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Taking It Apart and Putting It Back Together Again: Using Item Pool Visualisation to Summarise Complex Data Patterns in (Positive) Body Image Research

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Abstract

Issues of construct commonality and distinguishability in body image research are typically addressed using structural equal models, but such methods can sometimes present problems of interpretation when data patterns are complex. One recent-developed tool that could help in summarising complex data patterns is Item Pool Visualisation (IPV), an illustrative method that locates item pools from within the same dataset and illustrates these in the form of single or nested radar charts. Here, we demonstrate the utility of IPV in visualising data patterns *vis-à-vis* positive body image. Five-hundred-and-one adults from the United Kingdom completed seven widely-used measures of positive body image and data were subjected IPV. Results demonstrated that, of the included measures, the Body Appreciation Scale-2 provided the closest and most precise measurement of a core positive body image construct. The Functionality Appreciation Scale and the Authentic Pride subscale of the Body and Appearance Self-Conscious Emotions Scale tapped more distal aspects. Our results also highlight possible limitations with the use of several other instruments as measures of positive body image. We discuss implications for research aimed at better understanding the nature of positive body image and interpreting complex data patterns in body image research more generally.

Keywords: Item Pool Visualisation; Positive body image; Body appreciation; Construct commonality; Construct distinguishability

1. Introduction

Research and research-informed practice on positive body image has grown dramatically in the past decade (for reviews, see Daniels et al., 2018; Tylka & Piran, 2019). The construct of *positive body image* has been defined as an "overarching love and respect for the body" (Tylka, 2018, p. 9), with three inter-related but independent core components: appreciation of the appearance and function of the body; being aware and attentive to the body's needs, and; the ability to process appearance-related messages in a self-protective manner (Menzel & Levine, 2011). In this view, positive body image is not merely the absence, or polar opposite, of negative body image; rather, positive body image is a complex and multi-faceted construct that is distinct from low levels of negative body image and that extends beyond body satisfaction (Tylka, 2018; Tylka & Wood-Barcalow, 2015a). Indeed, studies have shown that positive body image is associated with additional variance in outcomes such as psychological well-being and adaptive eating behaviours, after accounting for negative body image (for a review, see Tylka, 2018).

Just as theoretical understandings of the positive body image construct have grown, so have attempts to develop psychometrically-valid tools to measure its aspects. Where early efforts to measure positive body image were narrowly centred around satisfaction-based constructs (e.g., the Body Esteem Scale; Franzoi & Shields, 1984), the shift toward understanding the construct holistically has led to a proliferation of instrumentation. For example, in their review of measures of positive body image, Webb and colleagues (2015) identified 17 distinct instruments measuring 10 aspects of positive body image (e.g., body appreciation, body image flexibility). Most of these measures have benefitted from strong psychometric assessments in English-speaking populations and, in some cases, diverse social identity groups (Swami, 2018). While important and undoubtedly helpful in terms of operationalising aspects of positive body image, the proliferation of instrumentation also raises important theoretical and practical questions for scholars working to define, measure, and promote positive body image.

In terms of theory development, for example, while there is now much better recognition that positive body image is a multi-faceted construct, scholars have not fully considered whether – and the degree to which – proposed aspects may overlap (i.e., construct commonality and distinguishability) (Halliwell, 2015). Put differently, given the proliferation of aspects under the umbrella of positive body image, scholars need to be certain that core aspects do not suffer from dilution (i.e., constructs are too diffuse to be meaningful or lack precision in terms of definitions), do not substantively overlap (i.e., do not measure the same latent constructs), and do not replicate existing aspects (i.e., a new wine in old bottles problem). Where studies have included multiple indices of positive body image, inter-correlations between scores have usually been moderate, which is suggestive of construct distinctiveness. Occasionally, however, studies report a high degree of inter-correlation: in a sample of women from the United Kingdom, for example, Swami and colleagues (2018) reported a strong correlation (r = .71) between measures of body appreciation and authentic body pride. While this and other similar findings might reflect sample-specific idiosyncrasies, they also fail a litmus test for conceptual and empirical nomological distinctiveness (cf. Newman et al., 2011) and is thus worthy of further investigation (Halliwell, 2015).

Perhaps a more pressing concern relates to the practical matter of instrument selection (see Thompson, 2004; Thompson & Schaefer, 2019), where the issues of scale commonality and distinguishability can impact decision-making processes in a number of ways. In most cases, the decision to use particular scales will depend on the specific aspect of positive body image that a scholar wishes to operationalise. In other instances, however, a scholar may wish to measure positive body image in general or would like to obtain broad coverage of the positive body image construct (e.g., see Swami et al., 2018). In such cases, given the wide range – “a ridiculous plethora” in the words of one scholar (Atkinson et al., 2020, p. 55) – of instruments available, which would be the most appropriate instrument(s)? While the answer to this question will partly be based on psychometric considerations (i.e., the validity and reliability of instrument scores in the target population; for a discussion, see Swami & Barron, 2019) and practical considerations (e.g., minimising participant response fatigue), considering facet and item redundancy is also important. That is, scholars need to be certain that aspects of positive body image that they intend to measure are not redundant (i.e., they measure the same latent factor) and are sufficiently sensitive (i.e., measures are able to disambiguate different facets).

1.1. Item Pool Visualisation

Typically, issues of redundancy and sensitivity are investigated through factor analysis or structural equation modelling (SEM). While undoubtedly powerful, these methods sometimes rely on complex patterns of data that can be difficult to interpret or require inspection of statistical data at multiple levels, which can be particularly challenging as the number of items or constructs increases. In these cases, data visualisation can play an important role in summarising complex data patterns (Few, 2009; Gatto, 2015; Tufte, 2001, 2006) and helping scholars better understand complexities in their data. Indeed, in tandem with concerns over reproducible data science, scholars have called for improved and more meaningful approaches to data visualisation that balance interpretability, complexity, and aesthetics (Allen et al., 2019). One such data visualisation method that has been recently developed is Item Pool Visualisation (IPV; Dantlgraber et al., 2019), an illustrative tool based on different SEM estimations that locates items and item pools from within the same dataset and illustrated in the form of single or nested radar charts. IPV has the potential to complement existing methods for investigating factor commonality and distinguishability by illustrating comparisons of facets both within and between instruments aiming to assess the same construct.

This is essentially achieved by comparing factor loadings of items based on a general factor SEM (i.e., where all items from all scales load onto a single factor representing the core of the investigated item pool) and a correlated factor SEM (i.e., where the items first load onto their respective scales, and scales are directly inter-correlated without a general factor). These are used to compute “centre distances”, that is, the ratio of squared item loadings from the correlated factor SEM and the general factor SEM (minus 1 for easier interpretation). Centre distances thus reflect a combination of core and additional variance representing the relative systematic bias of each item or item pool with regards to the core variance. The core variance is defined by all investigated items and is not necessarily reflective of valid variance. A centre distance around 0, for example, means that a particular item does not measure specific aspects of its scale and, therefore, represents a relatively unbiased measure of the investigated core concept. On the other hand, a large centre distance means that the item or item pool is distant from the core concept; that is, it measures a specific aspect that is more distant from what all items from all scales are supposed to measure.

To take an example that is more directly related to the present study, it is possible that an aspect of positive body image – say, pride in one’s physical appearance – is strongly tapped by a single scale but not by other scales (i.e., this aspect of positive body image is scale-specific). However, if other scales also measure this aspect of positive body image, the respective scales would move to the centre and this aspect would become part of a more general construct of “positive body image”. That is, the IPV centre does not represent the core concept in principle, but rather the core of the entire investigated item pool. It is important to note that this is not only a limitation of IPV, but also of SEMs and factor analyses in general – but it is a limitation that may be overlooked when data visualisation methods such as IPV are not utilised. Moreover, by visualising information in radar charts – where more central factors are closer to the centre and less central ones are more distal – IPV not only illustrates comparisons of scales (such as in correlated factor models), but also illustrates superordinate commonalities (such as illustrations of general or hierarchical factor models). The combination of different information in radar charts (item- and scale-specific) enables the discovery of additional similarities and differences between psychological measures that may be overlooked in traditional scale comparisons.

In short, by visualising the centre distance that represents a comparison between a specific scale factor and a reference model, IPV has the ability to tells us not only how well each item represents each respective factor, but also to what extent each item (and also factor) can be viewed as an unbiased representation of the core of the investigated concept. In this sense, IPV complements existing methods, such as factor analysis and SEM, and has the potential to assist scholars in identifying additional similarities or differences between several instruments each claiming – whether explicitly or implicitly – to assess the same (psychological) construct (for an example concerning several self-esteem measures, see Dantlgraber et al., 2019). In particular, we suggest there is value in using IPV to examine issues of commonality and distinguishability in relation to the wide array of instruments that have been developed to measure aspects of positive body image, though of course IPV could also be used more broadly within body image research (an issue we return to below).

1.2. The Present Study

As a demonstration of the utility of IPV in body image research, the present study used IPV to illustrate both item and scale commonality and distinguishability for several core measures of positive body image. Specifically, we selected seven widely-used measures of positive body image, as described by Webb and colleagues (2015). These were the Body Appreciation Scale-2 (Tylka & Wood-Barcalow, 2015b; a measure of body appreciation and perhaps the most-widely used tool for indexing positive body image), the Functionality Appreciation Scale (FAS; Alleva et al., 2017; a measure of appreciation for what one's body can do and is capable of doing), the Body Image-Acceptance and Action Questionnaire (BI-AAQ; Sandoz et al., 2013; a measure of body image flexibility), the Authentic Pride subscale of the Body and Appearance Self-Conscious Emotions Scale (BASES-AP; Castonguay et al., 2014; a measure of body pride as a sense of personal appearance-related achievement), the Body Acceptance by Others Scale (BAOS; Avalos & Tylka, 2006; a measure of perceived acceptance of one's body from external sources), the Positive Rationale Acceptance subscale of the Body Image Coping Strategies Inventory (BICSI-PRA; Cash et al., 2005; a measure of positive rationale acceptance when coping with body image-related threats), and the Body Responsiveness Scale (BRS; Daubenmier, 2005; a measure of responsiveness and attunement to the body's needs).

We acknowledge at the outset that this list of measures is not exhaustive (i.e., other measures of positive body image are available; see Webb et al., 2015). Nevertheless, the measures we have selected have been shown to be psychometrically valid, can be construed as indices of distinct yet related aspect of positive body image (as reviewed by Webb et al., 2015), provide broad coverage of the positive body image construct, and are perhaps the most widely-used instruments, at least in English-speaking populations. Using a single dataset that included scores from each of these measures, we used IPV to assess both scale and item commonality and distinguishability by locating item pools from within the dataset. This allowed us to identify the scales(s) and item(s) that came closest to measuring a "core concept" (or, more precisely, a general factor model) of positive body image. Although this work was largely exploratory, we preliminarily expected that the BAS-2 – as a scale, but also in terms of its items – would most closely tap the core concept of positive body image, given that its item-coverage maps constructs that are central to definitions of positive body image

(Webb et al., 2015) and given that it was deliberately designed to be a non-specific measure of positive body image (Halliwell, 2015; Tylka & Wood-Barcalow, 2015b).

Likewise, given the generally moderate-to-high inter-correlations between body appreciation and, respectively, functionality appreciation and authentic body pride, we expected the latter two facets to be relatively adept at measuring the "core concept" of positive body image. Scores on the BAOS, BICSI-PRA, and BRS were expected to be more distally related to the aforementioned core concept. Conversely, given that the BI-AAQ measures the degree of negative body-related thoughts, behaviours, and affect that stifle growth, rather than the presence of positive body image flexibility specifically (i.e., the measure's content and face validity as a measure of positive body image has been called into question; see Timko et al., 2014), we expected this measure to be a less proximate measure of core positive body image. Beyond these assessments at the level of scales, IPV also allowed us to identify the specific items that come closest top tapping the positive body image core construct, although this aspect of our work was entirely exploratory.

2. Method

2.1. Participants

All participants (N = 501) were citizens of the United Kingdom who responded to an online call for participation. The sample was virtually balanced in terms of gender identity (50.1% women) and were on average 36.40 years old (SD = 12.63). Mean self-reported body mass index (BMI) was 24.48 kg/m^2 (SD = 5.21). The majority of participants self-reported their ethnicity as British White (87.0%; British Black or African Caribbean = 2.4%; British Asian = 5.8%; mixed race = 3.6%; other = 1.2%) and most participants were heterosexual (90.0%; gay/lesbian/homosexual = 2.6%; bisexual = 5.6%; pansexual/queer = 1.0%; asexual = 0.2%; other = 0.6%). In terms of relationship status, 25.9% were single, 10.0% were in a relationship but not cohabiting, 26.3% were in a relationship and cohabiting, 32.7% were married, 2.2% were divorced, 1.4% were widowed, 0.4% were in a polyamorous relationship, 0.6% were in an open relationship, and 0.4% stated another status. Finally, 13.0% had obtained their General Certificates of Secondary Education (GCSEs), 24.4% had completed an Advanced-Level (A-Level) qualification, 36.9% had an undergraduate degree, 19.8% had a postgraduate degree, 3.2% were still in full-time higher education, and 2.8% had some other qualification.

