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Body understanding measure for pregnancy scale (BUMPS): Psychometric properties and predictive validity with postpartum anxiety, depression and body appreciation among Italian peripartum women

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ABSTRACT

Pregnancy is a unique phase in a woman's life marked by profound physical transformations, including changes in body shape and weight. The Body Understanding Measure for Pregnancy Scale (BUMPs) was designed to assess body image during pregnancy. Despite its increasing use, the scale has not yet been adapted into Italian, and evidence regarding its predictive validity with respect to anxiety, depression, and body appreciation is lacking. This study aimed to address these gaps to validate the Italian BUMPs and test its predictive validity. A community sample of 726 Italian pregnant women was recruited (age range 18–48, M_{age}= 31.3 ± 4.79). Participants completed a translated BUMPs and other self-report questionnaires assessing anxiety, depression, and body appreciation. Confirmatory factor analysis supported a three-factor structure for the BUMPs, with dimensions assessing *Satisfaction with Appearing Pregnant, Weight Gain Concerns*, and *Physical Burdens of Pregnancy*. BUMPs subscales demonstrated satisfactory internal consistency (ω = 0.765–0.866). Cross-sectional analysis revealed that BUMPs scores correlated with anxiety (*r* range from 0.25 to 0.32), depression (*r* range from 0.31 to 0.34), and gestational body mass index (*r* range from 0.18 to 0.37). Longitudinal analysis associated BUMPs with anxiety, depression, and body appreciation measured after childbirth, providing evidence of predictive validity. Overall, the present study supports the BUMPs as a valid and reliable tool for assessing body image during pregnancy within the Italian context. Additionally, it provides the first evidence of the BUMPs' predictive validity for postpartum mental health outcomes and body appreciation after childbirth.

1. Introduction

Pregnancy is a unique phase in a woman's life, marked by profound physical transformations. These changes include modifications in body shape and weight, which occur over a relatively brief period. As a result, many women may experience fluctuations in how they think, feel, and perceive their bodies, ultimately altering their body image (Fuller-Tyszkiewicz et al., 2013). An important aspect of body image is body satisfaction, which comprises thoughts and feelings about our own body (Grogan, 2016). As pregnant women undergo these changes, they are more likely to reflect on their bodies and reassess their appearance-related values (Linde et al., 2022), which may result in either an improvement or a worsening in body satisfaction (Crossland et al., 2023; Salzer et al., 2024;). Specifically, some women consider bodily changes during pregnancy as a natural and inherent part of the transition to a new role as a mother (Chang et al., 2006; Duncombe et al., 2008) and report being more satisfied with their evolving bodies compared to the pre-pregnancy state (Clark et al., 2009; Loth et al., 2011;), while others struggle to adapt to these changes, reporting higher pregnancy body dissatisfaction (Bergbom et al., 2017; Brown et al.,

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2015; Earle, 2003; Fuller-Tyszkiewicz et al., 2013; Inanir, et al., 2015; Skouteris et al., 2005).

Body image is a multidimensional concept encompassing individuals' perceptions, attitudes, feelings, and experiences related to body size and shape (Cash & Smolak, 2011; Swami & Barron, 2019). It significantly impacts individuals' health and emotional well-being, and it is strongly modelled by social and cultural influences (Tylka & Wood-Barcalow, 2015; Wood-Barcalow et al., 2010). Negative body image refers to an altered perception of one's body size and shape, often leading to dissatisfaction and distress (Cash & Smolak, 2011), while positive body image is a multifaceted construct distinct from negative body image (Tylka & Wood-Barcalow, 2015), which refers to "individuals' love and respect for, acceptance and appreciation of, and comfort with their bodies" regardless of societal standards, promoting overall well-being and self-confidence (Maes et al., 2021, p. 271).

A substantial amount of literature has focused on negative body image during pregnancy and has evidenced its positive associations with negative outcomes, including peripartum depression (Clark et al., 2009; Duncombe et al., 2008; Linde et al., 2022; Silveira et al., 2015; Singh Solorzano et al., 2022) and anxiety (Hartley et al., 2017; Roomruangwong et al., 2017), maternal unhealthy behaviours and extreme weight control practices (e.g., skipping meals, self-induced vomiting, and laxative use; Chan et al., 2020; Clark & Ogden, 1999; Neiterman & Fox, 2017), challenges in breastfeeding initiation and retention (Brown et al., 2015), and impaired maternal-infant interactions and caregiving activities (Riquin et al., 2019; Silveira et al., 2015; Slomian et al., 2019).

Despite the great attention on negative body image during pregnancy, research on positive aspects of prepartum body image is limited. This is surprising, as in the general population it is well established that positive body image may serve not only as a protective factor against various mental health issues, including depression, anxiety, and eating disorders (Avalos, Tylka, & Wood-Barcalow, 2005; Linardon, 2021; Tylka & Wood-Barcalow, 2015) but also as a determinant of better adaptive emotional regulation, general well-being, gratitude, self-esteem, and sexual satisfaction (Linardon et al., 2022).

During pregnancy, body image satisfaction, one of the aspects of positive body image (Tylka & Wood-Barcalow, 2015), has been associated with increased prepartum psychological well-being, including higher levels of self-acceptance (Fahami et al., 2018), healthy behaviours (Silveira et al., 2015), and lower risk of depression (Przybyła-Basista et al., 2020). However, none of these studies have investigated the prospective association between body satisfaction and postpartum psychological well-being. Only one previous study so far has investigated the role of body satisfaction assessed during pregnancy on postpartum mental health (Downs et al., 2008), indicating that body satisfaction was a main determinant of postpartum depressive symptoms. However, as with all previously cited studies, this research did not employ pregnancy-specific validated measures, and this may have led to potential biases in results, potentially underestimating the importance of body satisfaction during pregnancy and the postpartum period (Fuller-Tyszkiewicz et al., 2013). The available instruments designed for the general population may, in fact, fail to adequately capture the nuanced feelings and concerns associated with bodily changes during pregnancy (Kirk & Preston, 2019). Furthermore, while some scales specifically designed for pregnancy have been developed (see e.g., Brown et al., 2015; Watson et al., 2017), they lack rigorous validation and comprehensive psychometric evaluation (Kirk & Preston, 2019), and do not consider positive attitudes toward the pregnant body (Salzer et al., 2023). Moreover, although another study psychometrically validated a retrospective measure of pregnancy body image satisfaction, which also implicated feelings towards the body during pregnancy to postnatal well-being, retrospective measures are also open to bias and the results were not validated with longitudinal analysis (Munns et al., 2024).

