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Do women with greater trait body dissatisfaction experience body dissatisfaction states differently? An experience sampling study

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ABSTRACT

The present study evaluated the relation of key features of state body dissatisfaction experiences – inertia, instability from moment-to-moment, and average level across time-points – to trait body dissatisfaction and/or eating disorder risk. Participants included 161 women who completed measures of trait body dissatisfaction and disordered eating pathology, and then completed reported state body dissatisfaction and contextual influences (binge eating, dietary restraint, exercise, and appearance comparison behaviors) 6 times daily for 7 days. Results indicated that individuals with elevated trait body dissatisfaction were reliably different from those with healthier body image in terms of average state body dissatisfaction ratings, but not for inertia or instability. State mean and trait body dissatisfaction uniquely predicted eating pathology, although their predictive accuracy for clinical caseness was comparable. Cost vs. benefit of using state body image data for understanding trait body image and eating pathology is discussed.

1. Introduction

Dissatisfaction with one's physical appearance (hereafter referred to as body dissatisfaction) is a common experience, particularly in Western cultures and more so for women than men (Frederick, Forbes, Grigorian, & Jarcho, 2007; Swami et al., 2010). Traditionally, body dissatisfaction has been measured as a stable trait-like construct (e.g., with questions such as, 'In general, how dissatisfied are you with your appearance?'; Thompson, 2004). Recent research efforts have focused on the experience of body dissatisfaction in daily life (e.g., Melnyk, Cash, & Janda, 2004; Rudiger, Cash, Roehrig, & Thompson, 2007). In large part, this recent interest is driven by the awareness that body dissatisfaction may vary within individuals over time, and this time-varying information may be theoretically and clinically informative.

Using the experience sampling method (ESM; alternatively referred to as ecological momentary assessment), researchers have shown that body dissatisfaction is highly variable within and across days (Colautti et al., 2011; Heron & Smyth, 2013a; Lattimore & Hutchinson, 2010; Mills, Fuller-Tyszkiewicz, & Holmes, 2014; Rudiger, Cash, Roehrig, & Thompson, 2007). Importantly, these shifts in body dissatisfaction states have been linked to a range of contextual factors, such as recent exercise (Fuller-Tyszkiewicz, Skouteris, & McCabe, 2013; LePage & Crowther, 2010) and appearance-related comparisons, especially with more attractive comparators (Leahey, Crowther, & Mickelson, 2007; Ridolfi, Myers, Crowther, & Ciesla, 2011). Elevated state body dissatisfaction may also predict onset of binge episodes (Holmes, Fuller-Tyszkiewicz, Skouteris, & Broadbent, 2014), engagement in dietary restraint efforts (Lattimore & Hutchinson, 2010), and reluctance to engage in social interactions (Mills et al., 2014).

1.1. Identifying clinically-relevant cases

Key features of state-based body dissatisfaction data may also be useful for distinguishing individuals with typical levels of body dissatisfaction from those with clinically-relevant levels of trait body dissatisfaction or related conditions, such as eating disorders. Drawing upon Kuppens and colleagues' work (e.g., Houbens, van

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den Noortgate, & Kuppens, 2015; Kuppens, Oravecz, & Tuerlinckx, 2010) on emotional states, we argue that at least three features of state-based data may be relevant for body dissatisfaction: (a) average level of state body dissatisfaction, (b) temporal instability in state body dissatisfaction ratings, and (c) level of correlation among body dissatisfaction states over time (often referred to as inertia).

1.1.1. Average of state ratings

Insofar as trait-like body dissatisfaction reflects continued, regular experience of body dissatisfaction states, we would anticipate that those with higher trait body dissatisfaction (and related constructs, such as eating pathology) would, on average, tend to have higher state body dissatisfaction ratings in daily life. Consistent with this view, Rudiger et al. (2007) and Melnyk, Cash, and Janda (2004) both found moderate to strong correlations between state mean body satisfaction scores and trait-level body image and eating pathology variables. Importantly, Melnyk et al. demonstrated that mean state body satisfaction scores uniquely contributed to prediction of eating pathology, even after controlling for trait body dissatisfaction.

1.1.2. Instability of state ratings

Individuals may also differ in the extent to which their state body dissatisfaction fluctuates in daily life. While some individuals may be stable in their body dissatisfaction levels over time, others may fluctuate, such that they experience periods of relative satisfaction or intensified body dissatisfaction. These changes may be rapid, or sustained over a number of hours. Moreover, for individuals with regular fluctuations in state body dissatisfaction, the correspondence between her/his average state body dissatisfaction rating and trait-like body dissatisfaction may be weakened as it is more difficult for the individual to appraise their body dissatisfaction in general.

