted from the Objectified Body Consciousness Scale Self-Surveillance subscale (McKinley & Hyde, 1996). We retain the single-item approach of Holland *et al.* (2017) to minimize response burden from the number of items and number of assessments within the experience sampling method (ESM) phase of this study. The construct validity of this single-item measure is supported by Holland *et al.*'s (2017) findings that this measure was positively associated with the related concepts of body shame and restrained eating, and negatively associated with self-esteem.

State body satisfaction. Participants were asked 'How satisfied are you with your appearance right now?' on a scale from 0 (*Completely dissatisfied*) to 10 (*Completely satisfied*). This single-item approach has been adopted previously (e.g., Pomerleau & Saules, 2007; Rogers, Fuller-Tyszkiewicz, Lewis, Krug, & Richardson, 2017; Sonneville *et al.*, 2012), and shown to be sensitive to change in body satisfaction (Pomerleau & Saules, 2007; Sonneville *et al.*, 2012). Importantly, low scores on this single-item measure of body satisfaction have been linked to greater frequency of engagement in appearance-related social comparisons (Rogers *et al.*, 2017). As appearance comparisons are common among body-dissatisfied than body-satisfied individuals (Leahey, Crowther, & Ciesla, 2011; Leahey, Crowther, & Mickelson, 2007), this finding supports construct validity of the current single-item measure.

Exercise. Participants were asked to report the minutes spent engaging in physical activity since the previous assessment point. Participants were asked to report separately for light, moderate, and vigorous activity levels. The total minutes reported for moderate and vigorous activity were aggregated (ignoring engagement in low-intensity activity) rather than modelling these separately. Prior reviews by Campbell and Hausenblas (2009) and Hausenblas and Fallon (2006) suggested that the effects of exercise on body satisfaction are greater for moderate/vigorous activity than for low-intensity activity. The exercise in minutes was recoded to a dichotomous variable (Yes = 1, No = 0), based on completing at least 15 min of exercise. This is in line with prior research in this area, such as Prichard and Tiggemann (2012) who found 15 min of self-paced exercise was sufficient to demonstrate changes in state body satisfaction.

Motives for exercise. In instances where exercise was reported, participants were subsequently asked to report if they had engaged in exercise since the last assessment for any of the following six motives: physical appearance, fitness/health, fun, goal, stress/mood, or social reasons. These motives derived from research using the Reasons for Exercise Inventory (REI; Silberstein, Striegel-Moore, Timko, & Rodin, 1988). Although the REI initially separated items into seven domains, subsequent work by Cash, Now, and Grant (1994) identified four distinct motives: physical

appearance, fitness/health, stress/mood, and social reasons. This study added enjoyment and goal-motivated exercise as two additional response options. We reasoned that (1) stress/mood and social reasons do not necessarily cover all instances of exercise for enjoyment and (2) goal-based exercise may differ in its level of specificity from the general notion of exercising for fitness/health. Participants were allowed to select more than one motivation at a given time point in recognition that individuals can engage in an exercise session for multiple reasons (e.g., Waldron & Dieser, 2010). Each of the six motives used in this study was endorsed between 9% and 26% of the time exercise was reported, supporting their inclusion and also reflecting differences across situations and individuals in reasons for exercise.

Procedure

Ethics approval was obtained from the ethics committees of the three participating universities. Participants attended an induction session, during which time they read a plain language statement, provided informed consent, and then completed a baseline survey in Qualtrics. In addition to demographic and trait-level measures, the baseline survey included instructions for how to download and use the InstantSurvey app for the subsequent ESM (Csikszentmihalyi & Larson, 1987) phase. The app was available for iOS (Richardson, 2015a) and Android users (Richardson, 2015b). Participants were instructed to download the app before completing the baseline survey as the app contained a random, alphanumeric code they needed to enter into the baseline survey to link these data with their ESM data.

For 10 consecutive days after the day of the baseline survey, the InstantSurvey app semi-randomly signalled participants to complete six ESM surveys per day between 9 am and 9 pm. The 12-hr assessment period was divided into six 2-hr blocks during which one survey was randomly signalled, with each survey available to complete within thirty minutes of the notification. Participants were sent friendly text messages during the ESM period to encourage compliance. At the completion of the study, participants were given AUD$10 gift vouchers as remuneration for participation in the study.