2.2. Measures

2.2.1. Body appreciation. To measure body appreciation, we used the Body Appreciation Scale-2 (BAS-2; Tylka & Wood-Barcalow, 2015b), a 10-item scale that assesses acceptance of one's body, respect and care for one's body, and protection of one's body from unrealistic beauty standards (sample item: "I respect my body"). All items were rated on a 5-point scale, ranging from 1 (*never*) to 5 (*always*), and an overall score was computed as the mean of all items. Higher scores on this scale reflect greater body appreciation. BAS-2 scores have been shown to have a 1-dimensional factor structure, adequate internal consistency coefficients and test-retest reliability after 3 weeks, and good indices of convergent and discriminant validity in English-speaking adults (Tylka & Wood-Barcalow, 2015b).

2.2.2. Functionality appreciation. The questionnaire included the Functionality Appreciation Scale (FAS; Alleva et al., 2017), a 7-item measure of participants' appreciation of what the body does and can do (sample item: "I feel that my body does so much for me"). All items were rated on a 5-point scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). An overall score was computed as the mean of all items, with higher scores reflecting greater functionality appreciation. FAS scores have been reported to have a 1-dimensional factor structure, adequate internal consistency and test-retest reliability after 3 weeks, and adequate criterion-related and construct validity in English-speaking adults (Alleva et al., 2017).

2.2.3. Body image flexibility. To measure body image flexibility, we used the 12-item Body Image-Acceptance and Action Questionnaire (BI-AAQ; Sandoz et al., 2013). This scale measures the degree of negative-body related thoughts, behaviours, and affect that stifle growth when experiencing aversive body-related thoughts and feelings (sample item: "I care too much about my weight and body shape"). Webb et al. (2015) have suggested that this measure provides a preliminary measure of body image flexibility. Items were rated on a 7-point scale, ranging from 1 (*never true*) to 7 (*always true*). An overall score for the BI-AAQ was computed as the mean of all reverse-coded items, so that higher scores reflect greater body image flexibility. In English-speaking adults, BI-AAQ scores have been shown to have a 1-dimensional factor structure, adequate internal consistency, adequate test-retest reliability after 3 weeks, and adequate patterns of construct validity (Sandoz et al., 2013).

2.2.4. Body pride. We measured body pride using the Authentic Pride subscale of the Body and Appearance Self-Conscious Emotions Scale (BASES-AP; Castonguay et al., 2014). This 6-item subscale measures body pride as a sense of personal appearance-related achievement (sample item: "I am proud of my appearance efforts"). Items were rated on a 5-point scale, ranging from 1 (*never*) to 5 (*always*), and scores were averaged so that higher scores reflect greater authentic body pride. Data drawn from English-speaking adults supports the factor structure of the BASES, including the 1-factor structure of BASES-AP scores, and estimates supported the internal consistency, test-retest reliability after 2 weeks, and construct validity of the BASES subscales (Castonguay et al., 2014).

2.2.5. Body acceptance. The survey package included the 10-item Body Acceptance by Others Scale (BAOS; Avalos & Tylka, 2006), which measures an individual's perceptions of acceptance for, and receiving messages reflecting acceptance of, their body shape and weight from friends, family, dating partners, society, and the media (sample item: "I've felt acceptance from my friends regarding my body shape and/or weight"). Participants rated the frequency of these experiences using a 5-point scale, ranging from 1 (*never*) to 5 (*always*). An overall score was computed as the mean of all items, so that higher scores reflect greater perceived body acceptance from others. In English-speaking adults, BAOS scores have been found to have a 1-dimensional factor structure, adequate test-retest reliability after 3 weeks, and adequate patterns of construct validity (Avalos & Tylka, 2006).

2.2.6. Positive rationale coping. Participants were asked to complete the Positive Rationale Acceptance subscale of the Body Image Coping Strategies Inventory (BICSI-PRA; Cash et al., 2005), an 11-item measure of the extent to which participants use positive rational acceptance when coping with threats to body image (i.e., accepting the distressing event and engaging in self-care; sample item: “I react by being especially patient with myself”). Items were rated on a 4-point scale ranging from 0 (*definitely not like me*) to 3 (*definitely like me*) and an overall score was computed as the mean of all items, so that higher scores reflect greater positive rational acceptance. Cash and colleagues (2005) supported the psychometric properties of this subscale in English-speaking adults.

2.2.7. Body responsiveness. Participants were also asked to complete the Body Responsiveness Scale (BRS; Daubenmier, 2005), a 7-item measure of one’s attunement to their body’s needs and the extent to which they use embodied information to guide behaviour (sample item: “I enjoy becoming aware of how my body feels”). Items were rated on a 7-point scale ranging from 1 (*not at all true about me*) to 7 (*very true about me*). An overall score was computed as the mean of all 7 items following reverse-coding of 3 items, so that higher scores reflect greater body responsiveness. Daubenmier (2005) reported that BRS scores were 1-dimensional, had adequate internal consistency coefficients, and adequate patterns of construct validity in English-speaking adults.

2.2.8. Demographics. We asked participants to self-report their gender identity, age, sexual orientation, ethnicity, relationship status, and highest educational qualifications. We also asked participants to self-report their height and weight, which we used to compute BMI as kg/m^2. These data were used for sample-descriptive purposes and have been shown to be strongly correlated with measured height and weight data in British adults (Spencer et al., 2002).

2.3. Procedure

All research was conducted in accordance with the principles of the Declaration of Helsinki and ethics approval was obtained from the school ethics committee at [blinded for review] (approval code: PSY-S19-004). Data were collected via the Prolific website, a crowdsourcing Internet marketplace that allows individuals to complete academic surveys for monetary compensation, on December 11-12th, 2019. The project was advertised as a study on “body image” and included an estimate duration. Inclusion criteria included being a citizen and resident of the United Kingdom, self-reported fluency in English comprehension, and being of adult age. The former criterion helped to ensure that the sample was homogeneous in terms of cultural and national identity. Once participants provided digital informed consent, they were asked to complete the anonymous questionnaire containing the measures described above, which were presented in a counter-balanced order for each participant. Next, participants provided their demographic information before receiving written debriefing information. IP addresses were checked to ensure that no participant completed the survey more than once and no participant failed an attention check item embedded in the questionnaire. In exchange for completing the survey, participants were paid £1.50.

2.4. Statistical Analyses

2.4.1. Preliminary analyses. Missing data were infrequent (n = 54; 36 participants) and the nearest neighbour method was used to replace these missing points. We first used confirmatory factor analysis to examine the fit of 1-dimensional models for scores on each of the positive body image measures in our dataset. Although this is not a required step in IPV

(Michael Dantlgraber, personal communication, April 28, 2020), it may nevertheless be useful in helping to make sense of IPV results. For the confirmatory factor analyses, we used the *lavaan* package (Rosseel, 2012) with *R* (*R* Development Core Team, 2014). Assessment of the present data for normality indicated that they were neither univariate, nor multivariate normal, so parameter estimates were obtained using the robust maximum likelihood method with the Satorra-Bentler correction (Satorra & Bentler, 2001). To assess goodness-of-fit, we used the normed model chi-square (χ^2/df; values < 3.0 considered indicative of good fit and values up to 5.0 considered adequate; Hu & Bentler, 1999; Wheaton et al., 1977), the Steiger-Lind root mean square error of approximation (RMSEA) and its 90% CI (values close to .06 are considered to be indicative of good fit and values of about .07-.08 indicative of adequate fit; Steiger, 2007), the standardised root mean square residual (SRMR; values < .09 indicative of reasonable fit; Hu & Bentler, 1999), and the comparative fit index (CFI; values close to or > .95 indicative of adequate fit; Hu & Bentler, 1999). Where models demonstrated less-than-adequate fit, suggested modification indices were considered to improve model fit.

2.4.2. Item pool visualisation. For the IPV analyses, we used the *IPV* package (Petras & Dantlgraber, 2020) with *R* (*R* Development Core Team, 2014), whereas structural equation models (SEMs) – the basis for IPV analyses – were calculated using the *lavaan* package (Rosseel, 2012). In order to ensure that our data met all the requirements of IPV, factor loadings smaller than 0.1 were set to 0.1 (this applied to BRS Items #2, #3, #4)[1]. In a first step, we generated a general factor model of positive body image using SEM; that is, a single factor was extracted from the overall item pool. This single factor is supposed to represent the "core concept", which here is *positive body image*. In a second step, a correlated factor model was estimated based on SEM, where factors were extracted from increasingly smaller and specific sub-pools of items (i.e., seven correlated factors representing the seven measures we included in the survey; items only loaded onto their respective scale). Finally, using the *IPV* package in *R*, centre distances were calculated. Centre distances represent the proportional increase of the explained item variance when the items are allocated to smaller sub-pools compared to the larger common pool.

Centre distances were used for locating the items along facet dimensions in radar charts, with the centre of the chart representing item variance that is explained by the factor extracted from the overall item pool (single factor SEM). Item-based analysis in IPV gives us information about how well each item can be viewed as an unbiased representation of the core concept, how large the deviation of items is for each scale, and if there are problems with some items (e.g., single items that are very distant from the rest of the items of any particular scale). The scale-based analysis shows us which scale is closest to the core concept (i.e., is a good representation) and which scales are more distant (i.e., measures more distal aspects of the core concept). Furthermore, in the scale-based radar chart, the latent correlations of each item pool to the other item pools (i.e., scales) are depicted clockwise in the order of the scales in the radar chart. The scale-based radar chart is based on the item-based radar chart by using the mean centre distances of the respective items as the position for the item pools and adding latent correlations. This chart is actually the more important one because IPV was primarily developed to assists users looking to make decisions about scale suitability, not which item of a respective scale might be problematic.[2] Based on SEMs, IPV is a confirmatory method.

2.4.3. Open access. Our data, analysis scripts, and associated materials are available at https://osf.io/4pjua/.

3. Results

3.1. Preliminary Analyses

Results of the confirmatory factor analyses are summarised in Table 1. As can be seen, the 1-factor models for scores on the BAS-2, BI-AAQ, BASES-AP, and FAS all had generally adequate fit. Fit of the BICSI-PRA was less than adequate, but was improvable by fixing intercepts for two item pairs (Items 1 and 2, and Items 4 and 7), although CFI remained below acceptable thresholds. Conversely, fit of BAOS and BRS was poor and remained below acceptable levels despite freeing up to 3 error covariances. Although these results suggest that scores on the BAOS and BRS may not be 1-dimensional in our dataset, the intention of IPV is not to reassess the factorial validity of established measures. As such, we proceeded on the basis of considering each of the aforementioned scales as 1-dimensional and use the results of the CFA to explain complications arising in the IPV (see Discussion).

In general, scores on all instruments demonstrated adequate internal consistency coefficients as indexed using Cronbach's α and McDonald's ω (see Table 2). Coefficients were relatively attenuated for BRS scores, although this is consistent with previous work (Daubienmier, 2005). Inter-correlations between instrument scores were all significant at $p < .001$ and generally moderate in strength, although the relationship between body appreciation and body pride was strong (see Table 2). Furthermore, the correlated factor SEM revealed that item loadings for BRS Item #2, #3, and #4 were below .40 (see Table 3), which is typically used as a cut-off in classical test development. This is notable, because if we assume that all measures underwent a phase of test development, these items should have been excluded from the scale.