A difference in the magnitude of shift across participants may arise, for instance, if one individual is highly reactive or sensitive to predictors of state body dissatisfaction, whereas the other person is not. Conceivably, more regular shifts in state body dissatisfaction may also occur if a person is more attentive to cues in her/his environment that would prompt these shifts. Indeed, there is empirical support for these notions. Individuals with heightened body image disturbances (including individuals with an eating disorder) tend to exhibit greater sensitivity to appearance threat cues (Espeset, Gulliksen, Nordbo, Skarderud, & Holte, 2012) and show elevated rejection sensitivity (Calogero, Park, Rahemtulla, & Williams, 2010). Moreover, in ESM studies, there is some evidence to suggest that the magnitude and direction of state-based relationships involving body dissatisfaction may depend on one's level of trait body dissatisfaction (e.g., Leahey, Crowther, & Ciesla, 2011; LePage & Crowther, 2010; Mills et al., 2014). Melnyk et al. (2004) and Rudiger et al. (2007) reported that instability in state body satisfaction was associated with trait-level body image disturbances, with Melnyk et al. also finding an association with eating pathology. However, the moderating effect of instability on the association between trait and state-mean body dissatisfaction remains untested.

1.1.3. Correlation of state ratings

Finally, inertia refers to the strength of correlation among state-based ratings from one time-point to the next, and is typically modelled as an auto-correlation (e.g., state body dissatisfaction at time $t-1$ predicting state body dissatisfaction at time t). An individual with high inertia experiencing state body dissatisfaction may remain in a state of body dissatisfaction for longer (possibly intensifying over time) than for an individual with lower inertia, who – due to the low autocorrelation – may instead experience a subsequent reversal in state body dissatisfaction level. Such a pattern of high inertia is consistent with the notion of 'getting stuck' in a negative mood state (Koval, Kuppens, Allen, & Sheeber, 2012; Kuppens, Allen, & Sheeber, 2010).

We are unaware of any attempts to evaluate whether individuals with trait body dissatisfaction exhibit higher levels of inertia for state body dissatisfaction in daily life. However, the concept of inertia appears compatible with cognitive accounts of body image disturbances, which emphasize that individuals with heightened body dissatisfaction may differ from those with healthier body image in the way they engage in appearance-related stimuli in their environment. Individuals with heightened trait body dissatisfaction appear to be more attentive to negative appearance-related information (Mills et al., 2014), struggle to disengage from these negative stimuli once encountered (Ridolfi et al., 2011), and seem to show a bias towards interpreting ambiguous stimuli as a threat to their appearance (Rodgers & DuBois, 2016; Smeets, Roefs, van Furth, & Jansen, 2008). This hyper-vigilance towards, and difficulty disengaging from, negative appearance-related information is thought to perpetuate body dissatisfaction and related symptoms (e.g., disordered eating). Within the context of experience sampling designs, this may manifest as: (a) longer maintenance of elevated state body dissatisfaction level, and/or (b) stronger associations between consecutive state body dissatisfaction ratings over time for individuals with elevated trait body dissatisfaction. These characteristics may be captured using the concept of inertia.

While these findings offer some insights into the nature of the relationship between state- and trait-level body dissatisfaction, this evidence base remains small and gaps clearly remain. To our knowledge, the relationship between trait body dissatisfaction and inertia has yet to be tested empirically despite theoretical reasons to suspect a link. Similarly, although state mean and trait body image have been shown to strongly correlate (Melnyk et al., 2004; Rudiger et al., 2007), it is unclear whether such associations are contingent upon level of instability an individual experiences. Finally, with the exception of Melnyk et al., there has been insufficient consideration of whether state-based properties of body dissatisfaction may have predictive utility beyond that afforded by trait body dissatisfaction. If characteristics such as inertia and instability are different manifestations of negative body image, then it may be anticipated that they uniquely contribute to body image-related outcomes, such as eating pathology.

1.2. The present study

The primary aim of the present study is to extend prior investigations of the relationship between state and trait body dissatisfaction. In particular, the present study explored whether: (a) trait body dissatisfaction measured at baseline was associated with mean level, instability, and inertia in state body dissatisfaction measured repeatedly across a one-week testing period; and (b) the strength of correspondence between trait body dissatisfaction and average of state body dissatisfaction ratings is moderated by level of instability during the ESM phase. Given that it is unlikely that trait body dissatisfaction will be perfectly related to these characteristics of state body dissatisfaction, a secondary aim was to evaluate the unique contributions of these state-based body dissatisfaction characteristics to predict eating pathology, controlling for trait body dissatisfaction.

We predicted that average state body dissatisfaction, instability, and inertia will be positively correlated with trait body dissatisfaction (Hypothesis 1a–c) and eating pathology (Hypothesis 2a–c). However, it was further predicted that the correlation between trait and state average body dissatisfaction would be lower for individuals with more unstable state body dissatisfaction ratings during the ESM testing phase (Hypothesis 3). Finally, it was hypothesized that the three state body dissatisfaction characteristics and trait

body dissatisfaction would each be significant unique predictors of eating pathology when modelled together (Hypothesis 4).

