A network analysis comparison of central determinants of body dissatisfaction among pregnant and non-pregnant women

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A B S T R A C T
The objective of the present study was to compare body dissatisfaction of pregnant (n = 1245 overall; n = 320 trimester 1, n = 497 trimester 2, n = 428 trimester 3) and non-pregnant (n = 547) women in terms of: (a) global dissatisfaction, (b) dissatisfaction with specific body parts/features, and (c) strength of inter-relation among these areas of dissatisfaction. While ANOVAs revealed small group differences in overall body dissatisfaction ratings for appearance and function, more sizable differences were observed at the item level. Network analysis showed that the dissatisfaction items clustered together in similar ways across groups, but that the relative importance of these items for the networks differed by group. In particular, dissatisfaction with chest was much less connected to other areas of dissatisfaction for pregnant women, whilst dissatisfaction with shape and/or weight were more strongly connected to other items for this group. Body function items were less important in the network for non-pregnant women. Findings support earlier qualitative findings suggesting that pregnant women are concerned with both appearance and functioning of their bodies. More broadly, information gleaned at the item level highlights the value in exploring areas of dissatisfaction that may increase understanding of global dissatisfaction ratings.

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1. Introduction

Dissatisfaction with one’s physical appearance is common in Western cultures, especially among girls and women (Fallon, Harris, & Johnson, 2014; Frederick, Forbes, Grigorian, & Jarcho, 2007; Frederick, Sandhu, Morse, & Swami, 2016; Swami et al., 2010). Dissatisfaction with appearance is a key risk factor for the development and maintenance of an eating disorder (Stice, 2002; Stice, Marti, & Durant, 2011), and is also a feature of body dysmorphic disorder (Bjornsson, Didie, & Phillips, 2010). Those who are dissatisfied are more likely to use extreme dieting techniques (such as purging, chemical supplementation, and diuretics) and undergo unnecessary cosmetic surgery (Fuller-Tyszkiewicz, Ricciardelli, McCabe, & Laville, 2013). However, not all individuals are dissatisfied solely with the aesthetic aspects of their bodies, and for those that are dissatisfied, the source of dissatisfaction may be an individual difference (Mellor et al., 2013; Warren, 2014).

Popular models of body image disturbances – such as the tripartite influence model (Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999) and objectification theory (Fredrickson & Roberts, 1997) – emphasize sociocultural influences in perpetuating (a) focus on aesthetic, appearance-related aspects more so than the functional aspects of one’s body, and (b) an unrealistically thin physique (the ‘thin ideal’) for girls and women to aspire to. Dissatisfaction with one’s appearance may depend on the extent to which one prioritizes physical appearance and subscribes to this ideal, as well as one’s perceived distance from this ideal. Moreover, an individual may be broadly dissatisfied with her appearance, or derive dissatisfaction from a few salient features that fail to meet one’s ideal (Thompson & Schaefer, 2019; Thompson, 2004).

Although the thin ideal is unattainable for most individuals, this may be increasingly so for some populations, such as those who are pregnant. Unlike at other periods in one’s life, pregnancy is characterised by rapid physiological changes that push an individual further from the ideal (Skouteris, 2011). These differences raise the question of whether the thin ideal – and indeed the importance one ascribes to physical appearance – remains relevant for pregnant women (Skouteris, 2011). Indeed, given these physiological
changes, it is plausible that some features become more salient with respect to the idealised body shape or, alternatively, that new features – distinct from the typical idealised physique of non-pregnant women – emerge as important (Talmon & Ginzburg, 2018). Understanding of the areas of greatest body dissatisfaction, as well as their inter-relation with each other and with global ratings of body dissatisfaction, may provide greater insights into the nature of body image disturbances during pregnancy than would be afforded by simply asking whether body image is important to these women.

To date, the evaluation of body image during pregnancy has resulted in mixed findings. While some studies have shown that pregnant women become more dissatisfied with their appearance during pregnancy than pre-pregnancy both as a derived index across a range of body parts (Goodwin, Astbury, & McMeeken, 2000), other findings suggest that pregnant women may become less body dissatisfied relative to pre-pregnancy whether measured as an average across a range of body parts (Clark & Ogden, 1999; Loth, Bauer, Wall, Berge, & Neumark-Sztainer, 2011) or in relation specifically to feeling fat (Skouteris, Carr, Wertheim, Paxton, & Duncombe, 2005). Attempts to identify the period of greatest body image disturbance during and beyond pregnancy have been similarly inconclusive, with some evidence suggesting that body dissatisfaction (averaged across a range of body parts) peaks in early pregnancy (Goodwin et al., 2000), other studies finding body dissatisfaction – when measured as perceived attractiveness – to be stable during pregnancy (Duncombe, Wertheim, Skouteris, Paxton, & Kelly, 2008), and others still finding that body dissatisfaction is perhaps most elevated in the post-partum phase when measured in terms of feeling fat (Clark, Skouteris, Wertheim, Paxton, & Milgrom, 2009; Rallis, Skouteris, Wertheim, & Paxton, 2007).