Statistical analyses

Prior to main analyses, data quality from both the baseline and ESM phases was checked. There were <2% missing data overall for baseline variables. These missing values were imputed using expectation maximization (Tabachnick & Fidell, 2007). For the ESM phase, there were no incomplete data within time-points, although individuals differed in the number of assessments they completed of the possible 60 across the 10-day testing period. Continuous variables from baseline and ESM phases were normally distributed and did not exhibit any evidence of multicollinearity/singularity or outliers.

Quality of ESM data was explored further. Correlations between number of assessments completed and scores on trait/demographic variables were conducted to assess potential biases in amount of data collected. Key model variables (exercise occurrence, appearance motives, appearance awareness, and state body satisfaction) were also regressed on the order of assessment (from first to last), day of week (weekend vs. weekday), and time of day (coded in hour blocks) to evaluate potential differences in data quality across time.

Study hypotheses were tested using a series of multilevel models via Mplus version 7.1 (Muthen, Los Angeles, CA, USA). Hypotheses 1a and 1b were tested with a hierarchical approach. First, state body satisfaction ratings were regressed onto exercise (Yes vs. No). In a second step, trait body dissatisfaction was included as a moderator of the exercise–state body satisfaction relationship.

Hypothesis 2a was tested by regressing each of the six exercise motives (in separate models) onto trait body dissatisfaction. For Hypothesis 2b, state body satisfaction was regressed onto appearance motives (Yes vs. No), controlling for whether any other motives were also reported (Yes vs. No). Hypothesis 2c repeated the steps of Hypotheses 1a and 1b, except that the multilevel model for Hypothesis 2c removed cases where appearance was the stated motive for exercise.

Hypotheses 3a and 3c were tested in two steps for the same model. Hypothesis 3a was tested by regressing appearance awareness onto exercise occurrence (Yes vs. No). Trait body dissatisfaction was entered as a moderator of the exercise–appearance awareness to test Hypothesis 3c. Similarly, Hypotheses 3b and 3d were tested in a hierarchical model. State body satisfaction and appearance awareness (controlling for scores on each at the prior time point) were correlated to test Hypothesis 3b. Subsequently, trait body dissatisfaction was included as a moderator of the relationship between state body satisfaction and appearance awareness to test Hypothesis 3d.

For Hypothesis 4a, appearance awareness was regressed onto appearance motives (Yes vs. No), controlling for whether any other motives were also reported (Yes vs. No). In a subsequent step, trait body dissatisfaction was included as a moderator of the appearance motives–appearance awareness relationship to test Hypothesis 4b.

In all models, Level 1 predictors were group-mean-centred, while Level 2 predictors were grand-mean-centred (Enders & Tofighi, 2007). The effects of exercise occurrence (Yes vs. No) and exercise motives on state body satisfaction and appearance awareness were adjusted for pre-exercise levels on these DVs by including scores on the DV at the prior time point as a covariate. BMI was also included as a covariate given prior evidence of associations between BMI and exercise engagement (van Ekris *et al.*, 2016) and body image (Weinberger, Kersting, Riedel-Heller, & Luck-Sikorski, 2015). When trait body dissatisfaction was included as a moderator, it was also included as a main effect on the DV. Time lag between assessments was also included as a covariate given that the random assessment schedule meant that the time lags between assessments were not equidistant. All analyses involving effects of exercise on these state-based body image constructs were conducted within-day. This further constrains the time lag between prior and current time-points, consistent with the approach taken in prior ESM studies of body image (e.g., Fitzsimmons-Craft, 2015; Rogers *et al.*, 2017). Outputs for parameters directly pertaining to study hypotheses are reported in text. Full multilevel model outputs for these models are available from the corresponding author upon request.

Effect sizes for parameters within the multilevel models were calculated using Cohen's f^2 for continuous predictors (Selya, Rose, Dierker, Hedeker, & Mermelstein, 2012) and Cohen's d for binary predictors (converting from t values as per Arnow *et al.*, 2013). Following Cohen's (1988) guidelines, $f^2 \geq 0.02$ and $d \geq 0.20$ is considered a small effect, $f^2 \geq 0.15$ and $d \geq 0.50$ is a moderate effect, and $f^2 \geq 0.35$ and $d \geq 0.80$ is a large effect. Directional hypotheses were tested with one-tailed significance. As direction of effects was not specified for preliminary analyses, two-tailed significance tests were used (Field, 2013).