2. Method

2.1. Participants

One hundred and sixty-one women aged 18–40 (M_{age} = 22.13, SD = 6.73) were recruited via advertising on websites of eating disorder-related organizations, social media, and through the Australian universities where the authors work. Although the sample was recruited for a broader study exploring the influence of body image on social interactions, we limit reporting to body dissatisfaction and disordered eating measures relevant for present hypotheses.

Self-reported body mass indices (BMI) ranged from 15.65 to 44.11 (M = 22.36, SD = 4.29). Thirteen percent of this sample was classified as underweight (BMI < 18.5), 71% were classified in the 'normal' weight range (BMI 18.5–24.9), 10% were classified as overweight (BMI 25.0–29.9), and 6% were classified as obese (BMI ≥ 30.0). The majority of participants reported being Caucasian (n = 121, 75.2%), currently employed in at least part-time capacity (n = 101, 62.7%), single (n = 81, 50.3%), and the highest educational attainment was most commonly high school level (n = 98, 60.9%). Thirty-two participants (20%) were identified as at-risk for an eating disorder as judged by scores ≥20 on the EAT-26 (described below).

2.2. Materials

2.2.1. Trait measures (Phase 1)

2.2.1.1. Trait body dissatisfaction. The 5-item version of the Body Image Dissatisfaction subscale of the Body Image and Body Change Inventory (Fuller-Tyszkiewicz et al., 2012; Ricciardelli & McCabe, 2002) was used to measure how individuals feel about their appearance in general. This scale assesses satisfaction with weight/shape, muscles, lower body (e.g., thighs and legs), middle body (waist and stomach), and upper body (chest and arms). Items were rated on a 5-point Likert scale with the following response options: 1 (*very unhappy*), 2 (*a bit unhappy*), 3 (*neutral*), 4 (*a bit happy*), and 5 (*very happy*). Scores for the 5 items were reverse coded and then summed so that scores ranged from 5 to 25, with higher scores reflecting greater body dissatisfaction. This subscale has been shown to be internally consistent, unidimensional, and correlate with other measures of body image disturbance (Mellor, McCabe, Ricciardelli, & Merino, 2008; Mellor et al., 2009). Cronbach's α in the present study was 0.84.

2.2.1.2. Eating pathology. Disordered attitudes and behaviors towards eating (representing risk for an ED) were assessed with the Eating Attitudes Test- 26 (EAT-26; Garner et al., 1982). The EAT-26 consists of 26 items that are rated on a 6-point Likert scale (*Never* to *Always*), with higher scores reflecting greater eating pathology. The cut-off score of 20 is often used to denote possible presence of an eating disorder, and was adopted in the present study. Additionally, good internal consistency (α = 0.83–0.90) and test–retest reliability (r = 0.84) have been demonstrated in samples of young women (Carter & Moss, 1984; Garner et al., 1982). In the current study, Cronbach's alpha was 0.90.

2.2.2. State-based measures (Phase 2)

2.2.2.1. State-based body dissatisfaction. Participants reported their response to the question, 'How satisfied are you with your appearance right now?' on an 11-point Likert scale from 0 (*completely dissatisfied*) to 10 (*completely satisfied*). The item was then reverse coded so that higher scores reflect greater body dissatisfaction. This single item approach is consistent with prior ESM-based investigations of body dissatisfaction (e.g., Rogers, Fuller-Tyszkiewicz, Lewis, Krug, & Richardson, 2017). Importantly, higher body dissatisfaction on this single item measure has been linked to greater frequency of engagement in appearance-related social comparisons (Rogers et al., 2017), a phenomenon thought to be more common among body dissatisfied than body satisfied individuals (Leahey et al., 2007, 2011). This finding supports construct validity of the current single item measure.

Average state body dissatisfaction ratings and inertia were derived using multilevel models. Average state body dissatisfaction ratings for each individual were calculated as the intercept value for each participant in a null model in which only the DV (state body dissatisfaction) was entered. Deriving person-specific means for state body dissatisfaction in this way is deemed more reliable than simply averaging assessments within individuals as it relies on empirical Bayes estimation (Hox, 2010). As inertia reflects the extent to which scores on state body dissatisfaction at one time point relate to scores on state body dissatisfaction at a subsequent time point, the present study obtained estimates of inertia by obtaining for each individual the coefficient representing a regression of state body dissatisfaction scores at time t onto state body dissatisfaction scores at time $t - 1$. Values of this inertia parameter range from −1 to +1.