Addressing these gaps, the Body Understanding Measure for Pregnancy Scale (BUMPs; Kirk & Preston, 2019) has been recently developed, offering a valid instrument designed to specifically assess different aspects of body image during pregnancy, encompassing both negative and positive facets. The original BUMPs comprises 19 items, with a factorial structure that includes three dimensions: *Satisfaction with Appearing Pregnant*, *Weight Gain Concerns*, and *Physical Burdens of Pregnancy*. Specifically, the *Satisfaction with Appearing Pregnant* subscale captures a positive dimension of body image during pregnancy, assessing an individual's enjoyment of physical changes, appreciation for social recognition of their pregnancy, and confidence in their pregnant appearance. In contrast, the *Weight Gain Concerns* and *Physical Burdens of Pregnancy* subscales address negative aspects of body image, focusing on concerns about weight gain, changes in appearance, discomfort with others' comments on the pregnant body, and perceived reductions on physical ability, respectively. The reported internal consistency for the three subscales is satisfactory, with Cronbach's alpha values of $\alpha = .85$, $\alpha = .84$, and $\alpha = .74$, respectively, and an overall alpha of $\alpha = .90$ for the total score. Additionally, test-retest reliability is good, with correlation coefficients for the individual scales ranging from $r = .78$ to $r = .93$, and of $r = .91$ for the total score.

The scale has been validated in multiple languages, including Brazilian Portuguese (Salzer et al., 2024), Turkish (Duman et al., 2023; Gulec Satir and Hazar, 2021), and Chinese (Wu et al., 2022). The original three-factor structure was successfully replicated in the Brazilian version (Salzer et al., 2024) and in one of the Turkish adaptations (Duman et al., 2023) with internal consistency values ranging from $\alpha = .76$ to $\alpha = .84$ and from $\alpha = .78$ to $\alpha = .87$, respectively. The Chinese version, however, comprises 16 items and encompasses four subscales: *Appearance focus* ($\alpha = .85$), *Weight Gain Concerns* ($\alpha = .60$), *Physical Burdens of Pregnancy* ($\alpha = .52$), and *Feelings about Physical Changes* ($\alpha = .76$). Another Turkish adaptation (Gulec Satir and Hazar, 2021) includes 17 items and two subscales, namely *Satisfaction with Appearing Pregnant* ($\alpha = .87$) and *Weight Gain Concerns and Physical Difficulties* ($\alpha = .77$).

In the available versions of the BUMPs, its construct validity was established through associations with general body image measures and other relevant constructs. The total BUMPs score demonstrated negative correlations with measures of positive body image in the original version ($r = -0.48$), as well as in the Brazilian one ($r = -0.82$) and in one of the two Turkish versions ($r = -0.48$; Duman et al., 2023). Additionally, the total score in both the original and Brazilian versions showed significant positive correlations with symptoms of anxiety ($r = 0.40$ and $r = 0.45$, respectively) and depression ($r = 0.55$ and $r = 0.42$, respectively). In the original and Brazilian versions, positive correlations were also reported with relationship satisfaction ($r = 0.24$ and $r = 0.14$, respectively), and negative associations were reported with interoceptive awareness ($r = -0.46$ and $r = -0.52$, respectively). Finally, in the Chinese and Brazilian versions, positive correlations between the BUMPs total score and gestational BMI were also reported ($r = .27$ and $r = .12$).

While the impact of pregnant body image on adverse postpartum outcomes has been reported using measures not specifically developed for pregnancy (Singh Solorzano et al., 2022; Duncombe et al., 2008; Silveira et al., 2015; Clark et al., 2009; Linde et al., 2022), no studies are available on the predictive validity of pregnancy-specific measures, like the BUMPs, on postpartum outcomes. The association of the BUMPs with different health outcomes has been analysed, in fact, only cross-sectionally (Duman et al., 2023; Kirk & Preston, 2019; Munns & Preston, 2024; Salzer et al., 2024) and retrospectively (Munns et al., 2024). For this reason, it is noteworthy to assess whether this specific measure of both positive and negative body image predicts postpartum anxiety and depression.

Similarly, it is important to establish if the BUMPs predicts positive aspects of body image (like body appreciation) in the postpartum period. Current evidence shows, in fact, that body appreciation is correlated both to positive mental health and well-being in the general population (Linardon et al., 2022) and to positive health outcomes, in postpartum women, including breastfeeding self-efficacy (Rodgers et al., 2023) and

maternal adaptive exercise behaviours (Raspovic et al., 2020).

Prior studies in the Italian context have investigated body image during pregnancy and the postpartum period (Grano et al., 2024; Singh Solorzano et al., 2022; Spinoni et al., 2023), revealing that body dissatisfaction is a predictor of poor mental health outcomes (Grano et al., 2024; Singh Solorzano et al., 2022). However, to the best of our knowledge, there are no pregnancy-specific instruments available in Italy that evaluate multifaceted aspects of body image, including its positive dimensions. Similar to many other Western societies, Italy places a cultural emphasis on beauty and physical appearance, favouring thinness and physical fitness (Bucchianeri et al., 2013; Di Gesto et al., 2023). This cultural emphasis exacerbates concerns related to body weight and shape (Stefanile et al., 2019). Given that cultural norms and values significantly shape body image (Grogan, 2016), validating a specific instrument for assessing body image in Italian pregnant women would enable more accurate detection of the various facets of body image among this population.

Therefore, the present investigation aimed to adapt and evaluate the psychometric properties of the BUMPs in a community sample of Italian pregnant women. Specifically, we aimed to examine its factorial structure, composite reliability, and concurrent validity. Moreover, we aimed to investigate the predictive validity of the scale by estimating the prospective relationship between pregnant body image and postpartum depression and anxiety symptoms, and body appreciation measured one month after giving birth.