Results

Preliminary analyses

Compliance

In total, 6,063 surveys (out of a total of 10,680 signalled via the smartphone app) were completed across 178 participants. The remaining 4,617 surveys that were signalled were coded as missing data due to non-response. The average number of ESM surveys completed per participant was 34.06 (SD = 14.79). Number of ESM surveys completed was significantly, yet weakly, related to trait body dissatisfaction (r = −.19, p = .011), but unrelated to age (r = −.07, p = .358), BMI (r = −.06, p = .466), level of educational attainment (r = −.08, p = .293), ethnicity, $F(5, 172)$ = 0.68, p = .637, primary language (r = −.03, p = .671), and employment status (r = .02, p = .786).

Reactivity and time of assessment effects

Reactivity to the ESM protocol was explored by evaluating potential increased frequency of reporting of behaviours across the testing period. Multilevel models with order of assessment as a predictor found that reporting of exercise sessions was more likely earlier in the ESM testing period (b = −0.01, OR = 0.99, t = −2.50, p = .013). Order of assessment was unrelated to appearance motives for exercise (b = −0.01, OR = 0.99, t = −0.85, p = .398), body satisfaction ratings (b = 0.01, t = 1.60, p = .111), and appearance awareness (b = 0.00, t = 0.81, p = .419).

Effects on reporting were also explored with respect to time of day and day of week. Separating day of week into weekday (Monday to Friday; coded as 0) versus weekend (Saturday, Sunday; coded as 1), day of week was unrelated to reported exercise occurrence (b = −0.10, OR = 0.90, t = −0.91, p = .361), appearance motives for exercise sessions (b = −0.18, OR = 0.83, t = −0.96, p = .340), body satisfaction (b = −0.07, t = −1.17, p = .243), or appearance awareness (b = −0.08, t = −0.92, p = .358). The effects of time of day were evaluated by categorizing time by hour, with continuous coding from first possible hour of the day (coded as 0) to last, and treating this variable as a predictor in multilevel models with the Level 1 variables as DVs. Time of day was unrelated to body satisfaction (b = 0.01, t = 1.65, p = .098), appearance awareness (b = 0.00, t = 0.03, p = .976), or appearance motives for exercise (b = −0.06, OR = 0.94, t = −1.92, p = .055), but was related to exercise occurrence (b = −0.07, OR = 0.93, t = −3.43, p = .001), suggesting that participants reported exercise sessions more often earlier in the day.

Descriptive statistics and correlations

Table 2 presents the frequencies, means, standard deviations, and possible range of scores for the Level 1 and Level 2 variables of interest. As shown by the intraclass correlation values, most of the Level 1 variables had approximately equal proportion of variance between and within individuals. Exceptions were appearance and goal motives for exercise, which had considerably more variance across participants (72% and 64%, respectively) than within participants. Nevertheless, there was still considerable variance within individuals for each of these variables, justifying exploration at the state level. Level of trait body dissatisfaction was moderate for the sample as a whole. Moderate or strenuous exercise of at least 15 min in duration was reported for approximately 9% of

Table 2. Descriptive statistics for all Level 1 and Level 2 variables

Level	Variable	%	*M*	*SD*	Possible range	ICC
Level 1	State body satisfaction	n/a	5.59	1.75	0–10	0.57
	Appearance awareness	n/a	3.74	1.84	0–10	0.44
	Exercise episodes	9.0	n/a	n/a	0 or 1	0.33
	Appearance motives	9.3	n/a	n/a	0 or 1	0.72
	Fun motives	12.6	n/a	n/a	0 or 1	0.48
	Goal motives	21.0	n/a	n/a	0 or 1	0.64
	Health motives	16.5	n/a	n/a	0 or 1	0.56
	Mood motives	13.9	n/a	n/a	0 or 1	0.56
	Social motives	25.8	n/a	n/a	0 or 1	0.52
Level 2	Trait body dissatisfaction	n/a	28.30	8.14	9–45	n/a

Note. Frequency for motive variables is calculated based on instances where exercise was reported. Exercise sessions were coded as yes if 15 min or longer and moderate/strenuous activity level.

assessments. For the sample overall, the most commonly endorsed motive for exercise was social reasons, while appearance motives were endorsed least frequently. On average, participants reported moderate levels of state body satisfaction and low levels of appearance awareness.