Temporal instability in state body dissatisfaction ratings was calculated using the approach recommended by Jahng, Wood, and Trull (2008) for data with unequal time intervals. This approach: (a) takes into consideration temporal dependency in the data by subtracting one state body dissatisfaction rating from its rating at the prior time point rather than from a mean value across all time points, and (b) controls for the effect of unequal time intervals on magnitude of shifts in state body dissatisfaction from one time point to the next by dividing the difference in state body dissatisfaction by a median-scaled time lag between assessments (see Eq. (13) of Jahng et al., 2008 for further details about this scaling). The resulting adjusted successive difference scores (reflecting temporal instability) were squared to remove the minus sign when scores decreased over consecutive time points. Possible range of scores depends on the time intervals between assessments and level of influence of time on successive differences in a variable in a given study. In the present study, the possible range of instability scores was 0–33, with higher scores reflecting more instability from one time point to the next.

2.2.2.2. Contextual influences. A series of items were included as covariates to control for individual differences in contextual factors previously linked to body dissatisfaction. Specifically, participants were asked (Yes vs. No) if they had engaged in binge eating, dietary restriction, or exercising for weight-related reasons. Single item approaches have been used previously to measure disordered eating behaviors (e.g., Engel et al., 2013; Heron, Scott, Sliwinski, & Smyth, 2014). Participants were also asked if they engaged in an appearance comparison since the last assessment and, if so, how they felt they looked compared to the comparator: (1) much worse, (2) worse, (3) same, (4) better, or (5) much better. This latter item has been used previously (e.g., Leahey et al., 2007; Rogers et al., 2017) to ascertain direction of appearance comparison, and was dummy coded into variables for upward (worse, much worse), downward (better, much better), and lateral (same), with no comparison as the reference category. As per Ridolfi et al. (2011), participants also reported frequency of appearance comparisons since the last assessment. In the present study, options for frequency estimates ranged from 0 (*none at all*) to 10 (*constantly*).

2.3. Procedure

Following approval from the Ethics Committees at each of the three study sites, participants were recruited via announcements in undergraduate lectures, advertising on class portals, and posters within these universities, as well as via social media and online forums/websites related to eating disorders. These advertisements contained a web link to a plain language statement about what participation entails and, for those who electronically consented to participate (by indicating that they had read the plain language statement and agreed with terms of participation), instructions were given for downloading an iPhone app (Instant Survey) via the iTunes AppStore (Richardson, 2015a) or Google Play (Richardson, 2015b).

The app was downloaded prior to commencement of the baseline survey as the app generates a random alphanumeric code that allowed for linking baseline Qualtrics data (Phase 1) to app-based, experience sampling data (Phase 2). Phase 2 commenced the morning after downloading the app, and all 161 participants completed the baseline survey prior to Phase 2, ensuring that baseline assessments preceded ESM data. Phase 2 consisted of six audible alerts on their phone per day at semi-random intervals between 9:00am and 9:00pm for seven consecutive days. Each assessment was set to be 30–180 min apart, and structured to sample the whole day. As shown in the linked Supplementary Materials, the average time interval between completed assessments was 2.41 h ($SD = 1.47$), with almost half of assessments within 2 h of each other.

Random intervals were chosen instead of fixed scheduling to avoid response bias due to habituation and to ensure sampling across time of day (Napa-Scollon, Kim-Prieto, & Diener, 2003; Smyth et al., 2001). Each of the alert-prompted surveys was available to the participant via the app for 15 min; in instances where no response was given during this time, data were coded as missing. This 15-min window is consistent with prior ESM studies (e.g., Colautti et al., 2011), and ensures that participants complete assessments at intended times (rather than completing all assessments at a single time-point), thus maintaining integrity of the intended response schedule to sample across the day.

2.4. Analysis plan

All multilevel analyses were undertaken using Mplus version 8 (Muthén & Muthén, 1998–2017), while other analyses were conducted in SPSS version 24 (IBM Corp, 2016). Hypotheses 1 and 2 were conducted within a multilevel modeling framework. For evaluations of trait level predictors of state mean body satisfaction (Hypotheses Hypothesis 11a and Hypothesis 22a), state body satisfaction ratings at Level 1 were given a random intercept which was predicted by trait body dissatisfaction in one model and eating pathology in a separate model. The predictive value of these trait variables for temporal instability in state body dissatisfaction ratings was assessed in the same way (Hypotheses Hypothesis 11b and Hypothesis 22b), except contextual factors (appearance comparisons, binge eating, exercise, and dietary restraint) were entered as group-centered Level 1 predictors to control for their possible influence on instability in state body dissatisfaction ratings, and the possibility that individuals differ in their level of exposure to these influences. Group means for these contextual variables were entered at Level 2.