2. Methods

2.1. Participants and design

The present study recruited a community sample of 726 Italian pregnant women (age range: 18–48; $M_{age} = 31.3$, SD = 4.79). The majority were of Italian Nationality (97 %). Regarding education, 37.3 % had a high-school diploma, 22.3 % had a bachelor's degree, 28.4 % had a master's degree, 7.6 % had a middle-school diploma, 4.4 % had a PhD or a postgraduate specialization, and 0.1 % did not report their level of education. The sample reported a mean Body Mass Index (BMI) of 23.3 Kg/m^2 (SD = 4.36) pre-pregnancy and 25.6 (SD = 4.41) during pregnancy. In particular, 7.6 % of women were underweight before pregnancy, 67.2 % were normal weight and 25.1 % were overweight. Participants were recruited via different social media platforms from July 2020 to November 2022. Inclusion criteria for this study required that participants be women, over 18 years old, in the second or third trimester of pregnancy, and able to complete questionnaires in Italian.

Participation in the study was voluntary and not remunerated. During recruitment, women received comprehensive information about the study, including its purpose and procedures. Then, they completed a group of self-reported questionnaires hosted by the Qualtrics platform (Qualtrics, Provo, UT). and provided an email address for the postpartum recall. One month after childbirth, participants were re-contacted via email. Of these, 361 women (51.27 % of the sample) agreed to participate in the postpartum recall. At postpartum, participants were asked to complete the Body Appreciation Scale-2 (BAS-2) and the same questionnaires administered before childbirth, with the exception of the BUMPs which is pregnancy-specific. Anonymity was guaranteed by using alphanumeric codes. Ethical approval was obtained from the Institution Review Board of the Department of Psychology, Sapienza University of Rome (Prot. N. 2017BC4MST).

2.2. Measures

2.2.1. Socio-demographic questionnaire

Self-reported socio-demographic information including age, education, and BMI pre-pregnancy and during pregnancy was collected.

2.2.2. Italian Body Understanding Measure for Pregnancy Scale (BUMPs)

The Body Understanding Measure for Pregnancy Scale (BUMPs) was initially developed in the UK to assess body satisfaction during pregnancy, asking the respondents to base their answers on their feelings over the past two weeks (Kirk & Preston, 2019). The original scale consists of 19 items divided into three subscales: *Satisfaction with Appearing Pregnant* (9 items), *Weight Gain Concerns* (7 items), and the *Physical Burdens of Pregnancy* (3 items). Each item is evaluated using a 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The *Satisfaction with Appearing Pregnant* subscale measures a positive aspect of body image. Scores on this scale are reversed so that higher scores indicate less body satisfaction. The *Weight Gain Concerns* and the *Physical Burdens of Pregnancy* subscales assess negative aspects of body image, with higher scores reflecting greater body dissatisfaction. The BUMPs is the first instrument that assesses body image during pregnancy, capturing both positive and negative dimensions.

For the present study, the original English version was translated and adapted following the five-stage adaptation procedure (Beaton et al., 2000; Hambleton, 1994). Firstly, two translators—one informed and one uninformed—independently translated the BUMPs items, instructions, and response options from English into Italian. In the second stage, a third translator reviewed these translations, resolved discrepancies, and created a synthesized translation. In the third stage, two additional independent translators, unfamiliar with the scale, back-translated the synthesized translation into English. During the fourth stage, a bilingual committee comprising all translators and the study authors reviewed both the forward and back translations. Since no issues were found, we moved to the fifth stage. In this stage, a pre-final version of the BUMPs was pre-tested with a sample of 20 women (mean age = 30.58 years, SD = 3.70). The participants rated the comprehensibility of each item on a 5-point scale (1 = do not understand at all; 5 = understand completely). The average ratings per item were evaluated, and since all items received a high rating (> 4), no further revisions were necessary. The Italian version of the questionnaire employed in this study is reported in Appendix 1.

2.2.3. Generalized Anxiety Disorder-7 (GAD-7)

Anxiety symptoms were assessed using the Italian version of Generalized Anxiety Disorder-7 (GAD–7) scale (Shevlin et al., 2022; Spitzer et al., 2006), a widely used screening measure that evaluates the frequency of seven core anxiety symptoms over the preceding two weeks. The response scale ranges from 0 ("not at all") to 3 ("nearly every day"). An example item is "*Not being able to stop or control worrying*". Total scores range from 0 to 21, with higher scores representing more severe anxiety symptoms. The GAD-7 is reliable and valid across various populations (Rutter & Brown, 2017; Spitzer et al., 2006) and has been confirmed for use during the peripartum period (Simpson et al., 2014; Zhong et al., 2015). The omega coefficient in the present sample was 0.84, supporting the internal consistency of the scale.

2.2.4. Edinburgh Postnatal Depression Scale (EPDS)

The Edinburgh Postnatal Depression Scale, EPDS (Cox et al., 1987), is a 10-item self-report scale that assesses the levels of peripartum depressive symptoms in the previous week in pregnant and postnatal women. Responses to each statement are scored on a 4-point Likert scale (from 0 to 3). An example item is "*I have blamed myself unnecessarily when things went wrong*". The total score ranged from 0 to 30, with higher scores indicating greater peripartum depressive symptoms. It has been shown to be a reliable instrument for screening depressive symptoms during pregnancy and the postnatal period (Bergink et al., 2011; Levis et al., 2020). In this study, we administered the validated Italian version of the questionnaire (Benvenuti et al., 1999). In the current study, the omega coefficient was 0.87, indicating strong internal consistency.

2.2.5. Body Appreciation Scale (BAS)

The 10-item Body Appreciation Scale (BAS-2; Tylka &

Wood-Barcalow, 2015, Casale et al., 2021) is a self-report instrument designed to measure positive body image, encompassing acceptance, respect, and care for one's body, as well as safeguarding it from unrealistic beauty standards. Each item is rated on a 5-point scale, ranging from 1 (never) to 5 (always), with higher scores reflecting greater body appreciation. An example item is "*I respect my body*". The instrument demonstrated satisfactory internal consistency and strong construct validity across various national populations (Swami et al., 2023). In the current sample, the omega coefficient was 0.95.

2.3. Data analytic plan

Data were analysed using IBM SPSS v.25 and Mplus v.8.6 (Muthén & Muthén, 1998–2017).

