



# OPEN Self-efficacy as a moderator in the relationship between body image and health behaviors in pregnant women

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During pregnancy, women often experience shifts in their body image perspective. Active engagement in positive health behaviors is crucial for achieving optimal pregnancy outcomes and promoting healthy fetal development. In this context, self-efficacy may influence how body image perception translates into such behaviors. This study aimed to determine whether self-efficacy among pregnant women moderates the relationship between body image and their health behaviors. The study was conducted from December 2023 to July 2024, involving 921 pregnant women in Poland. A diagnostic survey method using a questionnaire technique was applied. The research instruments included the generalized self-efficacy scale, body esteem scale, positive health behavior scale, and a standardized interview questionnaire. Pregnant women with a more positive attitude toward their bodies demonstrated a greater tendency to engage in positive health behaviors during pregnancy ( $p < 0.001$ ). For sexual attractiveness, a positive association with positive health behaviors was maintained across all levels of self-efficacy ( $p < 0.001$ ). A significant positive association with positive health behaviors was found for weight concerns ( $p < 0.001$ ) and physical condition ( $p = 0.013$ ), but only at moderate and high levels of self-efficacy. The impact of body image on positive health behaviors is more pronounced in women with higher levels of self-efficacy, although this relationship varies across different aspects of body image.

**Keywords** Pregnant women, Self-efficacy, Body image, Health behaviors

During pregnancy, a woman's body and mind undergo profound changes, often creating significant challenges for expectant mothers<sup>1</sup>. Over the past few years, societal and cultural perceptions of the pregnant body have evolved considerably. While it was once largely absent from mainstream media, it has become increasingly visible and frequently subjected to heightened public scrutiny. This shift reflects both the celebration of motherhood and the commercialization of pregnancy, which impose pressures on women to conform to idealized aesthetic standards<sup>2</sup>.

Body image is a complex concept encompassing how individuals perceive their bodies, including their feelings and beliefs about their appearance<sup>3</sup>. Pregnant women often reassess their body image due to physical changes, leading some to appreciate their body's strength and capacity to nurture life<sup>4,5</sup>. However, societal expectations continue to impose beauty standards on them, often contributing to body dissatisfaction and psychological distress<sup>6,7</sup>. Although weight gain is a natural aspect of pregnancy, a distorted body image and the perceived discrepancy between one's appearance and the idealized slim figure can contribute to feelings of loss of control and body dissatisfaction. The dissatisfaction may manifest as low self-esteem, anxiety, mood swings, and, in some cases, depression<sup>1,8</sup>. Furthermore, these negative body-related feelings can lead to maladaptive

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coping strategies, such as unhealthy eating habits—including restrictive dieting and compulsive eating—as well as insufficient or excessive physical activity, all of which may pose health risks during pregnancy<sup>4,9</sup>.

Health behaviors during pregnancy include maintaining a balanced diet, engaging in regular physical activity, and attending prenatal check-ups<sup>10</sup>. These health behaviors are influenced by a complex interaction of social, demographic, and cultural factors. At the individual level, health behaviors are significantly influenced by dietary preferences, knowledge, education, and health status<sup>11,12</sup>. A healthy, well-balanced diet—both nutritionally and calorically—supports maternal health, provides essential nutrients, vitamins, and minerals for fetal development, and contributes to nutritional programming, shaping the child's long-term health and quality of life<sup>13–15</sup>. Regular, well-tailored physical activity significantly enhances the overall physical condition of pregnant women, preparing their bodies for the demands of pregnancy, childbirth, and the postpartum period<sup>16–18</sup>. Exercise improves physical fitness, promotes better sleep, helps prevent excessive weight gain, and lowers the risk of pregnancy complications. It also positively impacts work capacity<sup>17,19,20</sup>. Additionally, physical activity during pregnancy reduces anxiety, stress, and depressive symptoms, decreasing the risk of perinatal depression<sup>21–23</sup>. Emotional challenges such as depression, anxiety, and chronic stress can lead to unhealthy behaviors, including smoking, poor dietary choices, physical inactivity, and sleep disturbances<sup>24,25</sup>. Regular prenatal visits and routine health check-ups are essential for monitoring the health of both the mother and the fetus. These appointments enable the early identification of potential health issues, allowing for timely intervention and reducing the risk of pregnancy-related complications<sup>13,26</sup>.

Self-efficacy, or the belief in one's ability to manage tasks and challenges, is a predictor of attitudes, emotions, and behaviors in pregnant women. Women with high self-efficacy set ambitious goals, pursue them with greater commitment, and exhibit a higher propensity for positive health behaviors, such as adhering to dietary plans, following medical advice, and abstaining from harmful substances<sup>12,27</sup>. However, pregnancy can pose challenges to self-efficacy. The numerous physical changes during pregnancy—such as uncontrollable weight gain, stretch marks, melasma, acne, changes in hair and nail texture, or swelling—may intensify the gap between a woman's expectations and her actual appearance. This discrepancy can lead to emotional instability and decreased confidence, which in turn may contribute to detrimental health behaviors<sup>28</sup>. Although studies emphasize the link between body image disturbances in pregnant women and adverse health outcomes, this issue is often neglected by healthcare providers<sup>4</sup>.

This study aimed to evaluate self-efficacy, body self-esteem, and health behaviors among pregnant women and to determine whether self-efficacy moderates the relationship between body self-esteem and positive health behaviors.