3.2. Item Pool Visualisation

As noted in Section 2.4, the outcome from the general factor model represents a "core concept" (i.e., a general factor model) of positive body image that all items from all measures are assessing. This is represented by the centre of the radar plots (see Figures 1 and 2). The larger the centre distance, the more distant is the assessed aspect of the respective item from the core concept; that is, assesses more facet-specific aspects compared to general aspects of the core concept in the centre. As can be seen from Table 3, all items had positive centre distances, except for three items from the BRS (Items #2, #3, and #4). If these negative centre distances are of low magnitude (i.e., a random fluctuation around 0), this would not pose much of a problem. However, if these negative centre distances are substantial – which was the case for the three items (#2: -0.72; #3: -0.83, #4: -0.75) – this is usually indicative that something is wrong with those items. These large negative centre distances mean that each of these items assesses much more general aspects than scale-specific ones (see Table 3), which is odd when considering that the specific correlated factors are tailored to the respective scales. The substantial negative centre distances combined with the low item-loadings for the correlated factor SEM means that these items are not measuring what the BRS was intended to measure. This is probably due to their reversed-coded item formulation. Therefore, these centre distances were set to 0, as recommended (Dantlgraber et al., 2019). Although this might add some distortion to IPV (i.e., mean centre distance for BRS would be different because it is based on 4 instead of 7 items), the aim of the present study was not to re-evaluate published scales.[3]

As mentioned before and as can be seen from Table 3, with IPV it is not only the items that have centre distances; rather, the measures (item pools) also have centre distances (i.e., mean centre distance of all items from the respective scale). These are important for the scale-based analysis. As can be seen from Figure 1, the items from the BAS-2 were closest to the centre of the radar chart (i.e., representing the core concept of positive body image). Furthermore, we see that the deviation of BAS-2 items was very tight; that is, the items assessed a very clearly-defined narrow aspect of positive body image. Conversely, BICSI-PRA items were further away from the centre, with a higher deviation, which means that more distal aspects of the core concept positive body image are measured. Another aspect is noteworthy: for the BI-AAQ, Item #6 was very distant from all other items of the same scale. This might represent a problem with the validity of this item or the validity of the scale (when we conducted a factor analysis, we still obtained a 1-factor solution, but Item #6 had a reduced item-scale correlation compared to other items of the scale, $r = .56$ vs. $r_{mean} = .81$; detailed results omitted).

Figure 1 shows that the deviations of the centre distances differ between the scales. The BAS-2 has a small deviation, the BRS, FAS, BASES-AP have broader but very similar deviations, and the BAOS, BICSI-PRA, and BIAAQ the largest deviation of item centre distances. A small deviation indicates that all items are similarly constructed with regard to their relation of common and specific variance, but this cannot be used as an indicator for the "goodness" of a scale because even an intended mix of common and specific aspects can be reached with small or large deviations. However, outliers are problematic. Either they overemphasise specific content or the remaining items underemphasise it. With the BI-AAQ, Item #6 seems to be an outlier because it is very distant from the remaining items of the scale.

Based on the scale view that illustrates each item pool as a circle (the overall pool and the specific scales; see Figure 2), again the picture that emerges is clear. The BAS-2 is closest to the core followed by the BRS, BASES-AP, FAS, BICSI-PRA, and BAOS. The BI-AAQ was furthest away from the centre compared to all the other measures. Furthermore, the BAS-2 seems to have, on average, the highest latent correlations with all the other measures (values close to the scale-specific circles in Figure 2). It is correlated at .44 with the BIAAQ, .68 with BASES-AP, .42 with BAOS, .56 with FAS, .55 with BICSI-PRA, and .57 with BRS. Conversely, all measures have the highest latent correlation with the BAS-2 (see Figure 2). This again underlines the fact that the BAS-2 is the best representative of the core concept "positive body image". It is important to note that the mean centre distances as a measure of centrality do not exactly represent the mean latent correlations (mean centre distances are more sensitive to single items). However, there is always a clear association. Regarding the whole sample, there was a rank correlation of -.96 between the mean centre distances and the mean latent correlations, indicating that factors that have lower mean centre distances are more strongly associated to other factors. In short, the BAS-2 appears not only to offer a very clear measurement of positive body image, but also a very precise one.

3.3. Gender Differences

We additionally calculated the IPV separately for men and women (differentiating between heterosexual and non-heterosexual participants was not possible because of the small subsample size of the latter). As can be seen from Figure 1, item centre distances for women and men were comparable. There was only a slightly larger deviation of the BICSI-PRA items for men (largest value < 5) compared to women (largest value < 4). Item #6 of the BI-AAQ was conspicuous for both women and men. At the scale level, the BAS-2 was closest to the core concept for both women and men. All the other scales (except BI-AAQ) had similar centre distances for men and women, but of a slightly different order (women: BRS, FAS, BASES-AP, BICSI-PRA, BAOS; men: BASES-AP, BRS, FAS, BAOS, BICSI-PRA). In general, the differences in order were minor; that is, all scales appear to function similarly for women and men (see Tables S2 and S3 in Supplementary Materials). The only exception was BI-AAQ. For women, the BI-AAQ was in sixth position (centre distance: 1.59), but for men this scale was very far away from centre (centre distance: 8.19; see Figure 2).

4. Discussion

In the present study, we used IPV to assess facet commonality and distinguishability of seven widely-used measures of positive body image. To our knowledge, this is the first study to use IPV outside of the parent study (Dantlgraber et al., 2019) and certainly the first to use IPV in relation to scales of body image. More generally, the present study makes an important contribution to understandings of the nature of positive body image, which in turn, has important implications for scholars seeking to define and measure the construct. Here, we highlight the key findings from our study consider implications of these findings for theoretical understandings of positive body image and for the measurement of the construct. We also discuss the potential for IPV to be used more broadly within body image research.

First, at a broad level of abstraction, it is useful to note that most of the measures included in the present study had substantial loadings on the general factor resulting in centre distances of relatively low magnitude[4], meaning that they can conceptually be defined as indices of positive body image. In other words, based on the present dataset, we were able to provide empirical evidence that each of the measures we included does indeed assess – more or less distally – aspects of positive body image, hence supporting the theoretically-based evaluations of Webb and colleagues (2015). At a finer level, however, we found that the items of the BAS-2 most closely and most precisely tapped a core construct of positive body image. This has important implications: for the scholar wishing to measure positive body image in a general sense and facing instrument-selection decisions, our results suggest that the BAS-2 offers the most precise measure of the overall construct. That is, the BAS-2 is an instrument that both specifically measures body appreciation and generally measures positive body image. If wider coverage of the positive body image construct is required, then some combination of the BAS-2, the FAS, and the BASES-AP (or possibly the BAOS) would offer the broadest coverage of the positive body image construct.

Conversely, our results pose some interesting questions for the BRS and BI-AAQ. From a purely theoretical point-of-view, it is interesting to note that both of these measures appear to be tapping more distal aspects of positive body image as compared to, say, the BAS-2. One implication is that the constructs of body image flexibility and body responsiveness, respectively, measure less central aspects of the core positive body image construct; put differently, these aspects appear to be less important – relatively speaking – in conceptualisations of positive body image. This is not to suggest that what these instruments are measuring is invalid; rather, we merely suggest that the aspects that they are measuring are not as central to the construct of positive body image as, say, body appreciation. Certainly, there may be occasions when a scholar wishes to operationalise specific aspects of positive body image (e.g., using the BI-AAQ to measure body image flexibility specifically) and, in those situations, use of the BI-AAQ or BRS, respectively, would be warranted.

Nevertheless, we suggest that scholars using the BI-AAQ and/or BRS should be mindful of certain limiting issues that we uncovered. This suggestion for the application of caution is based not on the distance of items from the centre (see Figure 1), but rather the fact that the distribution of items is uneven. To take the BRS first, our results indicate that three of the seven items (i.e., Items #2, #3, and #4) do not adequately tap the core construct of positive body image (they hardly load onto any factor), resulting in items that in fact have substantial *negative* centre distances. For the same reason, scores on the BRS had less-than-adequate reliability in our data (see Table 2) and it is also notable that fit of a 1-dimensional model of BRS scores was poor based on the results of our confirmatory factor analysis (see Table 1). A prerequisite of IPV is that items should show substantial loadings, either with the correlated factors and/or the single factor. Published scales with adequate reliability usually fulfil this condition and consist of substantially correlated items, but this was not the case with the BRS items, at least in the present dataset. Moreover, it will perhaps come as no surprise that the three BRS items that were problematic were those that required reverse-coding prior to analyses. Indeed, as Tylka and Wood-Barcalow (2015a) have discussed, the use of negatively-worded items raises concerns about the content and face validity of instruments designed to measure positive body image. This is an issue that is also pertinent to the BI-AAQ, where all items have to be reverse-coded for this measure to serve as a measure of positive body image. For the BRS and the BI-AAQ to be more fully accepted as measures of positive body image, it may be necessary to first redesign reverse-coded items so that they are positively-valenced.

Aside from the use of negatively-worded items, the BI-AAQ presents an additional problem: while most items on this measure generally tap the core positive body image construct and are evenly distributed around the BI-AAQ mean centre distance, and although we found that a 1-dimensional model of BI-AAQ scores had adequate fit, Item #6 ("If I start to feel fat, I try to think about something else") appears to be an outlier. Although Sandoz and colleagues (2013) did not highlight any concerns with this item in the parent study, it is notable that Item #6 has been found to have relatively low item-factor loadings and item-total correlations in some translational studies (e.g., Ferreira et al., 2011). Indeed, based on the results of confirmatory factor analysis, at least one study has omitted Item #6 from the final translated version of the scale (Lucena-Santos et al., 2017). Furthermore, the BI-AAQ revealed substantial gender differences on the scale-specific analysis (Figure 2); it seems that this measure works better for women compared to men. One recommendation we make is that the BI-AAQ should perhaps be avoided as a sole measure of positive body image, unless scholars wish to operationalise body image flexibility specifically. In addition, when the measure is used, scholars are advised to examine the dimensionality of scores on the measure in their target population (with particular attention paid to Item #6) and to (re-)consider issues relevant to gender invariance (for a discussion, see Swami & Barron, 2019).

Finally, the items of BICSI-PRA demonstrated the largest deviations of all the measures included in the present study, suggestive of a lack of precision in its assessment of the core positive body image construct; or, put differently, although the BICSI-PRA does measure the core construct of positive body image, it does so relatively distally. From a practical point-of-view, we are not suggesting that scholars should avoid using the BICSI-PRA; indeed, there may be occasions when scholars wish to specifically measure adaptive body image coping styles and, in such situations, the instrument may be suitable (see Jarry et al., 2019). However, our results suggest that, when used in isolation, the BICSI-PRA does not offer a clear conceptualisation of the core construct of positive body image and it thus best used in combination with other scales if the intention is to measure positive body image generally rather than specifically. A similar issue pertains to the BAOS (which, interestingly, had poor fit in terms of a 1-dimensional model in our confirmatory factor analysis), although it should be noted that the BAOS is more accurately described as a contributor to, rather than a central aspect, of positive of body image (Webb et al., 2015). We, therefore, recommend its use alongside other measures of positive body image, where appropriate.

4.1. Limitations and Future Directions

The main limitation of the present study is that the definition of the “core construct” of positive body image is dependent on the measures that are included in the IPV. While we attempted to include a broad range of measures that have been identified as being central to definition of positive body image, we acknowledge that our list of measures is not exhaustive (for a review, see Webb et al., 2015). In this sense, the inclusion of additional measures would likely alter the factor structure and, therefore, the location of the centre (i.e., the general factor of all items). However, this is not an issue that is specific to IPV: the same is true of SEMs and factor analyses, but the advantage of combining IPV with existing methods is that IPV may be easier to navigate than factor models, particularly as the number of items or factors increases. Nevertheless, as Dantlgraber and colleagues (2019) have pointed out, the intention to create larger networks will need to be balanced with practical considerations, such as participant fatigue during questionnaire completion. Nevertheless, given that the present study included the most widely-used measures of positive body image, we suggest that our results are able to make a useful contribution to understandings of positive body image, as things currently stand in terms of the availability of instruments.

In a similar vein, while IPV is useful in helping scholars make decisions about distinguishability and commonality, there remains a degree of subjectivity in this decision-making based on IPV as things currently stand. That is, there is currently no agreed method of using IPV as a tool for scale construction or adaptation (e.g., it is unclear at present whether centre distances could be used to delete an item) or the extent to which confirmatory factor analyses should be used to feed into IPV decision-making. It is possible that these issues will be addressed more formally as IPV becomes more fully utilised (e.g., it may be possible to define cut-offs that are used to determine item deletion), but for now the novelty of IPV means that this is not something that was addressed in the present study. A different limitation is the fact that our dataset was derived from English-speaking participants, for whom all our target measures have adequate psychometric estimates. In this context, it is difficult to know how well our results might be replicated were our study to be conducted based on datasets from other linguistic, national, or cultural groups. This is important because the semantic meaning of individual items may vary across linguistic groups (Arnulf et al., 2014; Larsen et al., 2008), which in turn might affect how the core construct of positive body image is defined. Of course, replicating our work in additional linguistic contexts is dependent on the development of psychometrically-valid translations (Swami & Barron, 2019), but this would certainly be worth exploring as the instrumentation database is developed more fully. Likewise, we remind readers that the present dataset is reflective of an online sample of adults in the United Kingdom, who may not be representative of the wider population.

These limitations notwithstanding, the results of the present study suggest that IPV may be a useful complement to SEMs through its visualisation of the interplay of scales and items, which provides a fuller understanding of the construct of positive body image. More generally, this method could also contribute to provide better understandings of item pools within multi-dimensional measures, such as the BASES (Castonguay et al., 2014). Likewise, IPV may also be very useful in helping scholars develop better understanding the relationships between measures of positive body image and instruments that are conceptually related. To take one example, two recent studies examining associations between BAS-2 scores and an index of body trust (a facet of interoceptive awareness) have reported significant and strong inter-correlations (Todd et al., 2019a, 2019b), which is suggestive of construct overlap. In such contexts, IPV may be particularly useful in helping scholars better understand the nature and extent of scale and item commonality.