First, descriptive statistics were calculated to examine items' distributions. Skewness and kurtosis values outside the range of [−1; + 1] were considered indicative of non-negligible deviations from univariate normality (Muthén & Kaplan, 1985). Thereafter, to confirm the original latent structure of the BUMPs, a cross-validation approach was performed by splitting the total sample into two halves (i.e., calibration and validation samples; see Byrne, 1994). Following Kirk and Preston (2019), a confirmatory factor analysis (CFA) was carried out in the first subsample (n = 363) positing a three-correlated factor model (i.e., a solution with three correlated dimensions of *Satisfaction with Appearing Pregnant, Weight Gain Concerns*, and *Physical Burdens of Pregnancy*). Moreover, we tested alternative and more parsimonious models, such as a one-factor model (i.e., a model that constrained factor correlations to 1) and a two-correlated factor model (i.e., a model that combined the *Satisfaction with Appearing Pregnant* and *Weight Gain Concerns* factors; see Kirk & Preston, 2019). Subsequently, to minimize the possibility that the best-fitting model was determined by chance variations, the resulting factor solution was cross-validated through CFA in the second subsample (n = 363) (Byrne, 1994). Due to non-negligible deviations from normality, CFAs were conducted using robust maximum likelihood estimation (MLR; Muthén & Muthén, 1998–2017), which provided Yuan-Bentler scaled chi-square test statistic and standard errors that are robust to non-normality. Model comparison was performed using the Yuan-Bentler scaled chi-square difference test (Y-B $\Delta\chi 2$). Moreover, multiple indices were reported to assess the fit of the models to the observed data (Wang and Wang, 2019; Browne & Cudeck, 1993), including the root mean square error of approximation (RMSEA; ≤ 0.08 indicates a reasonable fit), the comparative fit index and Tucker-Lewis index (CFI and TLI, respectively; ≥ 0.90 indicates acceptable fit), and the standardized root mean squared residual (SRMR; ≤ 0.08 indicates acceptable fit).

Assumptions underlying Cronbach's alpha coefficient, such as essential tau-equivalence, are frequently violated in social sciences data (Dunn et al., 2014). Therefore, the composite reliability of the BUMPs was examined by calculating congeneric model-based omega coefficients (McDonald, 1970), with values higher than 0.70 considered satisfactory (Hair et al., 2019). Additionally, within a bifactor CFA solution, we assessed whether a total score could be regarded as sufficiently reliable to be used in conjunction with subscales scores by estimating bifactor statistical indices, as proposed by Rodriguez and colleagues (2016). More specifically, support for using a total score, even in the presence of a multidimensional factor structure, is recommended when the omega hierarchical is at least 0.80, and both the explained common variance (ECV) and the percentage of uncontaminated correlations (PUC) are at least 0.70 (Reise et al., 2016).

Criterion-related validity was assessed by examining the following hypotheses through correlation analyses: (a) BUMPs scores will be positively correlated with concurrent anxiety symptoms; (b) BUMPs scores will be positively correlated with concurrent depressive symptoms; (c) BUMPs scores will be positively correlated with gestational BMI; (d) pre-pregnancy BMI will be correlated with BUMPs scores; (e) BUMPs scores will be longitudinally correlated with body appreciation measured one month after childbirth. According to Cohen's conventions (1988), correlation coefficients higher than 0.10 were classified as small, higher than 0.30 as moderate, and higher than 0.50 as large. Regarding predictive validity, we examined whether BUMPs scores were longitudinally associated with anxiety symptoms and depressive symptoms measured at postpartum after accounting for their prepartum levels through multiple regression analyses. Coefficients of determination (R^2) were calculated, and values higher than 0.02 were interpreted as weak, higher than 0.13 as moderate, and higher than 0.26 as substantial (Cohen, 1988).

Lastly, factorial invariance tests were conducted across the second and third trimesters of pregnancy through multiple-group CFA. Configural invariance (i.e., the same pattern of free and fixed loadings), metric invariance (i.e., the equivalence of factor loadings), and scalar invariance (i.e., the equivalence of intercepts) models were examined (Meredith, 1993). Differences in CFI and RMSEA between nested models were calculated, with changes greater than 0.01 in CFI and 0.015 in RMSEA considered indicative of a lack of invariance (Cheung & Rensvold, 2002; Chen, 2007).

Table 1
Descriptive statistics of BUMPs items.

Item	Mean (SD)	Range	Skewness	Kurtosis
1. I feel good about my changing body	2.31 (1.19)	1–5	0.68	−0.53
2. I get embarrassed that I can't do as much physically as I could before I was pregnant	2.50 (1.37)	1–5	0.30	−1.30
3. When I compare the shape of my body to other pregnant women, I'm dissatisfied with my own	2.26 (1.38)	1–5	0.63	−0.97
4. I enjoy taking photos of my changing body	2.32 (1.31)	1–5	0.73	−0.56
5. I am concerned about the amount that I am eating and the effect this has on my physical appearance	2.68 (1.44)	1–5	0.15	−1.42
6. I like it when people comment on the size of my bump	2.63 (1.28)	1–5	0.41	−0.81
7. I worry about getting my figure back after pregnancy	3.03 (1.45)	1–5	−0.14	−1.38
8. I wear clothes to accentuate my pregnancy	2.71 (1.23)	1–5	0.32	−0.71
9. It upsets me when people comment on my changing body	2.77 (1.33)	1–5	0.10	−1.09
10. I look good pregnant	1.89 (1.05)	1–5	1.16	0.72
11. I like it when people notice I'm pregnant	1.71 (0.89)	1–5	1.14	0.78
12. I find it hard to accept that I get more tired now I am pregnant	3.25 (1.38)	1–5	−0.39	−1.12
13. I look overweight	2.37 (1.44)	1–5	0.56	−1.12
14. I feel like my bump is too big	2.15 (1.31)	1–5	0.70	−0.86
15. I have enjoyed changing my wardrobe during pregnancy	3.04 (1.22)	1–5	0.06	−0.85
16. I am worried about the amount of weight I am putting on	2.65 (1.39)	1–5	0.19	−1.30
17. When I compare the shape of my body to other non- pregnant women, I'm dissatisfied with my own	2.15 (1.35)	1–5	0.76	−0.77
18. I get frustrated that I am less physically able than I was before I was pregnant	2.67 (1.38)	1–5	0.11	−1.35
19. I am enjoying my new curves in pregnancy	2.30 (1.13)	1–5	0.58	−0.48

Note. SD = standard deviation. Analyses were conducted on the full sample (n = 708)

3. Results

3.1. Descriptive statistics

Item-level descriptive statistics are reported in Table 1. All points of the Likert-type scale had been endorsed at least once (range 1 −5). However, several items showed skewness and kurtosis values outside the [−1;+ 1] range recommended by Muthén and Kaplan (1985), suggesting that their distributions did not perfectly fit univariate normality assumptions. Accordingly, robust maximum likelihood (MLR; Muthén & Muthén, 1998–2017) was employed for further factor structure analyses to account for non-normal indicators.