Such inconsistency of findings is difficult to reconcile. Although a variety of different measures of body dissatisfaction were used across the studies, these surveys tend to ask about dissatisfaction with specific body parts in general (e.g., Goodwin et al., 2000; Loth et al., 2011) or dissatisfaction with shape and weight across a range of contexts (e.g., Clark et al., 2009a). However, there is no clear pattern of significance or non-significance based on whether the measures used were focused on a broad range of body parts or more narrowly focused on weight and shape, and inconsistencies were evident even across studies using the same measure (e.g., Duncombe et al., 2009 vs. Clark et al., 2009a; Rallis et al., 2007).

A key limitation that is consistent across these prior efforts to quantify body image issues during pregnancy is reliance upon measures validated for use in non-pregnant populations (e.g., the Body Attitudes Questionnaire: Ben-Tovim & Walker, 1991), that may be insufficiently comprehensive to cover all key bodily features that are relevant for pregnant populations (Fuller-Tyszkwicz, Skouteris, Watson, & Hill, 2012; Meireles, Neves, Carvalho, & Ferreira, 2015). Qualitative investigations highlight that although body weight and shape, breasts, and stomach remain areas of concern during pregnancy, pregnant women also have concerns with changes to their appearance in terms of stretch marks, varicose veins, and skin complexion (Watson, Fuller-Tyszkwicz, Broadbent, & Skouteris, 2015). In this prior work, pregnant women also articulated concern of both aesthetic and functional aspects of their bodies. In terms of functioning, they expressed concern about being physically restricted, lethargic, and impaired (Watson, Fuller-Tyszkwicz et al., 2015). To our knowledge, no existing body image measures cover this breadth of body image concerns.

Progress in this field of research may also have been limited by the manner with which researchers have typically differentiated individuals with body dissatisfaction from those without. A focus on differences across groups (e.g., pregnant versus non-pregnant women or comparisons of women at different stages of pregnancy) in terms of aggregates of body dissatisfaction item scores ignores potentially clinically useful information at the symptom (or item) level. For instance, it is possible that pregnant and non-pregnant women have comparable levels of body dissatisfaction overall, and yet the items that contribute to their dissatisfaction may differ. Similarly, the breadth of areas of dissatisfaction could also differ despite similar total scores being obtained.

Recently, advocates of a network perspective for psychopathology (e.g., Borsboom, 2017; McNally, 2016) have argued that a psychological construct may be best understood in terms of two core components: overall total score (in the case of psychological conditions, this would represent severity of symptoms) and strength of relation between the items (or symptoms) representing this construct. It is argued that a focus at the level of items (rather than total scores) can provide a rich, complementary source of information as a high total score does not necessarily mean that an individual endorses all items equally. Within the context of body image in pregnancy, this may mean that some of the body image parts referenced in prior measures are relevant and a source of dissatisfaction, whereas others are less relevant or may be viewed as satisfactory. A total score approach would miss this information, and is also insensitive to the possibility that some items cluster together due to their importance for overall body image dissatisfaction. Item-level analysis may be useful from a clinical perspective because it helps to identify symptoms that are of particular concern (when looking at item total scores) and also by identifying items that may exert influence on others (when looking at relation among items), thus allowing for prioritization of which features of body image to target first in cases where treatment is necessary.

The nature of a psychological construct can also be gleaned in this way from the items in terms of breadth and strength of connectivity amongst these symptoms. A network in which many of the items are related would suggest a broader construct than one in which only a few of these items inter-relate; this latter scenario could possibly be an indication that the operationalisation of the construct has included some construct-irrelevant items. While this network approach has been used to gain insights into the nature of a range of psychological conditions, including depression (Boschloo, van Borkulo, Borsboom, & Schoevers, 2016), posttraumatic stress disorder (McNally et al., 2015), and body image dissatisfaction of people with gender dysphoria (van de Grift et al., 2016), it has yet to be applied within the context of body image during pregnancy. However, it could be useful in better identifying which body parts and features ‘hang together’ to form a nomological network representing the construct of body dissatisfaction among pregnant women.

Hence, the present study sought to advance understanding of body image dissatisfaction during pregnancy by using a more appropriate and representative measure of body dissatisfaction for pregnant women derived from existing measures and qualitative data. Body dissatisfaction differences between the groups were evaluated: (a) at the item and aggregate levels, and (b) by conducting a network analysis of the inter-relation among these body image features, with particular emphasis on overall connectivity among items and identifying influential items, operationalized as having strong and diffuse connections to other body image items within the network.

Based on prior qualitative evidence (Watson et al., 2015), it was anticipated that pregnant women would exhibit higher levels of dissatisfaction for bodily functions (strength, flexibility, energy levels, and fluid retention), and for areas of the body associated with the appearance of their skin (complexion, stretch marks, and varicose veins). Furthermore, as a consequence of different body areas of focus during pregnancy relative to non-pregnancy, it was predicted that the pattern of inter-relations among body dissatisfaction items would also differ for the groups, and that a broader range of items would be inter-related for pregnant than non-pregnant women. These differences between pregnant and
non-pregnant women were expected to be most pronounced in the final trimester of pregnancy given women have had more time to get used to the change in their bodies and also because this should correspond with greatest divergence from the thin ideal.

Given the inconsistency in past findings regarding body dissatisfaction differences between pregnant and non-pregnant women, and also across pregnancy, we do not provide hypotheses about differences across groups in scores on the Body Attitudes Questionnaire. We include this measure moreso as a basis for comparing results derived from a more suitable body image in pregnancy measure against a measure that has been commonly used in prior research.