Finally, IPV may also prove useful for visualising conceptualisations across different types of body image constructs (i.e., perceptual, cognitive, and affective) or in terms of visualising construct and/or item overlap with regards to instruments tap negative body image (e.g., body dissatisfaction, maladaptive body image coping, current-ideal weight discrepancy) or body image-related variables (e.g., thin ideal internalisation). IPV may be particularly informative in terms of the latter, where issues of construct overlap have been more frequently noted and where a typical analytic strategy has been the removal of items based on subjective assessments of content rather than empirical evidence of overlap (e.g., Fitzsimmons-Craft et al., 2012, 2016). In cases such as these, the combination of traditional SEM methods with data visualisation techniques such as IPV would offer greater certainty that steps taken to minimise construct overlap are empirically robust. In a similar vein, IPV may also be useful alongside SEM and factor analytic methods in the development or refinement of existing body image instruments, as well as in studies of test adaptation.

4.2. Conclusion

To summarise, the present study used IPV – a recently developed illustrative tool based on the comparison of a single factor and correlated factor SEM – to develop a better understanding of scale and item commonality and distinguishability in terms of widely-used measures of positive body image. Our main take-home message, based on the present dataset and results, is that the BAS-2 is a *par excellence* index of the core construct of positive body image. Where scholars are seeking a singular index of this construct, we recommend use of the BAS-2 before all other measures of positive body image. Where space permits, some combination of measures (e.g., the BAS-2 and FAS, or the BAS-2, FAS, and BASES-AP) would offer better coverage of the core positive body image construct. Of course, this does not mean that scholars should avoid using particular scales for their intended purpose (i.e., to measure more specific aspects of positive body image), although our results do raise some questions about item content for some measures (the BRS and BI-AAQ in particular). More generally, we recommend IPV as a useful tool alongside more traditional methods in the arsenal of body image scholars, particularly in helping scholarly decision-making about the utility of particular scales in measuring core constructs.

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Footnotes

[1] Although Dantlgraber and colleagues (2019) suggested excluding items with loadings < 0.1, we wanted to keep them in order to give an unbiased indication of which scale – as it is published and used in the scientific community – is more central to the core concept.

[2] This does not mean that IPV is not capable of add information to test development. In fact, IPV can be used when developing a new measure to check how the items and item pools relate to the other measures that have already been developed.

[3] We recalculated IPV by excluding the three respective items to show how stable IPV is when items with questionable test statistics are excluded. As can be seen in the Supplementary Materials (Table S1, Figures S1), mean centre distances were quite similar (BAS: 0.11 vs. 0.11, BIAAQ: 2.61 vs. 2.76, BASES-AP: 0.67 vs. 0.65, BAOS: 1.95 vs. 1.97, FAS: 0.98 vs. 0.97, BICSI-PRA: 1.49 vs. 1.45) except for BRS (0.63 vs. 1.08). As expected, the overall picture remained stable. Only the item-pool of the BRS scale moved further away from the centre (see radar charts in Figure S1).

[4] For example, a factor loading of an item in the general factor model of 0.1, and in the correlated factor model of 1.0, would result in a centre distance of 99. Although this is not possible in practice because of measurement errors, it provides an indication of the possible range.

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Table 1

Results of Confirmatory Factor Analyses Examining Fit of 1-Factor Models for Each of the Scales Included in the Present Study.

Scale	χ^2	df	χ^2/df*	RMSEA (90% CI)	SRMR	CFI
(1) Body Appreciation Scale-2	160.418	35	4.58	.085 (.072, .097)	.035	.959
(2) Body Image-Acceptance and Action Questionnaire	227.568	54	4.21	.080 (.071, .090)	.029	.963
(3) Authentic Pride–Body and Appearance Self-Conscious Emotions Scale	45.073	9	5.01	.089 (.072, .107)	.023	.984
(4) Body Acceptance from Other Scales	1040.386	35	29.73	.239 (.229, .250)	.122	.688
(5) Functionality Appreciation Scale	54.540	14	3.90	.076 (.059, .094)	.029	.974
(7) Body Responsiveness Scale	315.025	14	22.50	.207 (.190, .225)	.157	.687
(6) Positive Rationale Acceptance–Body Image Coping Strategies Inventory	298.128	44	6.78	.107 (.097, .118)	.065	.817
(7) Positive Rationale Acceptance–Body Image Coping Strategies Inventory with intercepts fixed for Items 1 and 2	241.684	43	5.62	.096 (.086, .107)	.059	.857
(8) Positive Rationale Acceptance–Body Image	205.848	42	4.90	.088 (.078, .099)	.055	.882

Coping Strategies Inventory with intercepts fixed for Items 1 and 2, and 4 and 7

Notes. * all *p*s < .001.

Table 2

Internal consistency coefficients, descriptive statistics, and inter-correlations between scores on all measures included in the present study.

	Number of items	Cronbach α (95% CI)	McDonald’s ω (95% CI)	*M* (*SD*)	(1)	(2)	(3)	(4)	(5)	(6)
(1) BAS-2	10	.94 (.93, .95)	.94 (.93, .95)	3.2 (0.8)						
(2) BI-AAQ	12	.96 (.95, .96)	.96 (.95, .96)	4.9 (1.4)	.45					
(3) BASES-AP	6	.95 (.94, .96)	.95 (.95, .96)	2.7 (0.9)	.69	.23				
(4) BAOS	10	.90 (.89, .92)	.90 (.89, .91)	3.2 (0.9)	.42	.23	.34			
(5) FAS	7	.93 (.92, .94)	.93 (.92, .94)	4.0 (0.8)	.57	.29	.42	.42		
(6) BICSI-PRA	11	.87 (.85, .88)	.87 (.85, .88)	2.7 (0.5)	.56	.18	.43	.36	.44	
(7) BRS	7	.71 (.67, .75)	.67 (.62, .71)	4.3 (1.0)	.57	.38	.47	.33	.46	.45

Note. CI = Confidence interval, BAS-2 = Body Appreciation Scale-2, BI-AAQ = Body Image-Acceptance and Action Questionnaire, BASES-AP = Authentic Pride subscale of the Body and Appearance Self-Conscious Emotions Scale, BAOS = Body Acceptance from Others Scale, FAS = Functionality Appreciation Scale, BICSI-PRA = Positive Rational Acceptance subscale of the Body Image Coping Strategies Inventory, BRS = Body Responsiveness Scale. All correlations were significant on at $p < .001$.

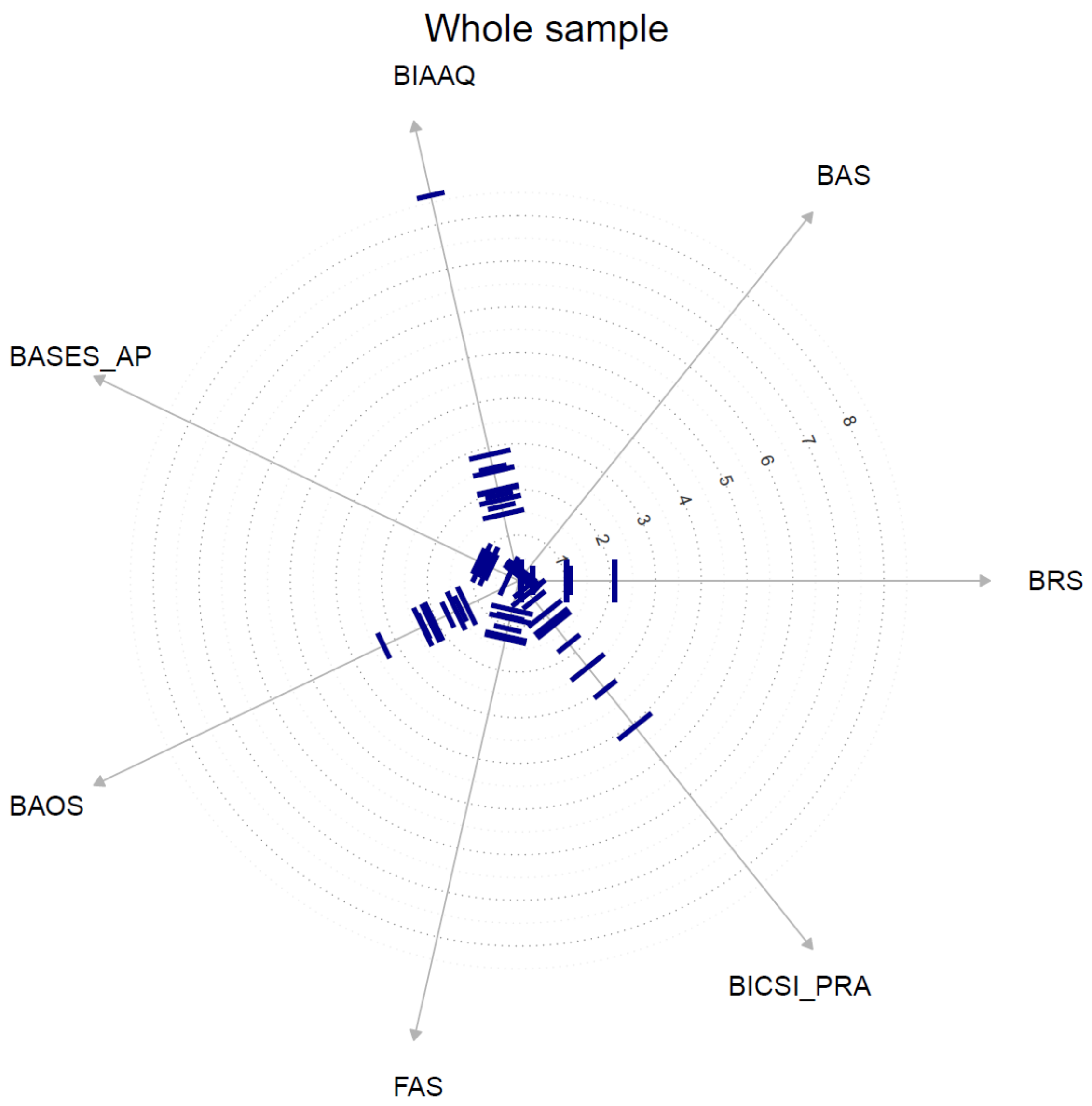
Table 3. *Basic Item Pool Visualisation calculations.*