3.2. Dimensionality

CFA in the first subsample (n = 363) was performed to examine three distinct factorial solutions: 1) the original latent structure of the BUMPs, i.e., a three-correlated factor model comprising three dimensions of Appearance, Weight, and Physical burdens; 2) a two-correlated factor model that combined the Appearance and Weight dimensions; 3) a single-factor model. Residual covariances between Item#3 and Item#17 were *a priori* freely estimated due to substantial redundancy in wording (see Table 1; Brown, 2015). Results are summarised in Table 2. Specifically, the fit of the one-factor model was unacceptable and statistically worse than the three-correlated-factor model: Y-Bχ2(151) = 764.874, $p < .001$, CFI = 0.760, TLI = 0.728, SRMR = 0.083, RMSEA = 0.106 (90 % CI 0.098–0.113); Y-B $\Delta\chi$2(3) = 323.710, $p < .001$. Similarly, the fit of the two-correlated factor model was inadequate and significantly worse compared to the three-correlated factor model: Y-Bχ2(150) = 678.872, $p < .001$, CFI = 0.793, TLI = 0.764, SRMR = 0.080, RMSEA = 0.099 (90 % CI 0.091–0.106); Y-B $\Delta\chi$2(2) = 269.456, $p < .001$. In contrast, the hypothesised three-correlated factor model exhibited a reasonable fit to the data: Y-Bχ2(148) = 362.859, $p < .001$, CFI = 0.916, TLI = 0.903, SRMR = 0.059, RMSEA = 0.063 (90 % CI 0.055–0.072). Table 3 presents the standardised parameter estimates for the 3-factor CFA. More specifically, all items significantly loaded on the *a priori* expected factor, with moderate-to-high standardised loadings (λ from 0.402 to 0.825, $p < .001$). The BUMPs subscales were significantly intercorrelated (latent correlations from 0.643 to 0.651, $p < .001$). Importantly, the lack of fit of the single-factor model, coupled with latent inter-correlations below 0.80, substantiated the discriminant validity and the empirical distinctiveness of the three latent dimensions of *Satisfaction with Appearing Pregnant*, *Weight Gain Concerns*, and *Physical Burdens of Pregnancy* (Browne and Cudeck, 1993).

Therefore, a three-factor structure was retained for further cross-validation analyses and subsequently examined on the second subsample (n = 363). The three-factor model showed a reasonable fit to the observed data, supporting the original latent structure of the BUMPs: Y-Bχ2(148) = 359.525, $p < .001$, CFI = 0.924, TLI = 0.912, SRMR = 0.064, RMSEA = 0.063 (90 % CI 0.055–0.071). As depicted in Table 3, all items significantly loaded on the expected factor, with moderate-to-high standardised loadings (λ from 0.457 to 0.841, $p < .001$).

Mean scores (standard deviations) calculated on the full sample were 21.6 (7.22) for *Satisfaction with Appearing Pregnant*, 17.2 (7.44) for *Weight Gain Concerns*, and 8.38 (3.36) for *Physical Burdens of Pregnancy* subscales.

Table 2
Goodness-of-fit statistics for Confirmatory Factor Analyses of 19-Item BUMPs in the first subsample.

Model	Y-Bχ2 (DFs)	CFI	TLI	SRMR	RMSEA (90 % CI)
Three-correlated factor model	362.859 (148)	0.916	0.903	0.059	0.063 (0.055–0.072)
Two-correlated factor model	678.872 (150)	0.793	0.764	0.080	0.099 (0.091–0.106)
Single-factor model	764.874 (151)	0.760	0.728	0.083	0.106 (0.098–0.113)

Note. The three-correlated factor model was retained for further cross-validation analyses.

3.3. Reliability

Findings supported the reliability of *Satisfaction with Appearing Pregnant*, *Weight Gain Concerns*, and *Physical Burdens of Pregnancy* subscale scores, with model-based omega coefficients calculated on the overall sample of 0.853, 0.866, and 0.765, respectively. Moreover, bifactor-related statistics were calculated to examine whether the scale can be considered as essentially unidimensional to yield a reliable total score despite multidimensionality in the item-response data. The omega hierarchical coefficient for the general factor was 0.781, the explained common variance (ECV) was 0.627, and the percentage of uncontaminated correlations (PUC) was 0.649. Hence, none of these indices support the use of a total BUMPs score (Reise et al., 2016).

3.4. Concurrent and predictive validity

Table 4 shows the cross-sectional correlations of the BUMPs scores with self-ratings of anxiety and depression. Specifically, zero-order correlations were all statistically significant, and their effect sizes were in the nearly moderate (i.e., [.25;.34]) range. Likewise, BUMPs subscales correlated with gestational BMI (r range 0.18 – 0.37), as well as with BMI pre-pregnancy (r range 0.13 – 0.35).

Concerning predictive validity, body appreciation measured one month after childbirth was longitudinally associated with BUMPs subscales: *Satisfaction with Appearing Pregnant* (r = -0.428, $p < .001$); *Weight Gain Concerns* (r = -0.450, $p < .001$); and *Physical burdens of pregnancy* (r = -0.291, $p < .001$). Moreover, three separate regression analyses were conducted for each criterion variable measured at postpartum (i.e., anxiety and depressive symptoms), individually assessing the influence of the three dimensions of the BUMPs as predictors (see Table 5). Prepartum levels of anxiety and depressive symptoms were included as control variables. More specifically, regression analyses showed that *Satisfaction with Appearing Pregnant* (β = 0.125, p = .012), *Weight Gain Concerns* (β = 0.188, $p < .001$), and *Physical Burdens of Pregnancy* (β = 0.180, $p < .001$) subscales significantly predicted depressive symptoms at postpartum after accounting for prepartum levels. Similarly, *Weight Gain Concerns* (β = 0.140, p = .004) and *Physical Burdens of Pregnancy* (β = 0.116, p = .017) subscale scores significantly predicted anxiety symptoms at postpartum after adjusting for prepartum levels, whilst the effect of *Satisfaction with Appearing Pregnant* (β = 0.064, p = .182) was non-significant.