2. Method

2.1. Participants

The present study comprises 1792 women (547 women who had never been pregnant, 320 women in the first trimester of pregnancy, 497 in the second trimester, and 428 in the third trimester). Participants were either from the U.S. (if recruited via MTurk) (n = 1224), or from the U.K. (n = 568) (if recruited via Prolific). Forty-one percent (n = 507) of the pregnant women were primiparous, 36.0% (n = 448) already had one child, 15.1% (n = 188) had two children, and 8.2% (n = 102) had three or more children. The four groups significantly differed in age, F(3, 1788) = 5.59, p < .001, eta2 = .01, though this difference was slight: non-pregnant women (M = 29.76, SD = 3.26) were youngest on average, followed by first (M = 29.81, SD = 5.23), second (M = 30.36, SD = 4.97), and third trimester women (M = 30.86, SD = 5.15). The groups also significantly differed on BMI; F(3, 1788) = 26.67, p < .001, eta2 = .04. Non-pregnant women had the lowest BMI (M = 25.28, SD = 6.34, range = 15.12–49.95), followed by first (M = 26.02, SD = 5.36, range = 16.98–43.34), second (M = 26.72, SD = 5.07, range = 16.12–50.30), and third trimester women (M = 28.44, SD = 5.38, range = 16.12–49.46).

Pregnant women were also asked to self-report their pre-pregnancy weight. There were no significant differences in BMI across the three groups before entering pregnancy; F(2, 1242) = 0.83, p > .436, eta2 < .01. The mean BMIs pre-pregnancy were 24.30 (SD = 5.33), 24.14 (SD = 4.94), and 24.58 (SD = 5.13) across first, second, and third trimesters, respectively. Differences in pre-pregnancy BMI values remained non-significant across groups after controlling for parity; F(2, 1241) = 0.33, p > .722, eta2 < .01.

2.2. Measures

2.2.1. Body dissatisfaction

Twenty-two items from the initial pool of the body dissatisfaction subscale of the Body Image in Pregnancy Scale (BIPS; Watson, Fuller-Tyszkiewicz, Broadbent, & Skouteris, 2017) were used in the present study. These items were developed by drawing upon content from existing body image measures used in pregnancy and qualitative reviews identifying additional body image concerns for pregnant women not covered in this existing item pool (e.g., Chang, Chao, & Kenney, 2006; Chang, Kenney, & Chao, 2010; Clark, Skouteris, Wertheim, Paxton, & Milgrom, 2009; Earle, 2003; Johnson, Burrows, & Williamson, 2004; Mills, Schmied, & Dahlen, 2013; Nash, 2012; Watson, Fuller-Tyszkiewicz et al., 2015; Watson, Broadbent, Skouteris, & Fuller-Tyszkiewicz, 2015). The scale measures dissatisfaction with 21 specific aspects of one's appearance (e.g., arms, legs, stretch marks), as well as a further item assessing overall dissatisfaction with one's appearance. For a full list of items, see the Supplementary Materials linked online to this article. The global item was added in order to evaluate the key body parts that drive body dissatisfaction for the two study groups (pregnant and non-pregnant women), and is not intended to be included when aggregating dissatisfaction scores for the 21 body parts. Participants respond using a 5-point response scale: completely satisfied (assigned a value of 1), satisfied (2), neither satisfied nor dissatisfied (3), dissatisfied (4), and completely dissatisfied (5). Given the possibility that this process may result in inclusion of items that are irrelevant for and unable to be answered by non-pregnant women, a ‘not applicable’ option was made available to participants. However, none of the participants in the present study used this option.

Several modifications were made to the scale. First, whereas the initial version asked participants how happy they were for each body part asked about, this was changed to how satisfied they were. Although similar in meaning, this change better reflects the intention of the scale to capture level of satisfaction/dissatisfaction with body image, and is also consistent with the item response format. Second, several of the items in the initial version of the scale did not clearly explain for the respondent whether they were to think about the body part in terms of function or appearance. In the present study, we separated the 21 items into body aesthetics and function groupings, and provided different wording for each set to emphasize whether the focus was on appearance or function (see the Supplementary File for the full list of items and instructions to participants). Third, a global item for overall dissatisfaction with function was added to the existing overall dissatisfaction with appearance item to facilitate evaluation of global dissatisfaction for these distinct components of body image. These global items for dissatisfaction with function and aesthetics correlated strongly with total scores derived from the average of individual items (r = .70, p < .001), suggesting good coverage of the key functional and aesthetic concerns of pregnant women.

2.2.2. Body attitudes

The Body Attitudes Questionnaire-Short Form (Ben-Tovim & Walker, 1991) is a 44-item self-report measure designed to assess one’s attitude to their body. The BAQ was included to provide a broader profile of potential differences in body image experiences for the pregnant and non-pregnant groups, and was used in preference to other multi-dimensional body image measures because the BAQ has been used previously in pregnant populations (Hill, Skouteris, McCabe, & Fuller-Tyszkiewicz, 2013; Rallis et al., 2007).