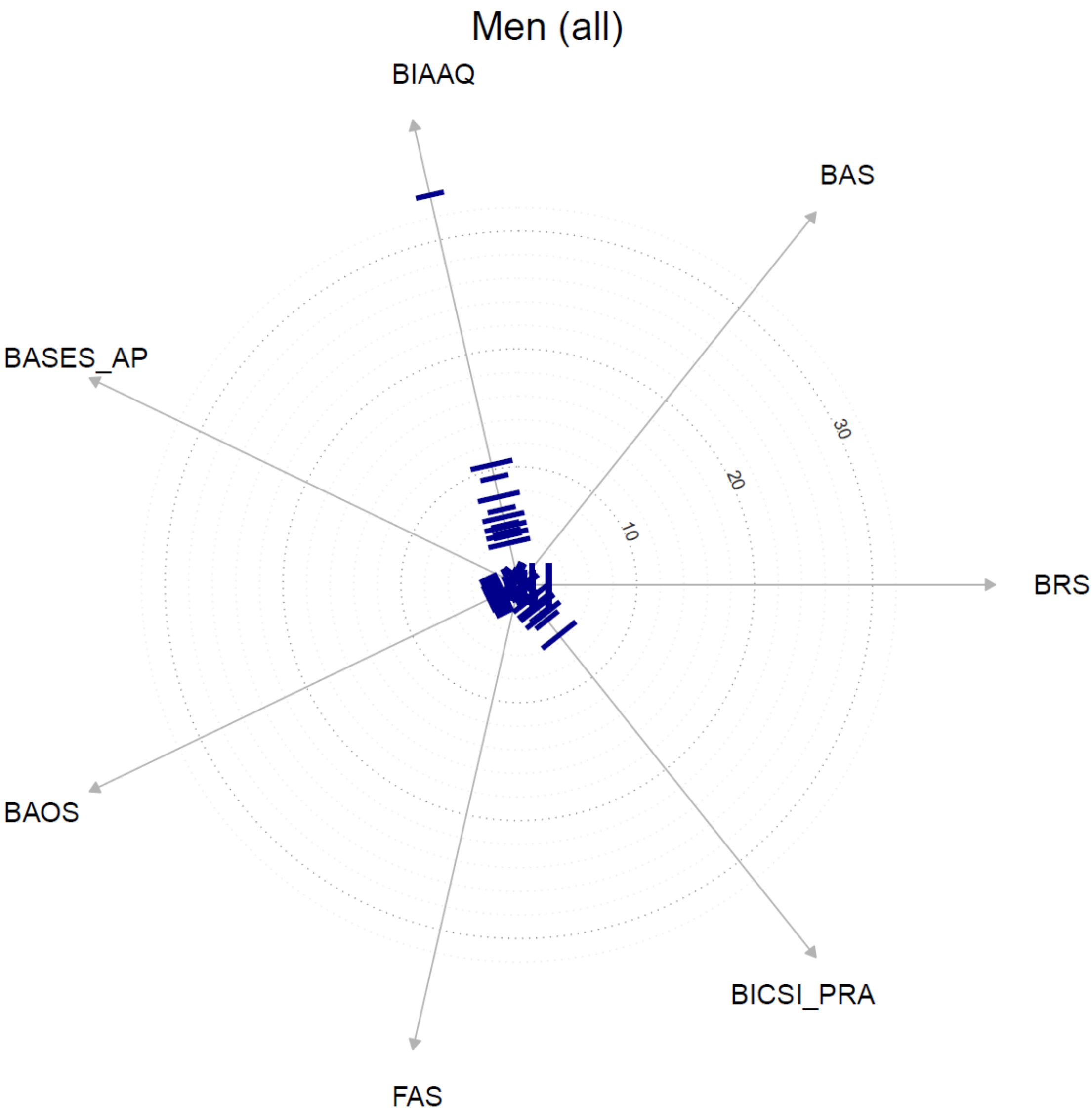
Scale	Item #	Factor loadings		Ratio of squared loadings	Centre distance	Mean centre distance
		General factor model	Correlated factor model			
BAS-2	1	0.68	0.71	1.10	0.10	0.11
	2	0.81	0.85	1.10	0.10	
	3	0.75	0.79	1.10	0.10	
	4	0.81	0.87	1.14	0.14	
	5	0.66	0.67	1.02	0.02	
	6	0.76	0.82	1.17	0.17	
	7	0.73	0.76	1.10	0.10	
	8	0.71	0.76	1.15	0.15	
	9	0.76	0.79	1.07	0.07	
	10	0.70	0.75	1.14	0.14	
BI-AAQ	1 (R)	0.48	0.83	2.99	1.99	2.61
	2 (R)	0.38	0.75	3.78	2.78	
	3 (R)	0.48	0.83	2.97	1.97	
	4 (R)	0.49	0.85	2.97	1.97	
	5 (R)	0.50	0.84	2.87	1.87	
	6 (R)	0.18	0.56	9.60	8.60	
	7 (R)	0.48	0.79	2.76	1.76	
	8 (R)	0.44	0.81	3.48	2.48	
	9 (R)	0.44	0.81	3.40	2.40	
	10 (R)	0.48	0.89	3.40	2.40	
	11 (R)	0.54	0.88	2.62	1.62	
	12 (R)	0.52	0.81	2.43	1.43	
BASES-AP	1	0.76	0.83	1.18	0.18	0.67
	2	0.66	0.90	1.85	0.85	
	3	0.69	0.88	1.62	0.62	
	4	0.64	0.88	1.92	0.92	

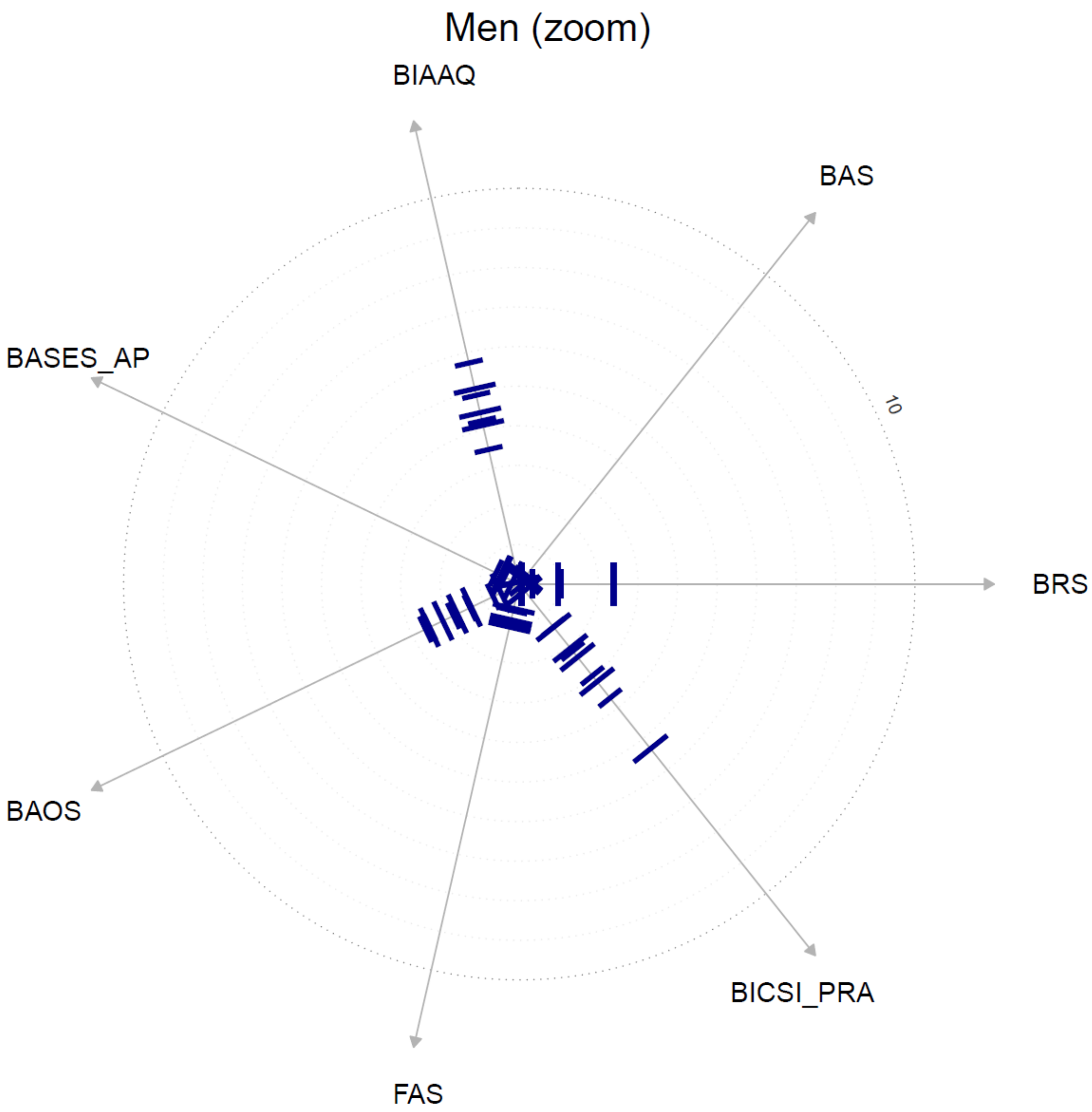
	5	0.67	0.86	1.67	0.67	
	6	0.68	0.91	1.77	0.77	
BAOS	1	0.37	0.57	2.46	1.46	1.97
	2	0.32	0.65	4.23	3.23	
	3	0.39	0.58	2.21	1.21	
	4	0.37	0.65	3.06	2.06	
	5	0.36	0.55	2.36	1.36	
	6	0.33	0.59	3.08	2.08	
	7	0.50	0.81	2.66	1.66	
	8	0.46	0.84	3.28	2.28	
	9	0.47	0.81	3.01	2.01	
	10	0.44	0.79	3.25	2.25	
FAS	1	0.62	0.78	1.69	0.60	0.98
	2	0.57	0.76	1.80	0.80	
	3	0.52	0.77	2.23	1.23	
	4	0.56	0.75	1.76	0.76	
	5	0.58	0.83	2.02	1.02	
	6	0.57	0.86	2.25	1.25	
	7	0.58	0.86	2.20	1.20	
BICSI-PRA	1	0.49	0.53	1.16	0.16	1.49
	2	0.60	0.66	1.29	0.29	
	3	0.30	0.61	3.99	2.99	
	4	0.42	0.70	2.71	1.71	
	5	0.36	0.53	2.17	1.17	
	6	0.26	0.58	5.03	4.03	
	7	0.39	0.71	3.37	2.37	
	8	0.39	0.57	2.19	1.19	
	9	0.41	0.59	2.09	1.09	
	10	0.50	0.61	1.49	0.49	
	11	0.44	0.60	1.87	0.87	
BRS	1	0.63	0.70	1.26	0.26	0.63
	2 (R)	0.19	0.06 (set to 0.10)	0.28	<.00 [-0.72]	
	3 (R)	0.27	0.11	0.17	< .00 [-0.83]	

4 (R)	0.20	0.09 (set to 0.10)	0.25	< .00 [-0.75]
5	0.54	0.76	2.00	1.03
6	0.44	0.77	3.05	2.39
7	0.58	0.83	2.08	1.05

Note. Items followed by (R) were reverse-scored before analysis. BAS-2 = Body Appreciation Scale-2, BI-AAQ = Body Image-Acceptance and Action Questionnaire, BASES-AP = Authentic Pride subscale of the Body and Appearance Self-Conscious Emotions Scale, BAOS = Body Acceptance from Others Scale, FAS = Functionality Appreciation Scale, BICSI-PRA = Positive Rational Acceptance subscale of the Body Image Coping Strategies Inventory, BRS = Body Responsiveness Scale. In square brackets are the original negative centre distances.