Recent evidence suggests that the inertia parameter is underestimated when the residual variance in the DV is fixed for all individuals (Jongerling, Laurenceau, & Hamaker, 2015). Consequently, multilevel models for Hypotheses Hypothesis 11c and Hypothesis 22c (the inertia effect) were undertaken using Bayesian estimation that permitted a random residual term in addition to random intercepts and slopes, and allowed for these random terms to correlate. In separate models, trait body dissatisfaction and eating pathology were included as predictors of these random terms. State body dissatisfaction ratings at the prior time point and contextual factors were entered as group-mean centered Level 1 predictors; group means for these contextual factors were also entered at Level 2, but the group mean for state body dissatisfaction was not (Hamaker & Grasman, 2015). The coefficient for the relationship between current state body dissatisfaction rating and dissatisfaction at the prior time-point represents the inertia effect. Significant relationships between this inertia term and trait level body dissatisfaction (Hypothesis 1c) and eating pathology (Hypothesis 2c) were taken as support for predictions. In analyses for temporal instability and inertia, the first assessment of each day was coded as missing in order to calculate these effects within-day. Hypothesis 3 was tested by evaluating the significance of the interaction between trait body dissatisfaction and average temporal instability ratings on state body dissatisfaction ratings, controlling for main effects of the two interacting variables. R-squared estimates were calculated by comparing the residual variance for models with the predictor of interest included vs. excluded (Hox, 2010).

Individual-specific parameter estimates for mean state body dissatisfaction ratings, inertia, and temporal instability were saved from multilevel models above, and subsequently used in a single-level regression along with trait body dissatisfaction to predict individual differences in eating pathology (Hypothesis 4). Finally, receiver operating curve (ROC) analyses were subsequently undertaken to compare the abilities of significant unique predictors from this regression for correctly identifying participants at-risk of an eating disorder. Area under the curve (AUC) values were used to characterize each measure across its range of values, and 95% confidence intervals were computed for each measure to assess for significant differences in their functioning. If the confidence intervals of the measures overlapped, it was concluded that they did not significantly differ in ability to detect cases of at-risk disordered eating. Youden's index (Youden, 1950) was used to estimate the optimal cutting point on these measures for detecting caseness. Youden's index is calculated as sensitivity plus specificity of the measure at a given cutting point. Higher values indicate the best balance between sensitivity and specificity of the measure.

3. Results

3.1. Compliance rates

The average number of responses completed per participant (out of a possible 42) was 21.82 ($SD = 9.21$). Bivariate correlations between compliance rates for ESM surveys and baseline measures were small yet significant for age ($r = -0.20$, $p = .013$) and eating pathology ($r = -0.22$, $p = .005$), and non-significant for BMI ($r = -0.05$, $p = .54$), trait body dissatisfaction ($r = -0.07$, $p = .405$), state mean body dissatisfaction ($r = -0.04$, $p = .581$), inertia ($r = 0.02$, $p = .811$), and temporal instability in state body dissatisfaction ratings ($r = 0.01$, $p = .934$). Further inspection revealed that the obtained ESM data were spread reasonably evenly across time of day and day of week (Monday, Tuesday, etc.). There was some bias in time of day, such that early assessments (9–10 am) and evening assessments (7–9 pm) were less common than other times throughout the day. Similarly, response rates were slightly lower for Sunday than other days of the week (see the linked Supplementary Materials for further details).

3.2. Group differences

As shown in Table 1, individuals with a probable ED had significantly higher trait and state average body dissatisfaction than

Table 1
Descriptive statistics for study variables across ED (n = 32) and non-ED (n = 129) groupings.

	Non-ED		ED			
Variable	*M*	*SD*	*M*	*SD*	*t*	*Cohen's d*
Trait body dissatisfaction	16.39	4.43	20.91	3.77	5.31***	1.10
Mean state body dissatisfaction	4.27	1.70	6.15	2.00	5.42***	1.01
Instability	4.76	3.06	4.13	1.90	1.11	0.25
Inertia	0.22	0.10	0.25	0.11	1.45	0.29
Mean comparison frequency	2.63	1.93	4.62	2.46	4.94***	0.90
Upward comparison	0.22	0.23	0.55	0.33	5.45***	1.16
Downward comparison	0.09	0.15	0.12	0.23	0.72	0.15
Lateral comparison	0.27	0.27	0.13	0.19	2.85**	0.60
Dietary restraint	0.09	0.18	0.38	0.34	4.74***	1.07
Exercise	0.08	0.16	0.26	0.27	3.50***	0.81
Binge-eating	0.04	0.10	0.22	0.28	3.50**	0.86

Note. Mean comparison frequency = average level of engagement in comparisons since the last assessment. Upward, downward, and lateral comparison = frequency of assessments in which participants reported engaging in these forms of appearance comparisons. *M* = mean, *SD* = standard deviation. Possible ranges for variables were: 5–25 for trait body dissatisfaction; 0–10 for state body dissatisfaction mean and appearance comparison frequency; 0–22 for instability; (−1)–(+1) for inertia; 0–1 for frequency of upwards, downward, and lateral comparisons, dietary restraint, exercise, and binge-eating.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

non-ED individuals. In both instances, effect sizes for these differences were large. ED and non-ED individuals did not significantly differ in their levels of instability or inertia. In terms of contextual influences, ED individuals tended to report higher rate of appearance comparison behaviors, with more upward comparisons and fewer lateral comparisons, as well as more frequent engagement in dietary restraint, exercise for appearance-related reasons, and binge eating.