Consistent with prior research (e.g., Hill et al., 2013; Rallis et al., 2007), the present study utilised the following four subscales of the BAQ thought to be most relevant during pregnancy: Attractiveness (five items; e.g., ‘I usually feel physically attractive’; Feeling Fat (12 items; ‘I have a slim waist’); Salience of Weight and Shape (five items; ‘I am preoccupied with the desire to be lighter’); and Strength and Fitness (six items; ‘I am proud of my physical strength’). Participants ranked their agreement with the statements on a five-point response scale (1 = definitely disagree through to 5 = definitely agree). Higher scores on these subscales indicate stronger feelings of fatness and salience of physical appearance, and higher levels of self-perceived attractiveness and strength/fitness. The BAQ has demonstrated reasonable internal consistency for a pregnant cohort in prior research (Hill et al., 2013; Rallis et al., 2007).

In the present study, the BAQ subscales demonstrated acceptable internal reliability for the non-pregnant sample (omega = .71–.92), second trimester (omega = .74–.93), and third trimester pregnancy group (omega = .71–.92). Three estimates were above .70 for the first trimester group (omega = .76–.92), but the attractiveness subscale had lower than desired internal consistency (omega = .64). As the BAQ was included for secondary aims in the present study, no attempts were made to improve internal consistency through item deletion. Further, low internal consistency for this subscale has been shown previously in pregnant popula-
tions (e.g., Duncombe et al., 2008), perhaps reflecting the measure’s unsuitability for this population.

2.3. Procedure

Deakin University’s Human Research Ethics Committee approved this research. Pregnant and non-pregnant women were recruited to the current study by separately targeting pregnant and non-pregnant women using the online recruitment platforms Amazon Mechanical Turk (MTurk) (Paolacci & Chandler, 2014) and Prolific (Palan & Schitter, 2018). This resulted in four separate rounds of data collection; one for non-pregnant women via Prolific, one for non-pregnant women via MTurk, one for pregnant women via Prolific, and, one for pregnant women via MTurk (in this order). These online platforms were chosen as they have been found to be more demographically diverse than in-person convenience samples (Levay, Freese, & Druckman, 2016), with MTurk in particular a successful recruitment strategy for obtaining diverse pregnant samples (Seymour-Smith, Cruysw, Haslam, & Brodribb, 2017).

Short recruitment notices were posted on both the MTurk and Prolific platforms. When targeting for non-pregnant participants, the notice on MTurk and Prolific asked these potential participants to take part in a “Short survey study on body image, only for women who have never been pregnant.” When targeting for pregnant participants, the notice on MTurk and Prolific asked these potential participants to take part in a “Short survey study on body image and pregnancy, for women who are currently pregnant only. Screeners checking whether participants were currently pregnant were also employed for both MTurk and Prolific, with MTurk and Prolific formatted to automatically exclude participants who had already taken part in one round of data collection from being recruited into any other data collection rounds. This strategy has been found to substantially reduce the likelihood participants misrepresent whether they are part of the target population (Chandler & Paolacci, 2017). Once presented with the recruitment notice, and passing the screeners, participants clicked on a web-link that presented a Plain Language Statement, followed by the online questionnaire, which took approximately 25 min to complete. Participants recruited via MTurk and Prolific were paid $US1 and £1, respectively.

2.4. Data analytic strategy

Data were screened for normality, outliers, and multicollinearity prior to analyses. All continuous variables were normally distributed and lacking multicollinearity among items. Several outliers were detected across variables (maximum of 1.2% for BMI among 2nd trimester participants); however, as results for analyses below changed negligibly with inclusion vs exclusion of outliers, these outliers were retained for analyses reported in the Results section.

Differences in the experience of body dissatisfaction among pregnant and non-pregnant women were tested using several approaches. Initially, ANOVAs were conducted to compare the groups on each of the items of the body dissatisfaction measure, as well as the BAQ subscales. Such an approach provides preliminary indication of any aspects of appearance for which the groups may differ, but does not reflect inter-relatedness among these aspects of body image. Differences in the relationship between item-level dissatisfaction and overall ratings of dissatisfaction with aesthetic and functional aspects of appearance were undertaken using multiple regression. The single item overall dissatisfaction with appearance rating was regressed onto all of the appearance items from the BIPS, while the single item overall dissatisfaction with body functioning rating was regressed onto the four functioning items of the BIPS. Analyses were run separately for the four groups to enable evaluation of differences between groups.

Network analysis was used subsequently to evaluate group differences in item inter-relation. This network was estimated using an adaptive least absolute shrinkage and selection operator (LASSO) approach, which is an efficient method for eliminating spurious non-zero partial correlations among items (Zou, 2006). The R package parcor (Kramer, Schafer, & Boulesteix, 2009) was used to conduct these network analyses with the main 21 items (excluding the two global items) of the body image dissatisfaction measure.

A visual representation of the inter-relatedness of these body dissatisfaction items was generated using R package ggraph (Epskamp, Cramer, Waldorp, Schmittmann, & Borsboom, 2012). These networks comprise ‘nodes’ (network analysis terminology for items) and ‘edges’ (lines representing inter-relation among items). Items that are more strongly related tend to spatially cluster closer together in the network visualisation. Edges vary in width, with an absence of an edge between two nodes suggesting the items are not directly related, whereas edges of greater width denote stronger association between two nodes. These edges are also color coded, with red typically used to denote a negative association and green for a positive association.