The interrelations between modelled variables are presented in Table 3. At the within-person level, both state body satisfaction and appearance awareness had small associations with other state-level variables. Correlations among motives for exercise ranged in magnitude from small to large. At the between-person level, body satisfaction and appearance awareness were strongly related. Among the exercise motives, the strongest relationships were observed between fun and mood motives, and health and mood motives.

Main analyses

Effects of exercise on body image

Consistent with Hypothesis 1a, engagement in exercise was associated with higher post-exercise body satisfaction for the sample overall ($b = 0.24$, $t = 2.00$, $p = .023$, Cohen's $d = 0.21$), controlling for pre-exercise body satisfaction ratings and time between assessment points. As predicted, this effect was attenuated for individuals with higher trait body dissatisfaction ($b = -0.03$, $t = -2.07$, $p = .019$, Cohen's $f^2 = 0.20$), thus supporting Hypothesis 1b. Extrapolating from the slopes for the main effect of exercise ($b = 0.24$), this cross-level interaction ($b = -0.03$), and the mean for trait body dissatisfaction ($M = 28.30$), body satisfaction *worsens* post-exercise for individuals with trait body dissatisfaction scores ~8 or more points above the mean (i.e., >36.30). In this study, 28 participants (16%) reported a level of trait body dissatisfaction this extreme or higher.

Appearance motives explanation

Consistent with Hypothesis 2a, individuals with heightened trait body dissatisfaction were more likely to report exercising for appearance-related reasons ($b = 0.14$, $t = 3.68$, $p < .001$, Cohen's $f^2 = 0.22$). Trait body dissatisfaction was unrelated to frequency of exercise for health ($b = 0.00$, $t = 0.12$, $p = .905$, Cohen's $f^2 = 0.00$), fun ($b = 0.00$, $t = 0.02$, $p = .984$, Cohen's $f^2 = 0.00$), goal ($b = -0.02$, $t = -0.43$, $p = .665$, Cohen's

Table 3. Correlations for all Level 1 and Level 2 variables

Variable	1	2	3	4	5	6	7	8	9	10
1. State body sat	–	−.50*	.01	−.29*	−.09	−.01	−.04	−.08	−.08	−.62*
2. App awareness	−.22*	–	.06	.15*	.01	−.01	.01	.01	.01	.32*
3. Exercise	.04	.09*	–	.29*	.23*	−.12	.09	.08	.12	−.05
4. App motives	−.16*	.11*	.29*	–	.52*	−.13	.19*	.29*	.15*	.26*
5. Health motives	−.06	.10*	.49*	.49*	–	−.07	.35*	.40*	.11	.02
6. Social motives	−.03	.11*	.04	.06	.09*	–	.37*	.12	−.20*	−.13
7. Fun motives	−.04	.08*	.32*	.24*	.35*	.25*	–	.48*	.04	−.03
8. Mood motives	−.07*	.05	.28*	.40*	.50*	.10*	.35*	–	.13	.04
9. Goal motives	−.01	.05	.21*	.09*	.12*	−.10*	.03	.06	–	.01
10. Trait body dis	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	–

Notes. Correlations below the main diagonal are for within-person associations, whereas those above the diagonal are between-person associations derived from group means for state-level data (except for trait body dissatisfaction). Within-person correlations are not included for trait body dissatisfaction as this was only measured once, and hence in the present study does not have variance within individuals.
app = appearance; dis = dissatisfaction; n/a = not applicable; sat = satisfaction.
*$p < .05$ (two-tailed).

$f^2 = 0.00$), mood ($b = 0.01$, $t = 0.17$, $p = .862$, Cohen's $f^2 = 0.00$), or social ($b = -0.02$, $t = -0.77$, $p = .440$, Cohen's $f^2 = 0.00$) reasons.