3.3. Main analyses

Hypothesis 1. Multilevel modeling showed that individuals with elevated trait body dissatisfaction were more likely to have high mean state body dissatisfaction ratings over the ESM phase ($b = 0.23$, *95% CI*: 0.17, 0.29, $p < .001$, $R^2 = 0.31$), but were no more likely to exhibit instability ($b = 0.03$, *95% CI*: −0.17, 0.23, $p = .770$, $R^2 = 0.00$) or inertia ($b = 0.01$, *95% CI*: −0.01, 0.02, $p = .183$, $R^2 = 0.00$) in their state body dissatisfaction.

Hypothesis 2. Individuals with higher levels of eating pathology tended to have higher mean state body dissatisfaction ratings ($b = 0.09$, *95% CI*: 0.07, 0.11, $p < .001$, $R^2 = 0.30$). Instability ($b = 0.03$, *95% CI*: −0.04, 0.10, $p = .429$, $R^2 = 0.01$) and inertia ($b = 0.00$, *95% CI*: −0.01, 0.01, $p = .365$, $R^2 = 0.00$) in state body dissatisfaction ratings were unrelated to eating pathology severity.

Hypothesis 3. Although there was a strong positive association between state mean and trait body dissatisfaction ratings for the sample overall, there was a significant interaction between trait body dissatisfaction and level of instability in state assessments ($b = 0.01$, *95% CI*: −0.02, 0.00, $p = .025$, $R^2 = 0.02$). Thus, for individuals with higher instability the correspondence between state mean and trait body dissatisfaction was weaker.

Hypothesis 4. A standard linear regression with trait body dissatisfaction and the three indices of state body dissatisfaction over the ESM testing period accounted for 32% of the variance in eating pathology; $F(4156) = 18.90$, $p < .001$. Trait body dissatisfaction ($\beta = 0.23$, $p = .004$, $r = 0.45$, $sr^2 = 0.04$) and mean state body dissatisfaction ($\beta = 0.41$, $p < .001$, $r = 0.54$, $sr^2 = 0.12$) were significant unique predictors, but inertia ($\beta = -0.06$, $p = .423$, $r = 0.05$, $sr^2 = 0.00$) and instability ($\beta = -0.04$, $p = .615$, $r = 0.00$, $sr^2 = 0.00$) were not.

The relative utility of these two significant predictors (trait body dissatisfaction and average state body dissatisfaction) was followed up using ROC analyses. Trait body dissatisfaction (AUC = 0.80, 95% confidence intervals: 0.72, 0.89) and average state body dissatisfaction (AUC = 0.78, 95% confidence intervals: 0.69, 0.88) were both able to differentiate those at risk of an eating disorder from those not at risk. Moreover, the overlap in confidence intervals for these two measures suggests that they were comparable in predictive utility.

Youden's index was used to evaluate the optimal values of state average and trait body dissatisfaction, respectively, to maximize sensitivity (i.e., proportion of ED group individuals who are correctly identified; true positives) and specificity (i.e., proportion of non-ED group individuals who are correctly identified; true negatives) in identifying individuals with a probable eating disorder diagnosis. Higher Youden's index values indicate greater balance of sensitivity and specificity, whereas lower values indicate high level of sensitivity but poor specificity (or vice versa). As shown in Table 2, the optimal cutting points for these scales (when balancing specificity and sensitivity) were 18.5 for trait body dissatisfaction and 5.5 for the state body dissatisfaction average.

4. Discussion

Despite growing research interest in state-based conceptions of body dissatisfaction (e.g., Fuller-Tyszkiewicz et al., 2013; Heron & Smyth, 2013a, 2013b; Rogers et al., 2017), much of this research has focused on identifying antecedents to, and consequences of, spikes in state body dissatisfaction. This is in spite of early studies in this area focusing on how state and trait body image constructs relate (e.g., Melnyk et al., 2004; Rudiger et al., 2007). Although these findings of predictors and consequences of state body dissatisfaction have clear theoretical and clinical utility, far less is known about the natural fluctuations in state body dissatisfaction in daily life. In particular, it remains unclear whether characteristics of these fluctuations, such as average level, instability, and inertia can help to differentiate healthy profiles of state body dissatisfaction from more pathological levels that may warrant clinical attention. Present findings help to fill this knowledge gap, and provide direction for further research.