Whole sample
BIAAQ
BAS
BASES_AP
BRS
BAOS
BICSI_PRA
FAS
1
2
3
4
5
6
7
8


Men (all)
BIAAQ
BAS
BASES_AP
BRS
BAOS
BICSI_PRA
FAS
10
20
30


Men (zoom)
BIAAQ
BAS
BASES_AP
10
BRS
BAOS
BICSI_PRA
FAS

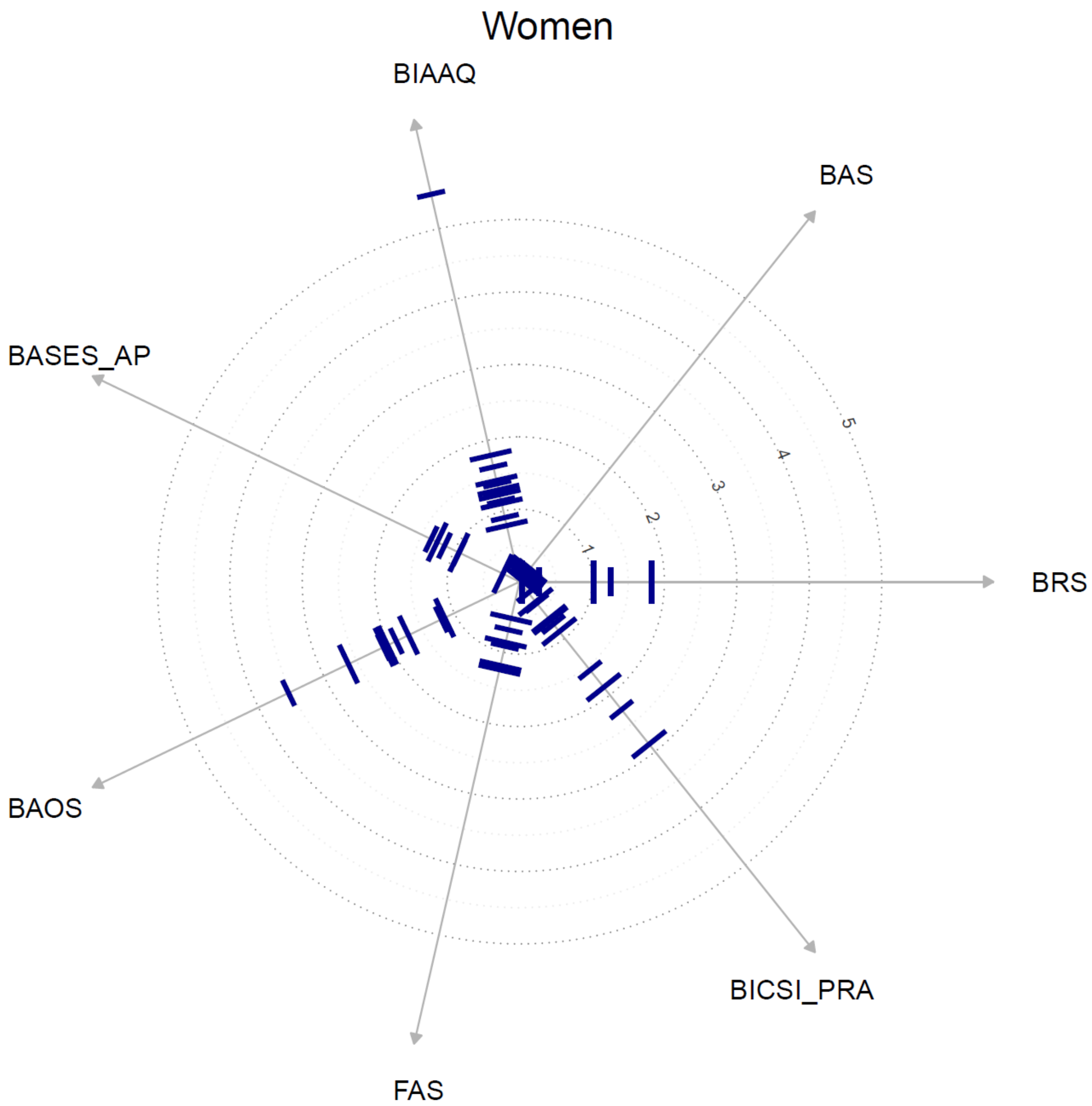
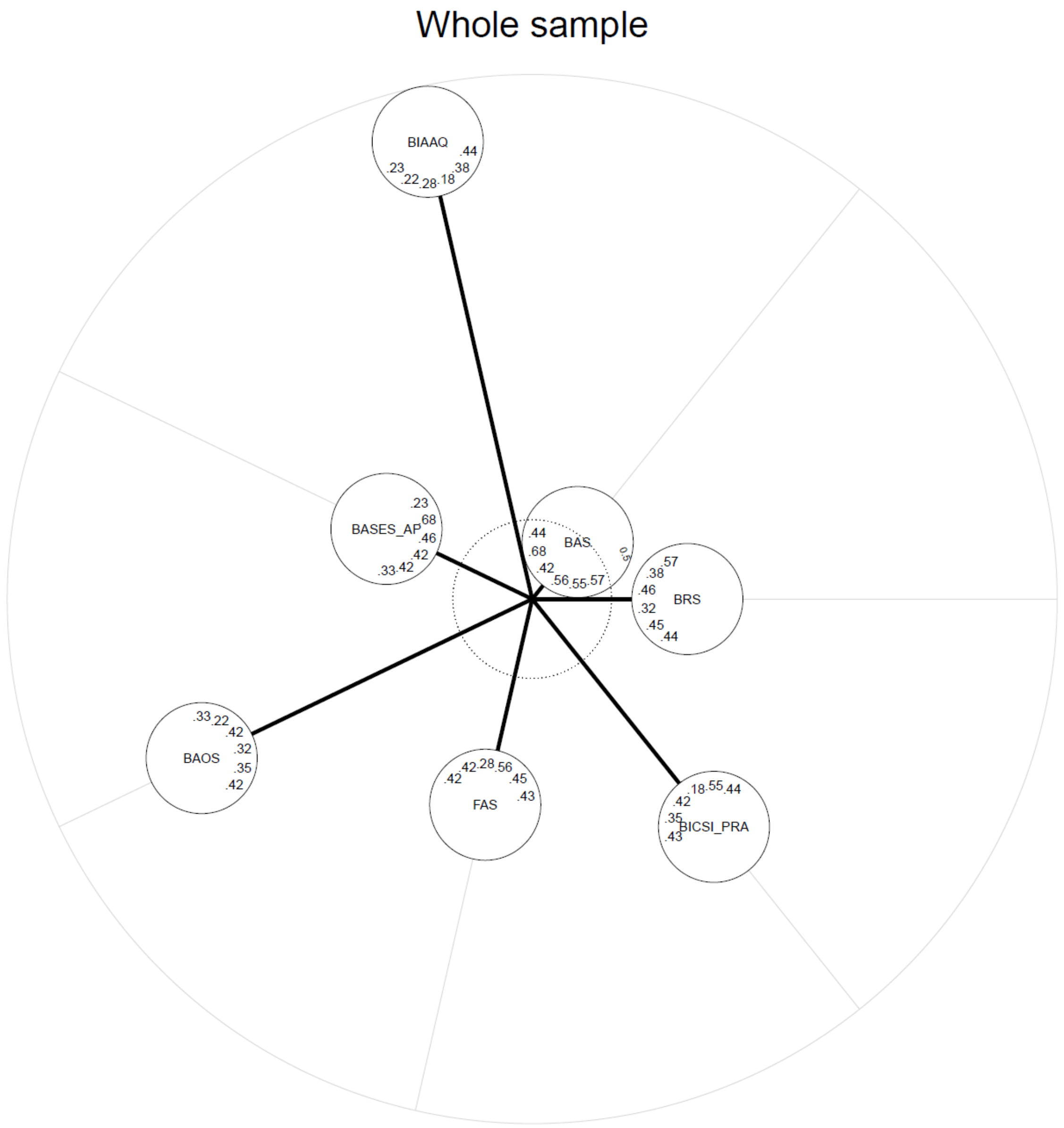
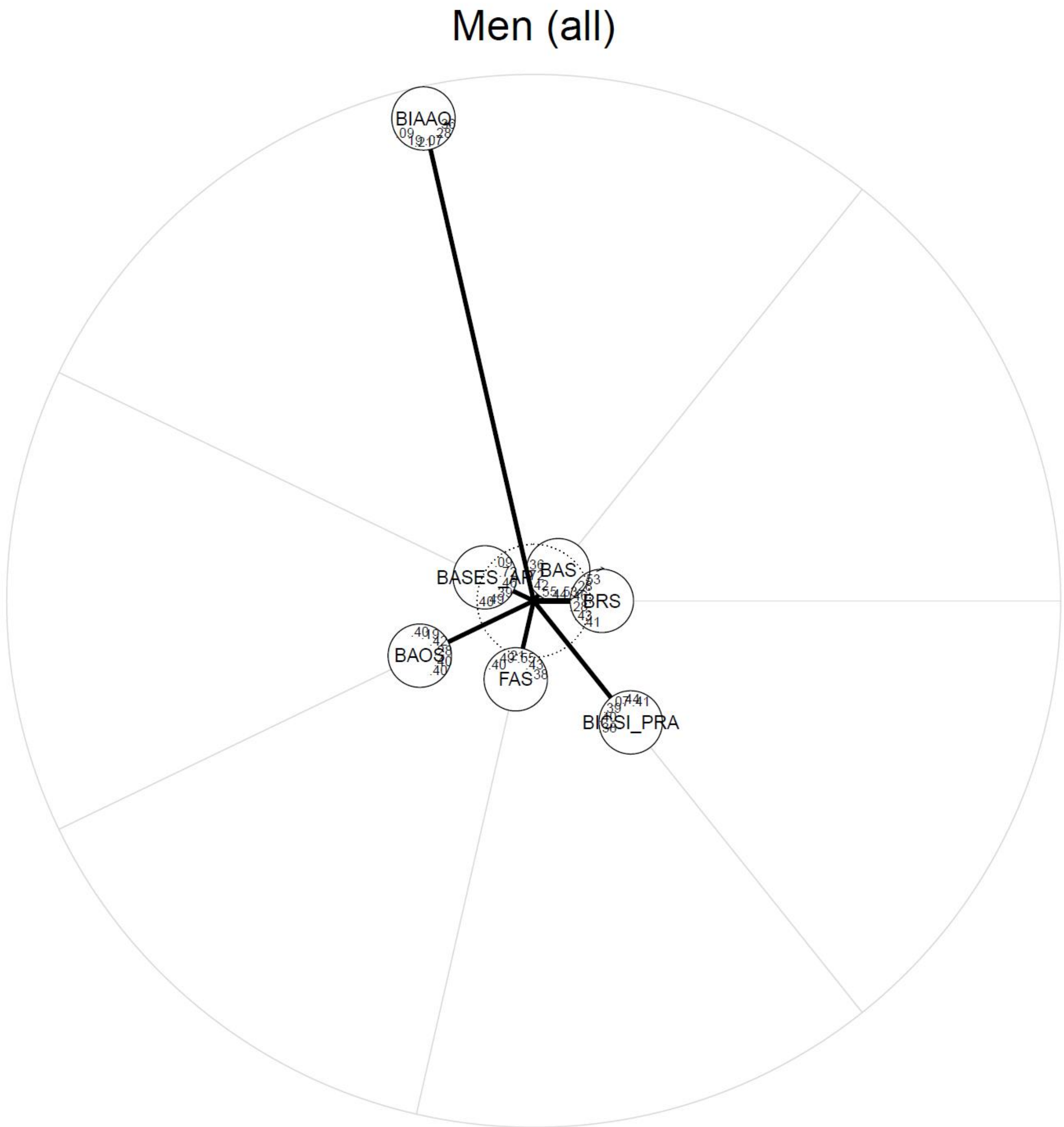
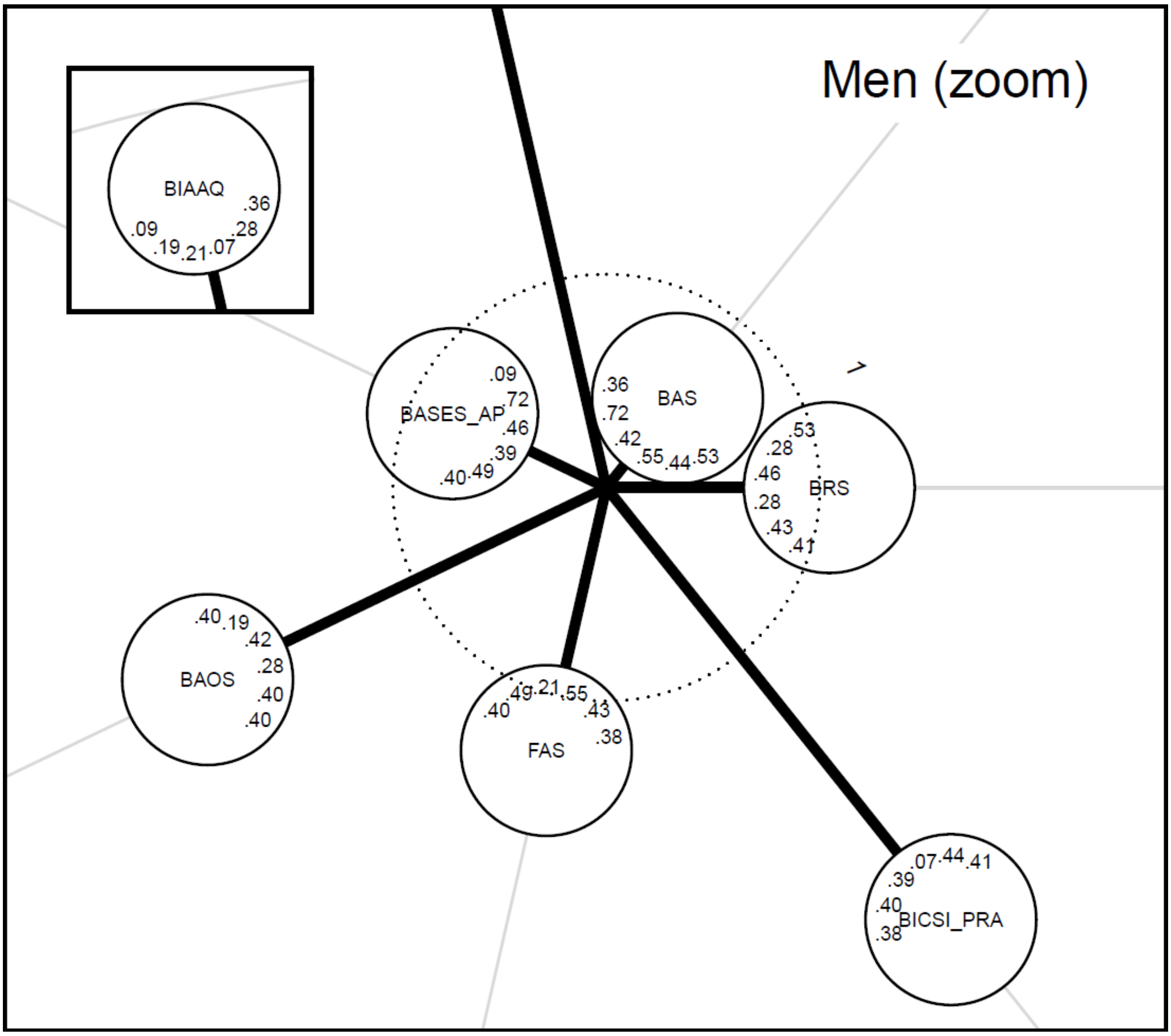


Figure 1. Radar charts with item locations on scale dimensions. Note: The dotted circles represent the grid of axis scaling. For clearer distinction, every second item is illustrated as having a different length.