Several statistics were used to characterise key features of the networks in the present study. Strength values (calculated as the sum of partial correlations involving a given item) were used to evaluate at the item level which items were most strongly connected to others in the network. The correlation stability (CS) coefficient was implemented via the bootnet package in R (Epskamp, Borsboom, & Fried, 2018) to evaluate the stability of these strength values as an indicator of possible replicability of present results. Epskamp et al. (2018) recommend a CS coefficient of at least .25 to ensure sufficient stability in centrality metrics to interpret from one’s sample, but note these are provisional until more definitive guidelines are established.

Finally, at the level of the network, potential clustering of nodes into groups was evaluated using exploratory graph analysis (EGA), implemented using the EGA package in R (Golino & Epskamp, 2017). This works by identifying communities of nodes that are related, analogous to item loadings on factors in exploratory factor analysis, further, statistical significance of group differences in overall connectivity of the network model was tested using the network comparison test (NCT), executed via the NCT package in R (van Borkulo et al., 2015).

3. Results

3.1. Group differences in body image measures and their association with total scores

A series of ANOVAs confirmed that the groups significantly differed for all measures, with the exception of dissatisfaction with hair and the BAQ subscale feeling fat. This latter finding is curious given the large difference between groups for the item dissatisfaction with weight (see Table 1). Further, although significant differences were observed for overall dissatisfaction with appearance and with function, this effect was small, and non-pregnant women had greatest difference with women in their third trimester (these pregnant women reported higher dissatisfaction).

Post-hoc testing revealed that significant differences were most often between non-pregnant and pregnant groupings. Pregnant women more dissatisfied with their weight, muscle size, skin tone, fluid retention, energy levels, and functioning overall. Pregnant women were less dissatisfied than non-pregnant women with their hips, chest, shoulders, calves, and facial complexion. However, most group differences were small in magnitude, with several moderate effects for dissatisfaction with chest, shoulders, and calves (lower
disatisfaction for pregnancy groups), as well as energy levels (higher dissatisfaction for pregnant women).

Regression analyses were conducted to evaluate the contributions of the body image dissatisfaction items for overall assessments of dissatisfaction with body image appearance and function. As shown in Table 2, there were differences in overall variance explained and significant predictors across the pregnant and non-pregnant groups. Overall variance explained was higher for both dissatisfaction with appearance and function for pregnant women relative to non-pregnant women. Moreover, dissatisfaction with weight and shape were significant predictors of overall appearance dissatisfaction for pregnant women only. Several other body areas were significant unique contributors for prediction of overall appearance dissatisfaction for pregnant women but not for non-pregnant women: hips, thighs, chest, stomach, legs, calves, ankles, and skin tone. For overall dissatisfaction with functioning, all four items were significant predictors for pregnant women, but fluid retention was not a significant predictor for non-pregnant women.

3.2. Inter-relation among body image dissatisfaction items

The networks for pregnant and non-pregnant women are shown in Fig. 1. In terms of item clustering, there were more similarities across groups than points of difference. A cluster comprising items for body shape, hips, muscle size, muscle tone, stomach, thighs, and weight was found for all groups, while dissatisfaction with chest also clustered with these other items for women in the first trimester of pregnancy. This cluster seems to represent salient features that are commonly included in measures of body dissatisfaction. A separate cluster was formed for the body function items (energy level, fluid retention, flexibility, and strength), and was found for all groups. A third clustering involved a broad grouping of body parts not limited to a specific body region (arms, ankles, chest, calves, hands, legs, and shoulders) that are perhaps less commonly reported areas of body image concern. For the first trimester group, chest and hands did not cluster with these other items. Hair, skin tone, and complexion—which might be broadly classified as dissatisfaction with the head region—clustered together for all groups, though surprisingly, dissatisfaction with hands clustered with these items for women in their first trimester. Finally, for the second trimester group, dissatisfaction with chest clustered by itself. Despite this similarity in item clustering, comparisons of network connectivity using permutation tests showed that the non-pregnant group differed significantly from the first trimester (p = .003), second trimester (p = .037), and third trimester pregnant groups (p = .005). There were no significant differences in structure across the three trimesters of pregnancy (p's ranged from .236 to .360). Thus, although item groupings tended to be similar across groups, the strength of these connections tended to be greater for pregnant women, suggesting that: (1) the inter-relation among these body features is stronger, and (2) pregnant women may have greater breadth of salient body image features that contribute to their body (dis)satisfaction.

Exploration at the item level provides further information about group differences in the importance of individual body features within the body dissatisfaction network. For non-pregnant women, arms, hips, and thighs had the highest strength values (indicating more and/or stronger connections with other items in the network), whereas fluid retention, flexibility, and chest had the lowest
Table 2
B weights for BIPS items predicting global scores for dissatisfaction with appearance and function, by group.