3.5. Factorial invariance tests

Factorial invariance tests across the second and third trimesters of pregnancy were conducted. The configural invariance model demonstrated an acceptable fit to the observed data: Y-Bχ^2(296) = 742.652, $p < .001$, CFI = 0.914, TLI = 0.900, SRMR = 0.063, RMSEA = 0.066 (90 % CI 0.070–0.072). Imposing invariance constraints on factor loadings (metric invariance) resulted in negligible changes in model fit (ΔCFI = −0.002; ΔRMSEA = −0.002). Similarly, when intercept constraints were applied (scalar invariance), the model fit did not significantly deteriorate (ΔCFI = −0.005; ΔRMSEA = 0.001). Configural, metric, and scalar invariance levels were therefore established (see Table 6).

4. Discussion

Extensive literature has highlighted the longitudinal impact of prepartum negative body image on postpartum depressive and anxiety

Table 3
Confirmatory factor analysis of the three-correlated factor model in the two subsamples.

Item	Subsample 1			Subsample 2		
	Appearance	Weight	Physical	Appearance	Weight	Physical
BUMPS1	0.761			0.761		
BUMPS4	0.644			0.660		
BUMPS6	0.573			0.546		
BUMPS8	0.402			0.477		
BUMPS9	0.494			0.457		
BUMPS10	0.822			0.841		
BUMPS11	0.525			0.667		
BUMPS15	0.517			0.577		
BUMPS19	0.794			0.830		
BUMPS3		0.690			0.697	
BUMPS5		0.719			0.750	
BUMPS7		0.673			0.750	
BUMPS13		0.685			0.766	
BUMPS14		0.637			0.518	
BUMPS16		0.802			0.805	
BUMPS17		0.724			0.719	
BUMPS2			0.689			0.715
BUMPS12			0.640			0.625
BUMPS18			0.825			0.821

Note. All factor loadings are reported in a completely standardised metric and are statistically significant ($p < .001$).

Table 4
Bivariate correlations between BUMPS, anxiety, depression, pre-pregnancy and gestational BMI, and body appreciation.

	Concurrent Anxiety	Concurrent Depression	Pre-pregnancy BMI	Gestational BMI	Body appreciation at postpartum
Satisfaction with Appearing Pregnant	0.248 * *	0.330 * *	0.198 * *	0.258 * *	−0.428 * *
Weight Gain Concerns	0.316 * *	0.337 * *	0.345 * *	0.367 * *	−0.450 * *
Physical Burdens of Pregnancy	0.285 * *	0.314 * *	0.132 *	0.182 * *	−0.291 * *

Note. *$p < .01$; * *$p < .001$. Analyses were conducted on the overall sample (n = 708). Abbreviations: BUMPS, Body Understanding Measure for Pregnancy Scale; BMI, Body Mass Index.

Table 5
Multiple hierarchical regression analyses examining the predictive validity of the BUMPs with respect to postpartum depressive and anxiety symptoms.

Predictor	**Postpartum EPDS as outcome**
Prepartum EPDS	β = 0.403 *
BUMPs_Appearance	β = 0.125 *
R-squared change	$\Delta R^2 = 0.014$ *
Total R-squared	$R^2 = 0.212$ *
Prepartum EPDS	β = 0.374 *
BUMPs_Weight	β = 0.188 *
R-squared change	$\Delta R^2 = 0.030$ *
Total R-squared	$R^2 = 0.229$ *
Prepartum EPDS	β = 0.180 *
BUMPs_ Physical	β = 0.389 *
R-squared change	$\Delta R^2 = 0.029$ *
Total R-squared	$R^2 = 0.228$ *
Predictor	**Postpartum GAD−7 as outcome**
Prepartum GAD−7	β = 0.457 *
BUMPs_Appearance	β = 0.064
R-squared change	$\Delta R^2 = 0.004$
Total R-squared	$R^2 = 0.230$ *
Prepartum GAD−7	β = 0.426 *
BUMPs_Weight	β = 0.140 *
R-squared change	$\Delta R^2 = 0.017$ *
Total R-squared	$R^2 = 0.243$ *
Prepartum GAD−7	β = 0.440 *
BUMPs_Physical	β = 0.116 *
R-squared change	$\Delta R^2 = 0.012$ *
Total R-squared	$R^2 = 0.238$ *

Note. *p < .05. R-squared changes represent the amount of variance uniquely attributable to the BUMPs dimensions. Abbreviations: EPDS, Edinburgh Postnatal Depression Scale; GAD-7, Generalized Anxiety Disorder-7.

symptoms (Clark et al., 2009; Duncombe et al., 2008; Hartley et al., 2017; Linde et al., 2022; Roomruangwong et al., 2017; Silveira et al., 2015; Singh Solorzano et al., 2022), unhealthy maternal behaviours (Chan et al., 2020; Clark & Ogden, 1999; Neiterman & Fox, 2017;), and impaired maternal-infant interactions and caregiving activities (Riquin et al., 2019; Silveira et al., 2017; Slomian et al., 2019). While negative dimensions of body image during pregnancy have been largely investigated, only limited research explored positive body image during pregnancy (Fahami et al., 2018; Przybyła-Basista et al., 2020; Silveira et al., 2015). Furthermore, none of the existing studies rely on pregnancy-specific instruments to examine the prospective association between positive body image during pregnancy and mental health in the postpartum period. Following previous studies emphasizing the necessity to develop pregnancy-specific questionnaires to evaluate body image during pregnancy, Kirk and Preston (2019) developed the BUMPs, a measure of pregnancy body image encompassing both negative and positive body image facets. Although the scale has been validated in different cultural contexts, evidence of the predictive validity of the scale in the postpartum is lacking. Moreover, thus far no pregnancy-specific body image questionnaires are available in Italian. The aim of the present study was therefore twofold: a) developing an Italian adaptation of the BUMPs and examining its psychometric properties including factorial structure, reliability, and concurrent validity with prepartum measures of anxiety, depression and BMI; b) extending existing research (Gulec Satir & Hazar, 2021; Salzer et al., 2024; Wu et al., 2022) by examining the predictive validity of the BUMPs with respect to measures of postpartum anxiety and depression, and postpartum body appreciation.