Whole sample
BIAAQ
.44
.23
.38
.22
.28
.18
BASES_AP
.23
.68
.46
.42
.33
.42
BAS
.44
.68
.42
.56
.55
.57
0.5
BRS
.57
.38
.46
.32
.45
.44
BAOS
.33
.22
.42
.32
.35
.42
FAS
.42
.28
.56
.42
.45
.43
BICSI_PRA
.18
.55
.44
.42
.35
.43


Men (all)
BIAAQ
BASES_APP
BAS
BRS
BAOS
FAS
BICSI_PRA


Men (zoom)
BIAAQ
.36
.28
.09
.19
.21
.07
BASES_AP
.09
.72
.46
.39
.49
.40
BAS
.36
.72
.42
.55
.44
.53
BRS
.53
.28
.46
.28
.43
.41
BAOS
.40
.19
.42
.28
.40
.40
FAS
.49
.21
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.40
.43
.38
BICSI_PRA
.07
.44
.41
.39
.40
.38

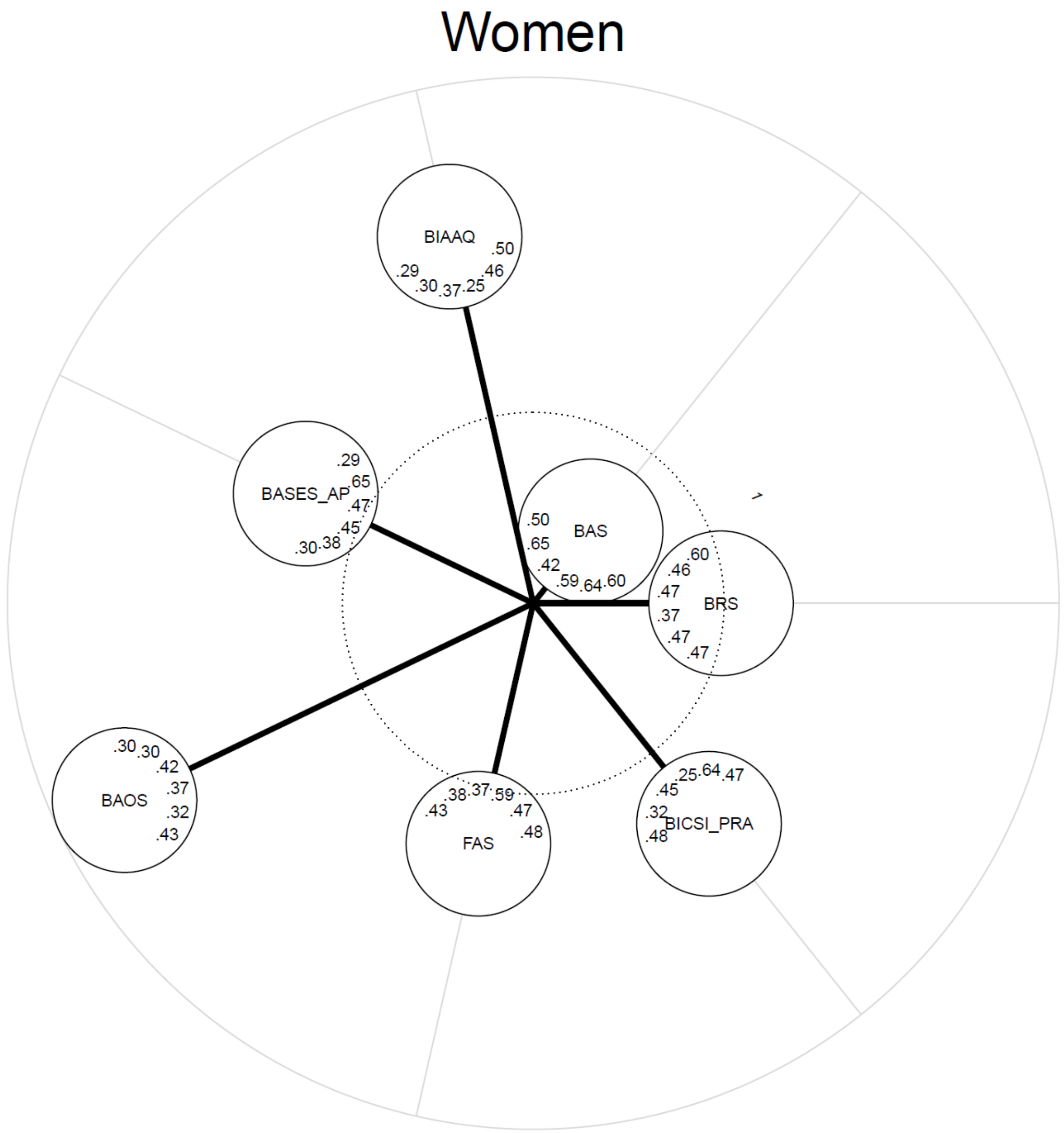


Figure 2. Radar charts with scale locations of all positive body image measures. Note: Numbers within the circles represent latent correlations between the respective scale with all the other scales. Correlations are arranged clockwise using the same order as the scales.

Supplementary Materials

Table S1

Basic Item Pool Visualisation Calculations without the Three Poorly-Performing Items from the Body Responsiveness Scale

Scale	Item #	Factor loadings		Ratio of squared loadings	Centre distance	Mean centre distance
		General factor model	Correlated factor model			
BAS-2	1	0.68	0.71	1.10	0.10	0.11
	2	0.81	0.85	1.10	0.10	
	3	0.76	0.79	1.10	0.10	
	4	0.81	0.87	1.14	0.14	
	5	0.66	0.67	1.02	0.02	
	6	0.76	0.82	1.16	0.16	
	7	0.73	0.76	1.09	0.09	
	8	0.71	0.76	1.15	0.15	
	9	0.76	0.79	1.08	0.08	
	10	0.70	0.75	1.13	0.13	
BI-AAQ	1 (R)	0.47	0.83	3.08	2.08	2.76
	2 (R)	0.38	0.75	3.90	2.90	
	3 (R)	0.47	0.83	3.06	2.06	
	4 (R)	0.49	0.85	3.07	2.07	
	5 (R)	0.49	0.84	2.95	1.95	
	6 (R)	0.18	0.56	10.35	9.35	
	7 (R)	0.47	0.79	2.84	1.84	
	8 (R)	0.43	0.81	3.61	2.61	
	9 (R)	0.43	0.81	3.52	2.52	
	10 (R)	0.47	0.89	3.52	2.52	
	11 (R)	0.54	0.88	2.69	1.69	

	12 (R)	0.51	0.81	2.51	1.51	
BASES-AP	1	0.76	0.83	1.18	0.18	0.65
	2	0.66	0.89	1.83	0.83	
	3	0.70	0.88	1.60	0.60	
	4	0.64	0.89	1.90	0.90	
	5	0.67	0.86	1.66	0.66	
	6	0.68	0.91	1.76	0.76	
BAOS	1	0.37	0.57	2.46	1.46	1.95
	2	0.32	0.65	4.19	3.19	
	3	0.39	0.58	2.21	1.21	
	4	0.37	0.65	3.06	2.06	
	5	0.36	0.55	2.34	1.34	
	6	0.34	0.59	3.05	2.05	
	7	0.50	0.81	2.67	1.67	
	8	0.46	0.84	3.28	2.28	
	9	0.47	0.81	3.01	2.01	
	10	0.44	0.79	3.24	2.24	
FAS	1	0.62	0.79	1.59	0.59	0.97
	2	0.57	0.76	1.79	0.79	
	3	0.52	0.77	2.21	1.21	
	4	0.57	0.75	1.74	0.74	
	5	0.58	0.83	2.02	1.02	
	6	0.57	0.86	2.23	1.23	
	7	0.58	0.86	2.18	1.18	
BICSI-PRA	1	0.50	0.53	1.15	0.15	1.45
	2	0.60	0.68	1.28	0.28	
	3	0.31	0.61	3.92	2.92	
	4	0.43	0.70	2.68	1.68	
	5	0.36	0.53	2.14	1.14	
	6	0.26	0.58	4.92	3.92	
	7	0.39	0.71	3.32	2.32	
	8	0.39	0.57	2.18	1.18	
	9	0.41	0.59	2.07	1.07	

	10	0.50	0.61	1.48	0.48	
	11	0.44	0.60	1.86	0.86	
BRS	1	0.63	0.70	1.23	0.23	1.08
	2 (R)	excluded				
	3 (R)	excluded				
	4 (R)	excluded				
	5	0.54	0.76	1.96	0.96	
	6	0.45	0.78	3.06	2.06	
	7	0.58	0.84	2.09	1.09	

Note. Items followed by (R) were reverse-scored before analysis. BAS-2 = Body Appreciation Scale-2, BI-AAQ = Body Image-Acceptance and Action Questionnaire, BASES-AP = Authentic Pride subscale of the Body and Appearance Self-Conscious Emotions Scale, BAOS = Body Acceptance from Others Scale, FAS = Functionality Appreciation Scale, BICSI-PRA = Positive Rational Acceptance subscale of the Body Image Coping Strategies Inventory, BRS = Body Responsiveness Scale.

Table S2

Basic Item Pool Visualisation Calculations for Men.

Scale	Item #	Factor loadings		Ratio of squared loadings	Centre distance	Mean centre distance
		General factor model	Correlated factor model			
BAS-2	1	0.67	0.74	1.22	0.22	0.13
	2	0.78	0.83	1.15	0.15	
	3	0.73	0.77	1.10	0.10	
	4	0.80	0.86	1.17	0.17	
	5	0.63	0.66	1.11	0.11	
	6	0.77	0.82	1.14	0.14	
	7	0.70	0.74	1.09	0.09	
	8	0.68	0.73	1.16	0.16	
	9	0.69	0.74	1.14	0.14	
	10	0.66	0.68	1.07	0.07	
BI-AAQ	1 (R)	0.32	0.78	5.83	4.83	8.19
	2 (R)	0.24	0.71	8.43	7.43	
	3 (R)	0.35	0.80	5.17	4.17	
	4 (R)	0.37	0.83	5.05	4.05	
	5 (R)	0.34	0.83	6.00	5.00	
	6 (R)	0.11	0.66	34.68	33.68	
	7 (R)	0.32	0.75	5.38	4.38	
	8 (R)	0.29	0.80	7.33	6.33	
	9 (R)	0.23	0.78	11.22	10.22	
	10 (R)	0.27	0.85	10.10	9.10	
	11 (R)	0.33	0.86	6.67	5.67	
	12 (R)	0.38	0.80	4.43	3.43	
BASES-AP	1	0.79	0.83	1.12	0.12	0.40
	2	0.73	0.88	1.46	0.46	

	3	0.74	0.86	1.35	0.35	
	4	0.68	0.86	1.59	0.59	
	5	0.72	0.86	1.42	0.42	
	6	0.73	0.88	1.46	0.46	
BAOS	1	0.44	0.53	1.45	0.45	1.67
	2	0.43	0.70	2.67	1.67	
	3	0.38	0.58	2.32	1.32	
	4	0.37	0.70	3.57	2.57	
	5	0.47	0.61	1.69	0.69	
	6	0.45	0.68	2.28	1.28	
	7	0.46	0.78	2.78	1.78	
	8	0.44	0.82	3.56	2.56	
	9	0.44	0.78	3.08	2.08	
	10	0.41	0.76	3.45	2.45	
FAS	1	0.60	0.77	1.63	0.63	0.86
	2	0.52	0.71	1.86	0.86	
	3	0.54	0.75	1.95	0.95	
	4	0.58	0.73	1.57	0.57	
	5	0.55	0.79	2.02	1.02	
	6	0.56	0.81	2.05	1.05	
	7	0.59	0.83	1.96	0.96	
BICSI-PRA	1	0.47	0.43	0.84	<.00 [-0.16]	2.19
	2	0.60	0.64	1.15	0.15	
	3	0.28	0.61	4.62	3.62	
	4	0.39	0.68	3.01	2.01	
	5	0.25	0.49	3.90	2.90	
	6	0.25	0.63	6.26	5.26	
	7	0.36	0.73	4.09	3.09	
	8	0.28	0.50	3.10	2.10	
	9	0.30	0.54	3.30	2.30	
	10	0.42	0.65	2.33	1.33	
	11	0.38	0.57	2.32	1.32	
BRS	1	0.57	0.65	1.27	0.27	0.64

2 (R)	0.13	-0.06 set to 0.10	0.59	<.00 [-0.41]
3 (R)	0.24	0.07	0.17 set to 1.0	<.00 [-0.83]
4 (R)	0.12	0.04	0.69 set to 1.0	<.00 [-0.31]
5	0.47	0.67	1.99	0.99
6	0.40	0.73	3.32	2.32
7	0.60	0.83	1.92	0.92

Note. Items followed by (R) were reverse-scored before analysis. BAS-2 = Body Appreciation Scale-2, BI-AAQ = Body Image-Acceptance and Action Questionnaire, BASES-AP = Authentic Pride subscale of the Body and Appearance Self-Conscious Emotions Scale, BAOS = Body Acceptance from Others Scale, FAS = Functionality Appreciation Scale, BICSI-PRA = Positive Rational Acceptance subscale of the Body Image Coping Strategies Inventory, BRS = Body Responsiveness Scale. In square brackets are the original negative centre distances.