<table>
<thead>
<tr>
<th>DV</th>
<th>IV</th>
<th>Non-pregnant</th>
<th>1st trimester</th>
<th>2nd trimester</th>
<th>3rd trimester</th>
</tr>
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<tbody>
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<td>Appearance</td>
<td>Weight</td>
<td>.10 [-.15,.35]</td>
<td>.17 [07,.28]*</td>
<td>.10 [01,.18]*</td>
<td>.15 [08,.23]**</td>
</tr>
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<td>Shape</td>
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<td>.17 [06,.29]*</td>
<td>.15 [07,.24]**</td>
<td>.22 [14,.30]*</td>
</tr>
<tr>
<td></td>
<td>Muscle size</td>
<td>-.09 [-.20,.02]</td>
<td>.02 [09,.13]</td>
<td>-.02 [-.10,.06]</td>
<td>.02 [-.07,.10]</td>
</tr>
<tr>
<td></td>
<td>Hips</td>
<td>.01 [-.10,.11]</td>
<td>-.04 [-.14,.06]</td>
<td>.04 [-.04,.11]</td>
<td>.08 [00,.17]*</td>
</tr>
<tr>
<td></td>
<td>Thighs</td>
<td>-.07 [-.14,.03]</td>
<td>.11 [00,.22]*</td>
<td>-.04 [-.11,.04]</td>
<td>.10 [02,.17]*</td>
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<tr>
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<td>Chest</td>
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<td>.01 [-.07,.09]</td>
<td>.06 [00,.12]*</td>
<td>.10 [04,.16]*</td>
</tr>
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<td>.09 [-.01,.18]</td>
<td>.19 [13,.26]**</td>
<td>.07 [01,.13]*</td>
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<td>-.10 [-.20,.00]*</td>
<td>.09 [02,.16]*</td>
<td>-.08 [-.16,.01]</td>
</tr>
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<td>.04 [-.05,.13]</td>
<td>-.11 [-.17,.04]*</td>
<td>.00 [-.07,.06]</td>
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<td>.12 [-.06,.18]**</td>
<td>.06 [-.01,.13]</td>
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<td>.11 [01,.21]*</td>
<td>.06 [-.01,.14]</td>
<td>.01 [-.06,.08]</td>
</tr>
<tr>
<td></td>
<td>Hair</td>
<td>.09 [00,.17]*</td>
<td>.06 [-.03,.15]</td>
<td>.11 [.05,.18]*</td>
<td>.13 [.07,.19]**</td>
</tr>
<tr>
<td></td>
<td>Muscle tone</td>
<td>.65 [58,.71]**</td>
<td>.23 [12,.33]**</td>
<td>.08 [00,.16]*</td>
<td>.06 [-.02,.15]</td>
</tr>
<tr>
<td>R-squared</td>
<td>.56***</td>
<td>.66***</td>
<td>.71***</td>
<td>.72***</td>
<td></td>
</tr>
</tbody>
</table>

| Function    | Fluid         | .05 [-.02,.12] | .16 [07,.25]** | .22 [16,.28]** | .10 [04,.17]* |
|             | Flexibility   | .16 [08,.25]** | .18 [08,.27]** | .12 [05,.19]* | .20 [12,.28]** |
|             | Strength      | .41 [32,.50]** | .23 [13,.33]** | .20 [12,.28]** | .20 [11,.29]** |
|             | Energy        | .25 [17,.33]** | .31 [24,.39]** | .34 [28,.40]** | .39 [31,.47]** |
| R-squared   | .40***        | .54***        | .63***        | .59***        |              |

Note. *p <.05, **p <.001. Unstandardized coefficients (with 95% confidence intervals in brackets) are reported.

Fig. 1. Network structure of body dissatisfaction items for pregnant women. Items with lines connecting them remain related (after controlling for all other items). Positive lines are denoted with green lines, and negative lines are in red. Items that are closer together are more strongly related. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article).

Notes: Auk = ankles, Arm = arms, BdS = body shape, Chs = chest, CIV = calves, Cmp = complexion, Enr = energy levels, Fltd = fluid retention, Flx = flexibility, Har = hair, Hnd = hands, Hps = hips, Lgs = legs, MsS = muscle size, MsT = muscle tone, Shl = shoulders, SkT = skin tone, Stm = stomach, Str = strength, Thg = thighs, Wgh = weight.

strength values. Weight, thighs, hands, and complexion had the highest strength values for first trimester women, whereas shape, thighs, weight, and complexion were strongest for second trimester women, and shape, muscle size, and calves were strongest for third trimester women. For all pregnant groups, dissatisfaction with shape was clearly the item with lowest strength in the network, suggesting it had least connection with other items. Fig. 2 provides a visual summary of the strength values for each of the 21 body image dissatisfaction items in the network, reported separately for each group. Evaluation of correlation stability coefficients (CS) for the strength values for each group indicated acceptable levels of stability for non-pregnant (CS = .28), second trimester (CS = .44), and third trimester pregnant women (CS = .44), but not for first trimester pregnant women (CS = .21).

4. Discussion

Although physiological changes associated with pregnancy push women further from the societally prescribed ‘thin ideal,’ our understanding of the implications of these bodily changes has been
hampered by reliance upon body image measures and frameworks validated for use in non-pregnant populations (Fuller-Tyszkiewicz et al., 2012; Watson, Fuller-Tyszkiewicz et al., 2015). Using a measure of body dissatisfaction derived from existing measures and qualitative data, the present study sought to advance knowledge in this research area by exploring similarities and differences in body dissatisfaction profiles of pregnant and non-pregnant women both at item- and scale-levels. Findings suggest that overall body dissatisfaction levels may be roughly equivalent, and that areas of body image concern cluster together in comparable ways across groups, but that the body features that are most connected to others in the body dissatisfaction construct and their strength of inter-relations may differ. Furthermore, while functional features of body image clustered together for both pregnant and non-pregnant women, these items had stronger presence in the overall body image network for pregnant women and were less frequent sources of dissatisfaction for non-pregnant women. These findings and their possible implications for theory and practice are detailed below.