The confirmatory factor analyses of the BUMPs suggested that the 3 correlated factor model provided a good representation of the data. The factorial structure identified in the Italian version of BUMPs is consistent with the original study (Kirk & Preston, 2019), as well as with one of the Turkish versions (Duman et al., 2023) and the Brazilian one (Salzer et al., 2023). However, other validations of BUMPs have shown different factorial structures. The Chinese version (Wu et al., 2022) revealed a four-factor structure, while in another Turkish version, a two-factor

Table 6
Factorial invariance tests across trimesters of pregnancy.

Model	Y-Bχ2 (df)	RMSEA	CFI	TLI	SRMR	ΔRMSEA	ΔCFI
1.Configural invariance	742.652 (296)	0.066	0.914	0.900	0.063		
2.Metric invariance	764.488 (312)	0.064	0.912	0.904	0.066	−0.002	−0.002
3.Scalar invariance	808.224 (328)	0.065	0.907	0.903	0.066	0.001	−0.005

Note. Analyses were conducted on the full sample

structure was reported (Gulec Satir and Hazar, 2021). The differences in these factor structures may be attributed to the distinct statistical methods used. Both Kirk and Preston (2019) and our study employed CFA using the maximum likelihood estimation method. Differently, the Chinese version (Wu et al., 2022) and one Turkish version (Gulec Satir and Hazar, 2021) used principal component analysis (PCA) with orthogonal rotation, while the Brazilian version employed Diagonally Weighted Least Squares. While standard CFA and EFA are based on the common factor model, PCA is not (Schreiber, 2021). The former aims to identify latent structures by uncovering common factors influencing observed variables, while PCA reduces these variables to fewer components that retain maximum variance (Park et al., 2002). This difference, reflected in how each technique analyses variation in the observed variables, can lead to discrepant results. Additionally, cultural differences may have also accounted for these variations. Italy and the UK share similarities regarding the emphasis placed on physical appearance, which is strongly present in Western cultures. This may be less relevant in Eastern cultural contexts like China. Ultimately, Turkey represents a blend of both Eastern and Western cultural influences. In this sense, the differences that emerged may reflect different structures of body satisfaction evaluation, depending on the cultural context being assessed (Beaton et al., 2000). Nonetheless, the consistency in both the structure and number of items of our version with the British and Brazilian ones, facilitates accurate comparison.

With respect to the reliability analyses, the internal consistency of the Italian BUMPS was satisfactory for the three subscales, with omega coefficients ranging from 0.765 to 0.866. These findings align with those reported in studies identifying a comparable three-factor structure (i.e., the original version: Kirk & Preston, 2019; the Brazilian version: Salzer et al., 2024; and a Turkish version: Duman et al., 2023), wherein high levels of internal consistency were observed for both the total score and the subscales. High reliabilities were also reported in the other versions of the BUMPs where different factorial structures emerged (Wu et al., 2022; Gulec Satir and Hazar, 2021). It has to be noted that the reliability value of the *Physical burdens of pregnancy* subscale was lower than the other two subscales. When interpreting this lower internal consistency, it must be considered that this factor includes only three items, which may have influenced the results. Importantly, through the calculation of bifactor statistical indices (see Rodriguez et al., 2016), we did not find support for the use of a total score in addition to subscale scores. More specifically, the omega hierarchical for the general factor and the ECV and PUC statistics suggested that a single total score cannot be considered sufficiently reliable due to multidimensionality in the item-response data (Reise et al., 2016; Rodriguez et al., 2016). The use of the three separate scores is therefore suggested in future studies using the Italian BUMPs.

Considering concurrent validity, findings confirmed the expected cross-sectional associations with self-report ratings of BMI, anxiety, and depressive symptoms. Specifically, positive correlations were found between all three dimensions of the BUMPS and the total score of the EPDS and the GAD-7. In particular, the relationship between the *Weight Gain Concerns* subscale with both antenatal anxiety and depressive symptoms is consistent with previous studies (e.g., Roomruangwong et al., 2017; Silveira et al., 2015) suggesting that reporting higher concerns and dissatisfaction with one's body changes during pregnancy is correlated with a higher risk of antenatal anxiety and depression. Additionally, also the correlation between the *Physical Burdens of Pregnancy* subscale and prepartum mental health outcomes is in line with literature in which pregnancy-related physical burdens, such as back pain, fatigue, and mobility issues, have been shown to exacerbate mental health challenges, thereby contributing to increased antenatal anxiety and depressive symptoms (Silveira et al., 2017).

The correlation between the *Satisfaction with Appearing Pregnant* subscale and both anxiety and depressive symptoms is consistent with the literature, indicating that women who feel positively about their pregnant bodies tend to experience lower levels of anxiety and depression (Duncombe et al., 2008; Loth et al., 2011). Under this view, positive body image during pregnancy can act as a protective factor, promoting better mental health and emotional well-being (Clark et al., 2009).

In terms of convergent validity with BMI, our findings revealed a positive correlation between the three BUMPs subscales and both pregnancy and pre-pregnancy BMI. This analysis was not conducted in the original (Kirk & Preston, 2019) or Turkish (Duman et al., 2023; Gulec Satir and Hazar, 2021) versions of the BUMPs; however, our results align with those of the Chinese and Brazilian versions (Wu et al., 2022; Salzer et al., 2024). Notably, the existing body of literature has consistently demonstrated a relationship between BMI and negative body attitudes during pregnancy (Kamysheva et al., 2008; Meireles et al., 2021; Watson et al., 2015). The present study supports previous findings (Munns & Preston, 2024), indicating that lower BMI is associated with greater satisfaction with one's body and that this association is strongest for the subscale *Weight Gain Concerns*.

Measurement invariance analysis of the BUMPs scale across the second and third trimesters suggests that the measure is robust and maintains its validity across different stages of pregnancy. Similarly, Kirk and Preston (2019) and Salzer & colleagues (2024) confirmed the scale's relevance for women throughout all three trimesters. The absence of score disparities between trimesters indicates that the BUMPs is a reliable tool for assessing pregnancy-related factors, regardless of gestational stage. This aligns with the understanding that body satisfaction is generally a stable construct (Crossland et al., 2023), and that the gestational period during which BUMPs is administered does not appear to affect its relationship with depression and anxiety during pregnancy (Munns & Preston, 2024).