Table S3

Basic Item Pool Visualisation Calculations for Women.

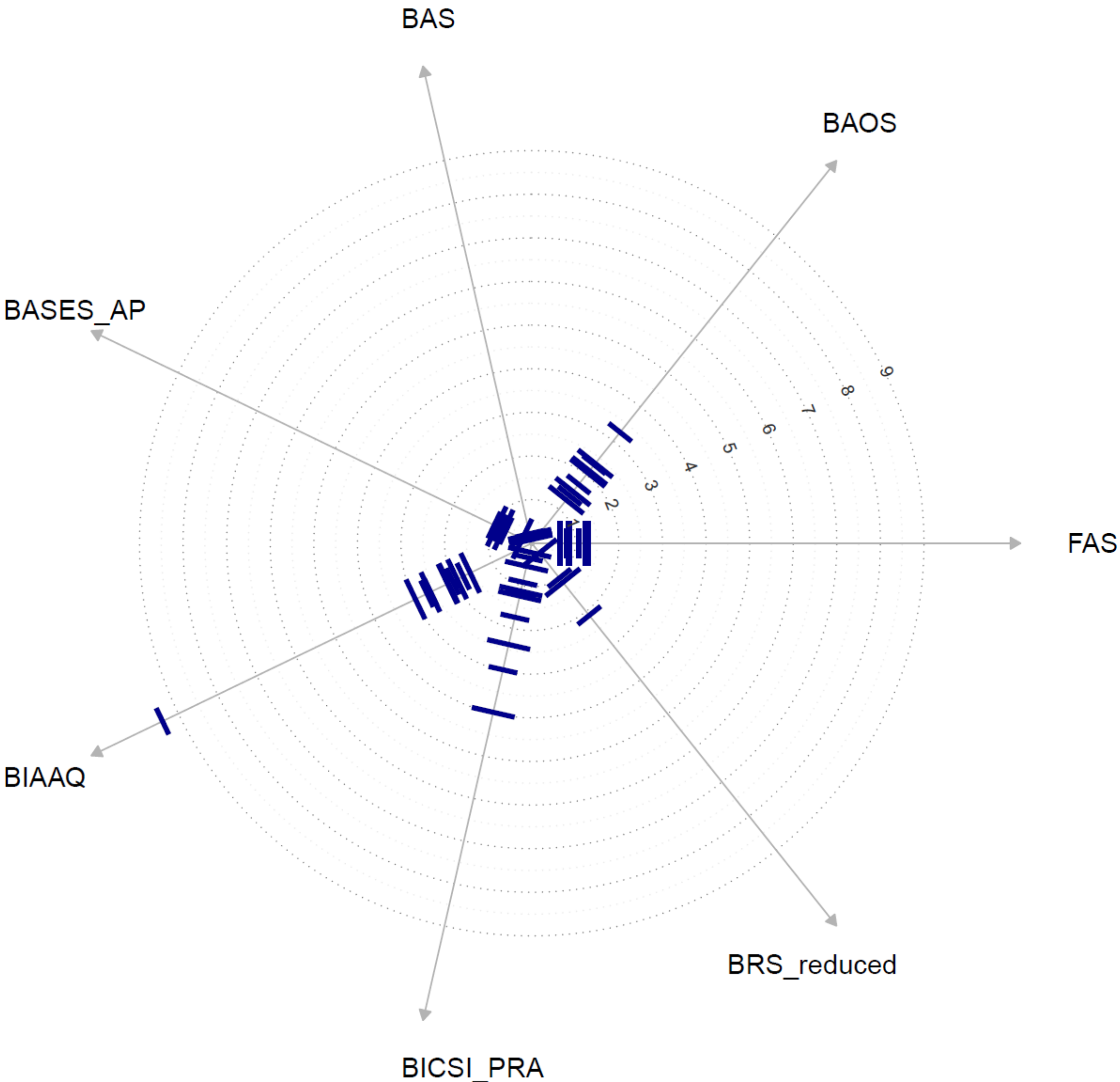
Scale	Item #	Factor loadings		Ratio of squared loadings	Centre distance	Mean centre distance
		General factor model	Correlated factor model			
BAS-2	1	0.69	0.70	1.02	0.02	0.10
	2	0.83	0.87	1.08	0.08	
	3	0.77	0.81	1.10	0.10	
	4	0.82	0.88	1.14	0.14	
	5	0.68	0.68	1.00	0.00	
	6	0.76	0.83	1.19	0.19	
	7	0.75	0.79	1.10	0.10	
	8	0.74	0.79	1.14	0.14	
	9	0.81	0.83	1.07	0.07	
	10	0.74	0.81	1.20	0.20	
BI-AAQ	1 (R)	0.57	0.86	2.26	1.26	1.59
	2 (R)	0.45	0.76	2.76	1.76	
	3 (R)	0.54	0.83	2.35	1.35	
	4 (R)	0.56	0.86	2.40	1.40	
	5 (R)	0.58	0.83	2.07	1.07	
	6 (R)	0.18	0.45	6.45	5.45	
	7 (R)	0.55	0.80	2.11	1.11	
	8 (R)	0.50	0.81	2.60	1.60	
	9 (R)	0.57	0.85	2.20	1.20	
	10 (R)	0.60	0.91	2.27	1.27	
	11 (R)	0.67	0.88	1.76	0.76	
	12 (R)	0.59	0.80	1.87	0.87	
BASES-AP	1	0.74	0.81	1.22	0.22	0.94
	2	0.60	0.91	2.32	1.32	

	3	0.65	0.90	1.89	0.89	
	4	0.60	0.90	2.23	1.23	
	5	0.63	0.86	1.89	0.89	
	6	0.64	0.93	2.11	1.11	
BAOS	1	0.32	0.61	3.59	2.59	2.00
	2	0.30	0.64	4.51	3.51	
	3	0.39	0.57	2.11	1.11	
	4	0.41	0.61	2.16	1.16	
	5	0.29	0.49	2.85	1.85	
	6	0.29	0.51	3.01	2.01	
	7	0.52	0.85	2.67	1.67	
	8	0.50	0.86	3.04	2.04	
	9	0.48	0.83	2.99	1.99	
	10	0.47	0.81	3.05	2.05	
FAS	1	0.65	0.80	1.48	0.48	0.91
	2	0.62	0.80	1.65	0.65	
	3	0.53	0.79	2.19	1.19	
	4	0.57	0.76	1.83	0.83	
	5	0.63	0.86	1.88	0.88	
	6	0.60	0.90	2.21	1.21	
	7	0.60	0.88	2.15	1.15	
BICSI-PRA	1	0.54	0.62	1.35	0.35	1.10
	2	0.62	0.71	1.32	0.32	
	3	0.35	0.62	3.23	2.23	
	4	0.45	0.72	2.53	1.53	
	5	0.45	0.57	1.65	0.65	
	6	0.29	0.57	3.84	2.84	
	7	0.42	0.71	1.83	1.83	
	8	0.46	0.63	1.85	0.85	
	9	0.50	0.64	1.62	0.62	
	10	0.55	0.59	1.16	0.16	
	11	0.48	0.63	1.71	0.71	
BRS	1	0.66	0.73	1.24	0.24	0.61

2 (R)	0.24	0.13	0.29 set to 1.00	<.00 [-0.71]
3 (R)	0.30	0.13	0.19 set to 1.00	<.00 [-0.81]
4 (R)	0.28	0.16	0.33 set to 1.00	<.00 [-0.67]
5	0.59	0.83	1.99	0.99
6	0.48	0.80	2.79	1.79
7	0.56	0.84	2.23	1.23

Note. Items followed by (R) were reverse-scored before analysis. BAS-2 = Body Appreciation Scale-2, BI-AAQ = Body Image-Acceptance and Action Questionnaire, BASES-AP = Authentic Pride subscale of the Body and Appearance Self-Conscious Emotions Scale, BAOS = Body Acceptance from Others Scale, FAS = Functionality Appreciation Scale, BICSI-PRA = Positive Rational Acceptance subscale of the Body Image Coping Strategies Inventory, BRS = Body Responsiveness Scale. In square brackets are the original negative centre distances.

Item locations



Scale locations

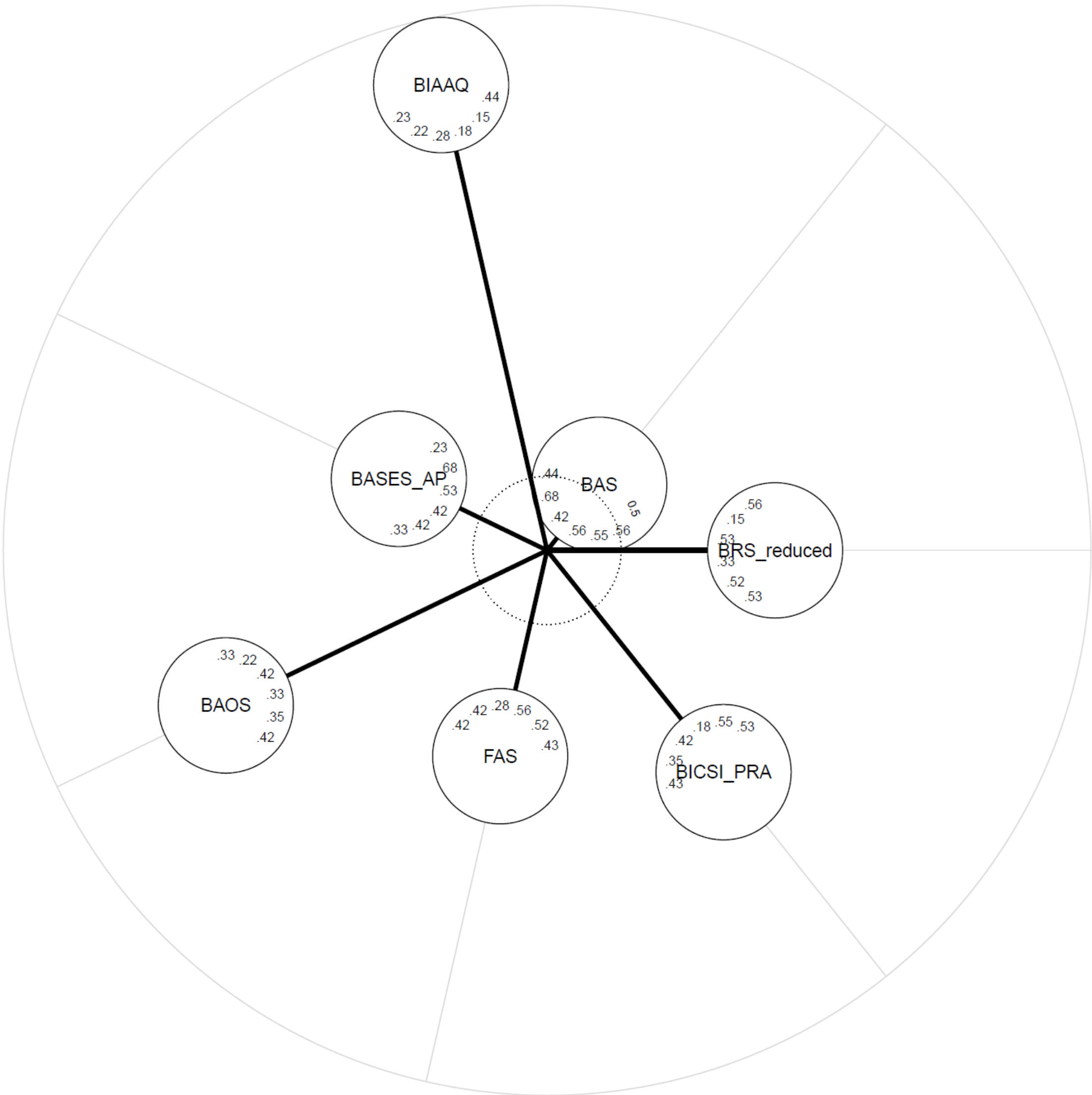


Figure S1: Radar charts with item and scale locations of all positive body image measures. Note: Numbers within the circles represent latent correlations between the respective scale with all the other scales. Correlations are arranged clockwise using the same order as the scales. The dotted circles represent the grid of axis scaling. For clearer distinction, every second item is illustrated as having a different length.