Despite small differences between groups for the BAQ subscales (attractiveness, feeling fat, salience of appearance, and strength/fitness) and items for dissatisfaction with overall appearance and functioning, several more sizable differences were found for individual body parts and features: greater dissatisfaction (particularly in later stages of pregnancy) for weight and energy levels, yet lower dissatisfaction for chest, shoulders, and calves. The largest of these effects was for weight, and is consistent with the notion that continued endorsement of the thin ideal during pregnancy (rather than revision of the ideal to a more stage-appropriate comparator) may place pregnant women at increased risk of body dissatisfaction (Duncombe et al., 2008). Higher dissatisfaction with energy levels and greater satisfaction with the chest area across pregnancy may also be explained by well documented reductions in energy levels and physiological changes in breast size attributable to pregnancy (Heinberg & Guarda, 2002). This greater dissatisfaction with energy levels is also consistent with prior qualitative findings suggesting an increased concern about functional aspects of one’s body during pregnancy (e.g., Chang et al., 2006; Clark et al., 2009b; Watson et al., 2015). Present findings for shoulders and calves are surprising, and we are unaware of literature that would support a reduction in dissatisfaction specific to these areas. Swelling in ankles due to pregnancy is well documented (Reynolds, 2003), and hence would be expected to increase dissatisfaction with that region, possibly including dissatisfaction with calves.

Findings from the network analysis provided further insights into the inter-relation among these body features, emphasizing how the items cluster together and which items exert greatest statistical influence within the network (i.e., greatest number and strength of connections). Body image items clustered together in a similar manner across the pregnant and non-pregnant groups. A cluster comprising some of the more commonly measured sources of body dissatisfaction (weight, shape, muscle size and tone, stomach, thighs, and hips) clustered together, suggesting that level of dissatisfaction for these tend to frequently co-occur. Further areas of concern, such as arms, ankles, calves, legs, and shoulders, clustered together rather than with weight and shape, perhaps suggesting that these may be less frequent sources of overall dissatisfaction. The finding of a separate cluster for dissatisfaction with functional aspects of one’s body is consistent with aesthetic vs functional distinctions in the body image literature (e.g., Fredrickson & Roberts, 1997; Moradi & Huang, 2008).

Differences between pregnant and non-pregnant women in the nature of their body dissatisfaction became more evident when exploring item level information from the network analysis. Dissatisfaction with chest (as an aesthetic item) clearly had the lowest strength value for the pregnancy groups, whereas flexibility and fluid retention (functional items) were the least connected items in the network for non-pregnant women. This finding for dissatisfaction with chest for pregnant women is not surprising given that physiological changes to breast size may serve to increase satisfaction even against broader trends of dissatisfaction increases with other body parts (including global aspects such as weight and shape). The finding that dissatisfaction with weight was an important item across pregnant and non-pregnant groups (as judged by its strength score) suggests that use of weight-focused measures of body image in prior studies (e.g., Clark et al., 2009a; Duncombe et al., 2008; Skouteris et al., 2005) may be a valid indicator of potential body image concerns during pregnancy. However, the lack of differentiation across pregnant and non-pregnant women on the basis of other body parts (e.g., dissatisfaction with chest) casts further doubt on the suitability of such items for evaluating specific sources of body dissatisfaction during pregnancy. Their inclusion in several prior studies may thus have contributed noise to measurement that may partially account for inconsistency in prior findings.

A further noteworthy finding is that although body image functionality items clustered together for pregnant and non-pregnant women, exploration of item-level centrality statistics revealed a different pattern for these items within the context of the over-

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**Fig. 2.** Comparison of strength values for pregnant and non-pregnant groups. Items with higher values indicate that the item is more strongly related to others in the network (strength). A = item rated by participant for aesthetic properties, F = item rated for functionality.
all body image network. Fluid retention and flexibility were more prominent in the networks for pregnant women, and pregnant women were more likely to report dissatisfaction with their energy levels. Exclusion of these items from commonly used measures of body image may thus provide an inaccurate picture of the key drivers of overall body dissatisfaction among pregnant women. Measures such as the BIPS may be a suitable alternative to commonly used measures, such as the BAQ, that have not been validated for use in pregnant populations.