In support of Hypothesis 2b, for the sample overall, state body satisfaction ratings were lower when individuals reported recent appearance-motivated exercise ($b = -0.19$, $t = -2.08$, $p = .019$, Cohen's $d = 0.22$). Figure 2 provides a breakdown of state body satisfaction ratings across all motive categories, and also shows body satisfaction was higher in exercise contexts than non-exercise.

To test Hypothesis 2c, further analyses were conducted to evaluate whether effects of exercise on body image remained if analyses excluded instances of appearance-motivated exercise. Post-exercise body satisfaction ($b = 0.18$, $t = 1.39$, $p = .082$, Cohen's $d = 0.15$) was not elevated relative to pre-exercise levels for the sample overall. However, trait body dissatisfaction still moderated the effects of exercise on body satisfaction ($b = -0.04$, $t = -2.18$, $p = .015$, Cohen's $f^2 = 0.32$), thus failing to support Hypothesis 2c.

Appearance awareness explanation

For the sample as a whole, post-exercise appearance awareness ratings were elevated relative to pre-exercise levels ($b = 0.42$, $t = 3.39$, $p < .001$, Cohen's $d = 0.36$). This change in awareness was significantly, negatively related to change in body satisfaction post-exercise ($b = -0.042$, $t = -3.05$, $p = .001$, Cohen's $f^2 = 0.01$), suggesting that body

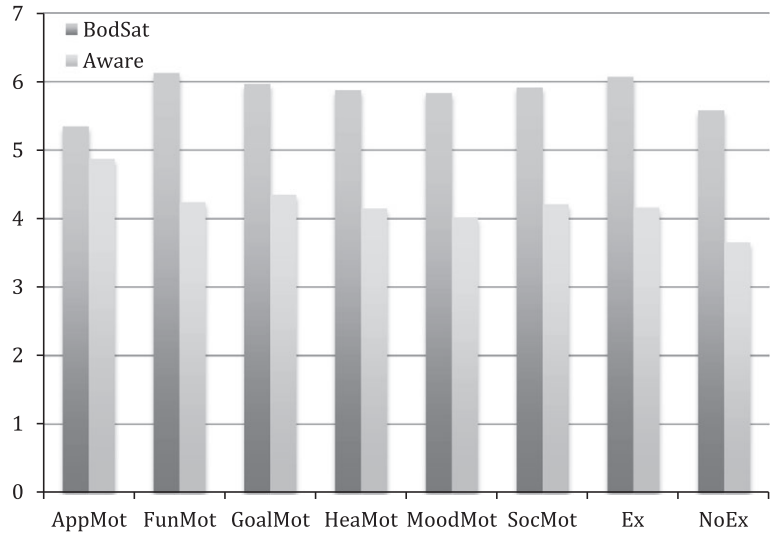

Figure 2. Mean levels of body satisfaction and appearance awareness across contexts.

satisfaction declined for individuals who experienced increased appearance awareness post-exercise. However, post-exercise increases in awareness were not moderated by trait body dissatisfaction ($b = 0.02$, $t = 0.88$, $p = .379$, Cohen's $f^2 = 0.00$). Trait body dissatisfaction did not moderate the relationship between change in awareness and change in state body satisfaction post-exercise either ($b = -0.01$, $t = -0.17$, $p = .869$, Cohen's $f^2 = 0.00$). Thus, Hypotheses 3a and 3b were supported, but Hypotheses 3c and 3d were not.

Combining explanations

Finally, in consideration of potential interrelation of the proposed awareness and appearance motives explanations for body image effects of exercise, post-exercise appearance awareness ratings were generated separately for each of the exercise motives tested in this study. As shown in Figure 2, and consistent with Hypothesis 4a, appearance awareness was higher for appearance-motivated exercise sessions ($b = 0.31$, $t = 1.80$, $p = .036$, Cohen's $d = 0.19$). Further, the level of appearance awareness following appearance-motivated exercise was higher for individuals with elevated trait body dissatisfaction ($b = 0.10$, $t = 2.94$, $p = .002$, Cohen's $f^2 = 0.14$), thus supporting Hypothesis 4b. Overall support for the appearance motives and appearance awareness explanations, and their integration, is summarized in Table 4.