4.1. Potential ESM-based markers of body image disturbance

Consistent with prior research (Lattimore & Hutchinson, 2010; Melnyk et al., 2004; Rudiger et al., 2007), present findings demonstrated that individuals with heightened trait body dissatisfaction may be differentiated from those with lower trait body dissatis-

Table 2
Sensitivity, specificity and Youden's Index estimates for state and trait body dissatisfaction scores predicting eating disorder status.

Measure	Value	Sensitivity	Specificity	Youden's Index
State BD average	0.5	0.969	0.023	0.992
	1.5	0.969	0.062	1.031
	2.5	0.969	0.171	1.140
	3.5	0.906	0.333	1.239
	4.5	0.813	0.519	1.332
	5.5	**0.688**	**0.798**	**1.486**
	6.5	0.438	0.922	1.360
	7.5	0.188	0.961	1.149
	8.5	0.156	0.992	1.148
	9.5	0.094	1.000	1.094
Trait BD	5.5	1.000	0.008	1.01
	6.5	0.969	0.016	0.99
	7.5	0.969	0.023	0.99
	8.5	0.969	0.047	1.02
	9.5	0.969	0.085	1.05
	10.5	0.969	0.132	1.10
	11.5	0.969	0.140	1.11
	12.5	0.969	0.178	1.15
	13.5	0.969	0.256	1.23
	14.5	0.969	0.318	1.29
	15.5	0.938	0.419	1.36
	16.5	0.938	0.488	1.43
	17.5	0.906	0.558	1.46
	18.5	**0.844**	**0.659**	**1.50**
	19.5	0.750	0.713	1.46
	20.5	0.594	0.822	1.42
	21.5	0.406	0.891	1.30
	22.5	0.375	0.938	1.31
	23.5	0.281	0.953	1.23
	24.5	0.156	0.969	1.13

Notes. BD = body dissatisfaction. The optimal cut-point for each body dissatisfaction measure is displayed in bold. Sensitivity = proportion of ED group individuals who are correctly classified. Specificity = proportion of non-ED group individuals who are correctly classified. Higher Youden's index values indicate more optimal balance between specificity and sensitivity to ensure ability to distinguish ED from non-ED individuals.

faction on the basis of average state body dissatisfaction rating over a 7-day period. In the present study, trait and state mean body dissatisfaction shared approximately one-third of their variance, which is similar to estimates found in these prior studies. This unexplained variance may in part be attributable to measurement error and/or individual difference factors. The present finding of a moderating effect of temporal instability on the state-trait relationship is consistent with the notion that attempts to estimate one's general, trait-like level of a construct is more challenging for individuals who experience considerable fluctuations in this construct over time (Fredrickson, 2000; Perrine & Schroder, 2005; Stone et al., 2005).

Surprisingly, however, trait body dissatisfied individuals did not report higher levels of temporal instability or inertia in state body dissatisfaction ratings. That is, individuals with trait body dissatisfaction were no more likely to exhibit large shifts in state body dissatisfaction from one moment to the next, nor were current body dissatisfaction states better predictors of their subsequent body dissatisfaction states (the proposed inertia effect of 'getting stuck' in a state of negative body image). The lack of differentiation on the instability measure across the range of trait body dissatisfaction scores is interesting as it is in contrast to findings of greater emotional instability for other conditions, such as depression (Thompson, Mata, Jaeggi, Buschkuehl, Jonides, & Gotlib, 2012), borderline personality (Glaser, Van Os, Mengelers, & Myin-Germeys, 2008), and bipolar disorder (Houbens et al., 2015). One point of difference, however, is that the instability in these other conditions is with respect to generic emotional states (i.e., negative and positive mood) that may potentially be subject to a wider range of contextual influences and, hence, may appear as more reactive for those with clinical conditions. In contrast, body dissatisfaction is a cognitive-emotional reaction to a very specific attribute (physical appearance).

The finding that trait body dissatisfied individuals do not exhibit greater shifts in state body dissatisfaction from moment-to-moment is seemingly inconsistent with prior findings suggesting that individuals with negative body image have stronger negative reactions to a range of contexts, including appearance threat cues (Espeset et al., 2012) and upward appearance comparisons (Leahey et al., 2011). It is worth noting that some evidence suggests that individuals with body image disturbances also have less positive reactions to contexts shown to improve body satisfaction, such as exercise (Fuller-Tyszkiewicz et al., 2013) or social interactions (Colautti et al., 2011). Thus, it is possible that these individuals do not differ in their temporal instability, but rather in the contextual factors that determine temporal shifts in body dissatisfaction. Such an explanation may also account for the lack of association between trait body dissatisfaction and inertia. Whereas trait body dissatisfied individuals may seek contextual cues that perpetuate their negative body image, those who are trait body satisfied may instead actively seek contexts that maintain their positive body image. Alternatively, trait body satisfied individuals may simply spend less time fixating on body image, and hence experience less dissatisfaction as a consequence. Further testing of the role of rumination in inertia effects may help to contextualize the observed auto-correlation of state body dissatisfaction ratings over time.