Several study limitations warrant consideration. First, present findings were based on cross-sectional data, and thus we are unable to infer that differences between the pregnant and non-pregnant groups in the present study are due to changes in body image that occur as a consequence of pregnancy. Second, although the body dissatisfaction items used in the present study derive from a body image measure validated for use with pregnant women (Watson et al., 2017), it is possible that other important features of body image are absent from this study (e.g., heartburn, incontinence, and backache). Attempted replications of present findings might consider stability of the present network results in the presence vs absence of additional body image features. Third, the pregnant sample comprised a mixture of individuals who had given birth previously with those who had not. Lack of prior experience of what to expect may impact on body image in a way that is less common for those who have previously given birth. Re-running group difference analyses (results available from the corresponding author upon request) on the sample with no prior births led to the same conclusions regarding group differences on body image constructs, suggesting differences in expectations regarding body image changes may be less pronounced across primiparous and multiparous individuals than feared. Fourth, although BMI is perhaps not the best indicator of weight status for pregnant women, and was not a key focus of present analyses, it is worth emphasizing that the group means for BMI were within the overweight category, suggesting that many of the pregnant women may have been in the normal weight range pre-pregnancy. This may place limits on generalizability of present findings. Finally, the correlation stability value in the network analysis was low for the first trimester pregnant women group. While the values for the remaining groups were acceptable and provide some confidence in replicability of their results, the low value for the first trimester group suggests we should exert caution in interpreting results for this group. It is encouraging that many results found for the second and third trimester groups were also found for this early pregnancy group. Even so, several of the findings that deviated for this first trimester pregnancy group were unexpected and hard to account for in terms of current knowledge of body image experiences during pregnancy. Attempted replication with a new sample – especially for this pregnant group – is necessary to confirm or disconfirm key trends observed in this study.

Despite these study limitations, present findings offer potential insights into the nature of body dissatisfaction during pregnancy, and avenues for further research. Whereas global estimates of dissatisfaction may provide a quick means to identify individuals who may need intervention, subsequent exploration of the profile of dissatisfaction across a range of bodily functions/parts and their inter-connectedness may provide important information to help tailor treatment options to the individual. In the present study, magnitude of group differences based on the BAQ – a commonly used body image measure in prior pregnancy research – were modest, and suggest possible comparability of body image concern among pregnant and non-pregnant women. However, inspection of item-level data suggests considerably greater dissatisfaction with weight and energy levels among pregnant women, and greater satisfaction with body areas such as chest, shoulders, and calves.

Further, the stronger overall connectivity among the body image items for pregnant women – as shown by network analyses – suggests that the concept of body image may be broader in focus for pregnant women. Failure to include all aspects of body image that are relevant for pregnant women may thus underestimate their level of (dis)satisfaction. Conversely, inclusion of body image features that are less important during pregnancy may serve to confound attempts to estimate level of dissatisfaction, particularly if these less important items contribute a sizable number of items to overall estimates of body dissatisfaction. More accurate assessment of body image during pregnancy is important in light of prior studies. We have found body image disturbances during pregnancy may be predictive of adverse health outcomes, including amount of weight gain during pregnancy (Hill, Skouteris, Fuller-Tyszkwicz, Kothe, & McPhie, 2016; Hill et al., 2013) and depression (Rauff & Symons Downs, 2011).

Furthermore, the importance of functional aspects of one’s body during pregnancy – as found in the present study – suggests the need for further consideration of how a psychological construct such as body dissatisfaction may link to physical and behavioral aspects of pregnancy. While prior studies have explored body dissatisfaction as a predictor of weight gain during pregnancy (Hill et al., 2013, 2016), its impact on key lifestyle factors such as diet, physical activity, and stress and fatigue levels has been under-explored in longitudinal studies (Fuller-Tyszkwicz, Skouteris, Watson, & Hill, 2013). Similarly, the link between body dissatisfaction and more positive aspects of body image is an area of increasing interest in the broader body image research field (Halliwell, 2015; Tylka & Wood-Barcalow, 2015), and might also be considered as an avenue for further research. To the extent that pregnant women are able to distance themselves from unrealistic appearance standards for non-pregnant women, we may observe increases in positive body image, such as greater body appreciation.

Based on the current data, item-level evaluation of body dissatisfaction may provide complementary information to better understand one’s overall level of dissatisfaction. While treatment approaches for body dissatisfaction may ultimately seek to minimise the over-valuation of physical appearance and/or provide a more realistic ideal to aspire towards (Alleva, Sheeran, Webb, Martijn, & Miles, 2015), identification of key drivers of overall dissatisfaction in the treatment formulation phase may provide clinicians with a concrete target to help train clients to reduce their negative appearance-related thoughts. Monitoring of reduction in these central sites may also be important for evaluating treatment progress and efficacy.

In summary, present findings suggest that aspects of body image dissatisfaction cluster together similarly for pregnant and non-pregnant women, but that several of the areas of focus for dissatisfaction and their relation to each other may differ. Concerns about weight and energy levels were evident at the item-level, and underscore the importance of considering both aesthetic and functional properties that may contribute to global dissatisfaction experiences of pregnant women. However, it was also clear that pregnant women may experience increased dissatisfaction with some aspects of their appearance and reduced dissatisfaction for other features. This pattern of findings suggests that an idealised body image may be retained and still drive dissatisfaction, but the composition of this ideal physique may differ. Future research tracking body dissatisfaction across pre-pregnancy into post-partum would help to confirm the notion that body image priorities change as a function of pregnancy. Furthermore, identification of the aspects of body image that are most salient during pregnancy may help clinicians and healthcare professionals to better tailor treatment of body dissatisfaction of their clients.
Author statement

All authors contributed to writing and drafting of the manuscript. The first author conducted analyses for this manuscript, and authors BW and AK were responsible for recruitment of participants for the study.

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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.2019.12.001

References