Table 4. Summary of findings in relation to proposed explanations

Components of study	Relevant hypotheses	Supported hypotheses
Replication of prior findings	Hypotheses 1a, 1b	Hypotheses 1a, 1b
Appearance motives explanation	Hypotheses 2a, 2b, 2c	Hypotheses 2a, 2b
Appearance awareness explanation	Hypotheses 3a, 3b, 3c, 3d	Hypotheses 3a, 3b
Interrelation of proposed explanations	Hypotheses 4a, 4b	Hypotheses 4a, 4b

Discussion

An abundance of studies attest to the psychological benefits of exercise (Campbell & Hausenblas, 2009; Hausenblas & Fallon, 2006). Even so, recent findings from studies of exercise within daily life suggest that the acute, positive effects on state body satisfaction may be attenuated for individuals with trait body image disturbances (Fuller-Tyszkiewicz *et al.*, 2013; LePage & Crowther, 2010). The reasons for this moderation effect remain unclear, although existing evidence (e.g., LePage & Crowther, 2010; Martin Ginis *et al.*, 2003, 2008; Vartanian, Wharton, & Green, 2012) points to at least two plausible mechanisms The first is that individuals with trait body dissatisfaction experience less benefits to state body satisfaction because they engage in exercise for appearance-related reasons (the *appearance motives explanation*). The second explanation is that the act of exercise may trigger negative appearance-related thoughts for them that offset potential benefits of exercise (the *appearance awareness explanation*). The present findings replicated the moderation effect found previously, offer some support for both explanations for this effect, and suggest that these two proposed mechanisms may be interrelated in their impact on post-exercise body satisfaction levels.

Summary of evidence for awareness and motive-based explanations

In support of the appearance motives explanation, individuals with elevated trait body dissatisfaction were more likely to engage in exercise for appearance-related reasons, consistent with prior cross-sectional findings (Furnham *et al.*, 2002; Strelan *et al.*, 2003; Tiggemann & Williamson, 2000). This form of exercise was associated with lowest state body satisfaction. However, the moderating effect of trait body dissatisfaction – which was moderate in size – remained once appearance-motivated exercise sessions were removed from analysis. Hence, the appearance motivations explanation does not fully explain the moderating effect of trait body image found previously (e.g., Fuller-Tyszkiewicz *et al.*, 2013; Martin Ginis *et al.*, 2003, 2008).

Appearance awareness may also influence the extent to which an individual experiences post-exercise increases in body satisfaction. Appearance awareness ratings were higher post-exercise for the sample as a whole, and regardless of motives. Changes in appearance awareness post-exercise were also associated with changes in body satisfaction, although the hypothesized moderating effect of trait body dissatisfaction was not supported. The non-significant moderating effect of trait body dissatisfaction suggests that this self-focus may be a general effect, rather than a specific risk factor for trait body-dissatisfied individuals. This is in contrast to the experimental studies of Martin Ginis *et al.* (2003, 2008) in which manipulation of salience of appearance during exercise sessions had the greatest impact for trait body-dissatisfied individuals. One possible reason for this is that in daily life, trait body-dissatisfied individuals may avoid the sorts of exercise contexts (highly appearance salient) exposed to in these prior experiments. Alternatively, while individuals may not actively avoid such contexts, they may simply arise less frequently compared to less threatening exercise environments. In either case, the result would be dampened effects relative to those found previously in experimental studies.

The present findings also offered support for the interrelation of these appearance awareness and appearance motivation processes. Appearance-motivated exercise sessions were associated with the highest level of appearance awareness for the sample as a whole, and this effect was most pronounced for individuals with elevated trait body

dissatisfaction. Thus, the greater state body dissatisfaction experienced by trait body-dissatisfied individuals post-exercise may be attributable to both (1) their greater tendency to focus on appearance motives preceding exercise and (2) the heightened appearance awareness they experience during such exercise sessions. Given that trait body-dissatisfied individuals are by definition dissatisfied with their appearance, it is not surprising that this added focus on their appearance might remind them of, and lead to, dissatisfaction with their appearance in the moment of exercise.