4.2. State vs. trait body dissatisfaction reconsidered

On balance, evidence was mixed regarding the potential clinical utility of three key characteristics of state body dissatisfaction (mean level, inertia, and instability). On the one hand, the overlapping variance between trait body dissatisfaction and these state-based characteristics ranged from 0 to 31%, suggesting considerable independence between these constructs. Furthermore, state mean body dissatisfaction was shown to uniquely contribute to prediction of eating pathology, controlling for trait body dissatisfaction, which is often considered one of the strongest predictors of ED symptomatology (e.g., Stice, 2002). The moderating effect of temporal instability on the state mean-trait body dissatisfaction relationship suggests that there may be contexts in which it is difficult for an individual to accurately appraise her/his general level of body dissatisfaction. Under such conditions, the severity of one's body image may be under- or over-estimated. However, further testing is needed to ascertain how often this is the case, and the level of instability necessary to render trait-level body dissatisfaction estimates unreliable.

On the other hand, present findings failed to establish a direct link between trait body dissatisfaction and inertia or instability. These aspects of state body dissatisfaction were similarly unrelated to eating pathology, and hence may not be useful markers of clinical caseness. In addition, when modelled separately, trait body dissatisfaction and state mean body dissatisfaction had comparable levels of accuracy in predicting whether an individual may have an eating disorder. Given the relative ease of single administration of a trait-based body dissatisfaction measure, this may be preferable for diagnostic purposes relative to the three indices of state body dissatisfaction tested in the present study. However, if state body dissatisfaction measurements are easily obtained (e.g., if they are embedded as a component within an eHealth body image intervention), then present findings suggest that mean levels of these state body dissatisfaction ratings may be a clinically useful metric. Further, for individuals who are more variable in their body dissatisfaction experiences, collection of state body dissatisfaction ratings may serve to confirm or disconfirm self-rated general level of body dissatisfaction.

4.3. Limitations

Several study limitations warrant consideration. First, the present sample was largely comprised of Caucasian women, consistent with the majority of prior body image research (Grogan, 2008). Further exploration of robustness of results is needed in more diverse samples and subpopulations. Second, as the primary aim of the study was to explore levels of trait and state body dissatisfaction, we did not obtain a balanced sample of eating disordered vs. non-eating disordered individuals. Moreover, disordered eating at-risk status was based solely on self-report, and did not include objective confirmation of diagnosis. Accordingly, some individuals classified as non-eating disordered may in fact have a diagnosis, and others identified in the ED group may have been misclassified due to inaccuracy in their self-report. The possibility that individuals with different ED subtype (anorexia vs. bulimia vs. binge eating disorder, etc.) may have different response profiles for state-based body dissatisfaction was unable to be explored due to reliance on this self-report measure. We thus encourage researchers to replicate present findings in the context of specific eating disordered groups.

Third, compliance rates were lower than prior ESM investigations of state body image. While compliance levels were not related to body image variables that form the main focus of this study, compliance was lower for individuals who were older and/or exhibited elevated eating pathology, suggesting generalizability threats for these populations. A key consequence of fewer assessments in the present context is a bigger gap between time-points. In case of positively auto-correlated ESM data (as obtained in this study), this would mean greater likelihood of shifts from one time-point to the next as the lag increases. Thus, low compliance in the present study would seemingly bias results towards finding an association between trait body dissatisfaction and instability if such an effect exists (an effect that was non-significant in the present study). Attempted replication of present findings in a sample with higher compliance is recommended to ensure the present pattern of findings are substantive rather than due to this methodological issue.

4.4. Concluding remarks

Despite these limitations, present findings offer further insights into the relevance of body dissatisfaction experiences in daily life for trait body dissatisfaction and eating pathology. It is clear that those who have higher trait body dissatisfaction also tend to report higher average state body dissatisfaction, although this correspondence is weaker for individuals who are variable in body dissatisfaction experiences in daily life. The finding that trait body dissatisfaction level is unrelated to inertia suggests that trait dissatisfied individuals are no more likely to be 'stuck' in negative body image experiences than trait satisfied individuals are to experience prolonged periods of body satisfaction. Thus, present findings suggest that inertia and temporal instability are not particularly useful markers of current trait body dissatisfaction or ED status, although state mean body dissatisfaction may be. However, it remains unclear whether these characteristics of state body dissatisfaction are better or worse predictors of maintenance or future onset of trait body dissatisfaction and eating pathology. Given the growing interest in state body image, future investment in longitudinal studies that incorporate bursts of state-based assessments (e.g., Sliwinski, 2008) could help to address these issues.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.bodyim.2018.01.004.

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