This study has also demonstrated, for the first time, that the BUMPs possesses good predictive validity in relation to postpartum mental health outcomes. In fact, besides the concurrent validity, BUMPs scores were also longitudinally associated with anxiety symptoms, depressive symptoms, and body appreciation measured during the first month after childbirth. Specifically, the positive association between the *Weight Gain Concern* and *Physical Burdens of Pregnancy* subscales with both postpartum anxiety and postpartum depression is in line with previous research reporting the detrimental effect of negative body image concerns during pregnancy on postpartum depressive symptoms (Singh Solorzano et al., 2022), and anxiety symptomatology (Hartley et al., 2017). The predictive role of *Satisfaction with Appearing Pregnant* with postpartum depressive symptoms is also consistent with the established relationship between positive body image and mental health that emerged from the general population (Tylka & Wood-Barcalow, 2015), indicating that a higher satisfaction with a changing pregnant body is associated with lower postpartum psychological distress. In this sense, future studies may evaluate whether fostering a positive body image during pregnancy might contribute to long-term health benefits for the mother, and positive parenting and secure bonding with the newborn.

Regarding the relationship between the three subscales of the BUMPS and postpartum BAS-2 scores, findings showed that body image assessed during pregnancy was associated with women's postpartum body appreciation, in line with previous research on the stability of body dissatisfaction from pre- to postpartum (Spinoni et al., 2023). More specifically, higher *Weight Gain Concerns* and experiencing more physical burdens during pregnancy were related to less postpartum body appreciation. Worries about weight gain and physical challenges perceived while pregnant may have long-lasting effects on how women perceive and appreciate their bodies after childbirth. Similarly, previous literature using instruments that have not been specifically developed for pregnancy demonstrates that women who are concerned about weight gain during pregnancy and those who experience significant dissatisfaction and physical discomfort are more likely to struggle with body dissatisfaction also during the postpartum (Clark et al., 2009). Different factors like *Weight Gain Concerns* can lead to negative body image and heightened anxiety, which can continue into the postpartum period, affecting overall body appreciation (Fuller-Tyszkiewicz et al., 2013). Similarly, physical burdens such as back pain, fatigue, and mobility issues can exacerbate negative body image by causing ongoing discomfort and frustration, which may also affect postpartum body satisfaction (Loth et al., 2011). Conversely, the negative relationship between *Satisfaction with Appearing Pregnant* and the BAS-2 indicates that higher satisfaction in pregnancy is associated with higher body appreciation. This underscores the importance of nurturing a positive body image throughout pregnancy, as women who maintain a positive body image during this transformative period may be more likely to continue appreciating their bodies after childbirth. These findings are noteworthy since a positive body image in the postpartum has been shown to correlate with several positive health outcomes. For instance, postpartum women who appreciate their bodies are more likely to experience better mental health, including reduced levels of postpartum depression and anxiety (Clark et al., 2009; Duncombe et al., 2008), exhibit greater breastfeeding self-efficacy (Geller et al., 2024), and demonstrate more adaptive exercise behaviours (Raspovic et al., 2020).

4.1. Strengths and limitations

Overall, the current findings contribute to the growing body of literature on peripartum body image, by confirming the reliability and validity of the BUMPS within the Italian context and by extending previous studies through the examination of the predictive validity of the scale, thereby enhancing the scale's robustness and applicability. Among the main strengths, addressing the need for culturally specific validation studies (Clayton et al., 2021), we enrolled a large community sample of Italian pregnant women. This is important given the emphasis in Italian culture on beauty and physical appearance, particularly the promotion of thinness (Bucchianeri et al., 2013; Di Gesto et al., 2023), as this cultural focus may make Italian women especially vulnerable to negative feelings about body changes during pregnancy. Secondly, by ensuring the cultural reliability of the instrument, healthcare providers can acquire more precise data regarding body image among Italian women during pregnancy. This enhanced accuracy facilitates a deeper comprehension and identification of body image issues within the specific cultural context. Moreover, by demonstrating significant correlations with measures of mental health and BMI, the present study provides evidence for the concurrent validity of the BUMPS, underscoring its relevance for maternal health outcomes. Furthermore, our study is the first to assess the scale's predictive role on the levels of postpartum anxiety and depression and of a positive measure of body image (i.e., body appreciation). This can help healthcare providers recognize the importance of body image issues during pregnancy and incorporate body image assessment into routine prenatal care. Future studies may capitalize on the BUMPs to evaluate the efficacy of interventions and programs aimed at promoting positive body image during pregnancy and in the postpartum.

Despite these strengths, the study is not without limitations. Firstly, we recruited a convenience sample that might not be completely representative of the population of Italian pregnant women. Collecting data through social networks may not reach women who do not have access to social networks or who are not active users, thereby limiting the generalizability of the results. Moreover, as the Italian language was an inclusion criterion, ethnic minority groups may not be fully represented. Secondly, we did not assess the test-retest reliability of the BUMPS scores during pregnancy, which should be considered in future investigations. Additionally, other constructs could have been included in criterion validity analyses due to their previously investigated associations with pregnant body image, including maternal-foetal attachment, relationship quality, and interoceptive sensibility (e.g., Salzer et al., 2024).

4.2. Conclusions

Overall, our results support the adequacy of the psychometric properties of the Italian version of the BUMPs, which can be considered a valid and reliable tool for assessing body image in pregnancy within the Italian context. Specifically, the Italian version of the BUMPs exhibits an adequate factorial structure, internal consistency, and concurrent validity with respect to anxiety and depression symptoms, and with BMI. Moreover, the predictive validity with measures of mental health and body appreciation in the postpartum was examined for the first time. These findings are particularly noteworthy. The BUMPs provides a reliable and valid assessment of both negative and positive aspects of pregnant body image and concurrently and prospectively predicts both mental health symptomatology (anxiety and depression) and postpartum body appreciation. In conclusion, we believe that having a valid and reliable tool able to predict postpartum outcomes may significantly enhance the rigor of research in this field, allowing also the evaluation of the efficacy of intervention protocols aimed to improve body image during pregnancy and in the postpartum.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.bodyim.2024.101847.

Data availability

Data will be made available on request.

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