Implications of findings

The finding that trait body-dissatisfied individuals appear less likely to experience body image-related benefit from exercise signals the need to further consider the impact of exercise on body image. Encouragingly, findings highlight that there may be periods when trait body-dissatisfied individuals experience the full benefit of exercise for their body image. After all, trait body-dissatisfied individuals still engaged in non-appearance-motivated exercise, which seems to lead to higher state body satisfaction. Further investigation of strategies to encourage greater engagement in non-appearance-motivated exercise sessions would be beneficial. Similarly, evaluation of strategies for reducing the negative body image experiences associated with appearance-related exercise would be useful from clinical and public health perspectives.

Psychoeducation about the effects of different exercise motives on body image may be an important step to raise awareness of exercise as a potential trigger for one's negative body image. For some individuals, this may be sufficient to divert their exercise efforts into non-appearance-related reasons. On the other hand, recognition of these negative effects of exercise may prompt reduced exercise engagement (Rhodes & Kates, 2015). This may be especially the case for individuals who are already concerned about their appearance, and who recognize that they frequently engage in exercise for this reason. Thus, providing individuals with psychological strategies to mitigate risk of negative experiences during exercise may foster less fear of exercise, and greater self-efficacy regarding one's ability to enjoy exercise without ill effects (Gillison, Sebire, & Standage, 2012; Jones, Harris, Waller, & Coggins, 2005; Rackow, Scholz, & Hornung, 2015). Such strategies may include setting more realistic exercise-related goals, focusing on enjoyment and health benefits of exercise, and seeking social support.

Limitations

The present findings should also be interpreted in the light of potential limitations arising from design choices and sample. The use of a simple self-report measure of exercise may impact results to the extent that participants inaccurately report the duration and/or intensity of exercise engaged in during the 10-day testing period. Given prior evidence that the effect of exercise on body image is strongest for moderate-to-strenuous activity (Campbell & Hausenblas, 2009; Hausenblas & Fallon, 2006), overestimation of exercise intensity would likely lead to underestimated effect sizes in the present study.

The impact of a 10-day testing period with semi-random assessment schedule on results is unclear. Greater number of assessments (per day or increased number of days) may increase the number of exercise assessments reported, and hence may improve the estimate of the exercise–body satisfaction relationship. Conversely, extending the study further may threaten data quality by increasing participant burden. Encouragingly, there was little evidence of reactivity effects in the present study, with a few notable exceptions.

First, exercise sessions were reported more frequently early in the day, suggesting that sampling more heavily during this period may enhance frequency of exercise sessions captured by the ESM protocol. Second, individuals with elevated trait body dissatisfaction tended to complete fewer assessments during the ESM phase. It is possible then that the current results are driven by individuals with lower trait body dissatisfaction. The estimate of the moderating effect of trait body dissatisfaction on the exercise–state body satisfaction relationship may have thus been affected.

Finally, the present sample primarily consisted of participants with normal BMI, who were predominantly university-aged students, which is consistent with prior exercise- and body image-focused ESM studies (e.g., LePage & Crowther, 2010). Age and weight status are both likely to relate to exercise participation and body image. Although accumulated evidence suggests that body image may be stable across adulthood (Grogan, 2011), young adults are among the most active adult age groups for exercise (Australian Bureau of Statistics, 2015). Further, the amount of physical activity one engages in negatively correlates with BMI (Van Dyck *et al.*, 2015). Hence, it is possible that the strength of association between exercise and body image changes as a function of age and/or BMI status. Further testing of the generalizability of current findings to older, heavier individuals who may engage less regularly in exercise is necessary.

Conclusions

Despite these limitations, the present findings offer support for the notion that benefits of exercise on state body satisfaction depend on motives for exercise and level of appearance awareness triggered by an exercise session. The observed interrelation between appearance motives and appearance awareness suggests that these mechanisms may be best thought of as complementary parts of a single process, rather than as separate or competing factors that determine post-exercise body satisfaction. As this is the first study to directly evaluate the interrelation of these mechanisms, an important first step is to evaluate replicability of these findings in subsequent research. Subsequently, future research is needed to determine the extent to which the adverse effects of appearance motives for exercise and subsequent increases in appearance awareness may be circumvented.

Conflict of interest

All authors declare no conflict of interest.

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