## Materials and methods

### Study design

This was a quantitative, cross-sectional study with a correlational moderation analysis model. The study was conducted between December 2023 and July 2024, among 921 pregnant women receiving healthcare in medical facilities across six Polish provinces: Lublin, Masovia, Podkarpackie, Podlaskie, West Pomerania, and Greater Poland. Inclusion criteria were as follows: consent to participate in the study, age of 18 years or older, Polish as the native language, and a singleton pregnancy. Exclusion criteria included: age below 18 years, complications in pregnancy requiring hospitalization, or a multiple pregnancy.

The study was performed in accordance with the Helsinki Declaration, and approved by the Poznań University of Medical Sciences (Resolution No. 931/23). Respondents provided informed consent to participate in the study. The respondents were informed that participation was voluntary, and that study results were anonymous and to be used exclusively for research purposes.

The sample size was estimated based on the number of births in Poland during the analyzed period, amounting to 145,878 (according to preliminary data from Statistics Poland). Assuming a confidence level of 95% and a response distribution of 50%, the margin of error for the obtained sample ( $n=921$ ) was calculated. The resulting maximum margin of error was 3.22%, meaning that with 95% confidence, the true population values fall within  $\pm 3.22\%$  of the observed results in the sample. The obtained sample size was adequate to ensure appropriate statistical power and precision of the analyses<sup>29</sup>.

### Data collection

The study employed a diagnostic survey method using a questionnaire-based technique. The research instruments included the Generalized Self-Efficacy Scale (GSES), Body Esteem Scale (BES), Positive Health Behavior Scale (PHBS), and a standardized interview questionnaire containing questions about the participants' sociodemographic characteristics.

Generalized Self-Efficacy Scale (GSES) developed by Schwarzer and Jerusalem, was adapted for Polish conditions by Juczyński. It measures respondents' beliefs in their ability to effectively cope with challenging situations and adversities. The overall score is the sum of points from 10 statements rated on a scale from 1 to 4, resulting in a possible score range of 10 to 40. Raw scores are converted to standardized sten scores, where: 1–4 stens (10–24 points) indicate low efficacy, 5–6 stens (25–29 points) indicate average efficacy, and 7–10 stens (30–40 points) indicate high efficacy. The scale's reliability, measured using Cronbach's alpha, is 0.85, with internal consistency ranging from 0.76 to 0.91<sup>30</sup>.

Body Esteem Scale (BES) created by Franzoi and Shields (Polish adaptation: Lipowska and Lipowski), assesses respondents' attitudes toward their bodies. The scale consists of 35 items grouped into three gender-specific subscales related to body esteem: sexual attractiveness, weight concern, and physical condition. Each item is rated on a 5-point Likert scale, where 1 indicates strong negative feelings, 5 indicates strong positive feelings, and 3 represents a neutral point. The total score is obtained by summing the points for each subscale. A higher total score indicates a more positive body esteem. The reliability of the subscales, measured using Cronbach's alpha

for the Polish version of the test, is 0.92. Reliability coefficients for the individual subscales are as follows: sexual attractiveness, 0.87; weight concern, 0.90; and physical condition, 0.87<sup>31,32</sup>.

Positive Health Behavior Scale (PHBS) developed by Hildt-Ciupińska, includes 29 positive health behaviors grouped into five subscales: nutrition, body care, safety behaviors, psychosocial health, and physical activity. Respondents rate the frequency of behaviors on a 4-point scale: almost always (3 points), often (2 points), sometimes (1 point), or almost never (0 points). A higher total score reflects more frequent engagement in positive health behaviors. The scale's reliability, measured using Cronbach's alpha, is 0.81<sup>33</sup>.

The standardized interview questionnaire included questions about participants' characteristics such as age (mean age calculated), place of residence (provincial city, other city, or village), marital status (single, married/in a stable relationship), education level (categorized into primary/vocational, secondary, and higher), subjective assessment of family affluence (wealthy, average, or poor), whether they had children (yes or no), and the pregnancy order.

### Statistical analysis

The Pearson correlation coefficient (Pearson's  $r$ ) was used to assess the relationships between the studied variables. A bias-corrected bootstrap estimation (10,000 samples) with a 95% confidence interval was applied to evaluate the moderating role of self-efficacy (GSES) in the relationship between body esteem (BES) and positive health behaviours (PHBS). Figure 1 presents the conceptual model illustrating the moderating effect of self-efficacy on the relationship between body esteem and positive health behaviours. Three independent models were analysed. The analysis was performed using SPSS 28 statistical software and the PROCESS macro (model 1) for SPSS. The PROCESS macro model has the advantage of addressing multicollinearity by automatically mean-centering both the independent variable and the moderator variable. Additionally, this method allows for a more detailed examination of the significance of the simple slope, which represents the effect of the independent variable on the outcome variable at different levels of the moderator. Moderation occurs when the strength or direction of the relationship between body esteem (BES) and positive health behaviours (PHBS) depends on the level of the moderator variable—generalized self-efficacy (GSES). The analysis was conducted to examine how the relationship between BES and PHBS varies depending on the level of the moderator (GSES: low, moderate, and high). The Johnson–Neyman technique was employed to probe the interaction. This technique identifies the values of the moderator ( $W$ ) at which the conditional effect of the focal predictor reaches a  $p$ -value of exactly 0.5.

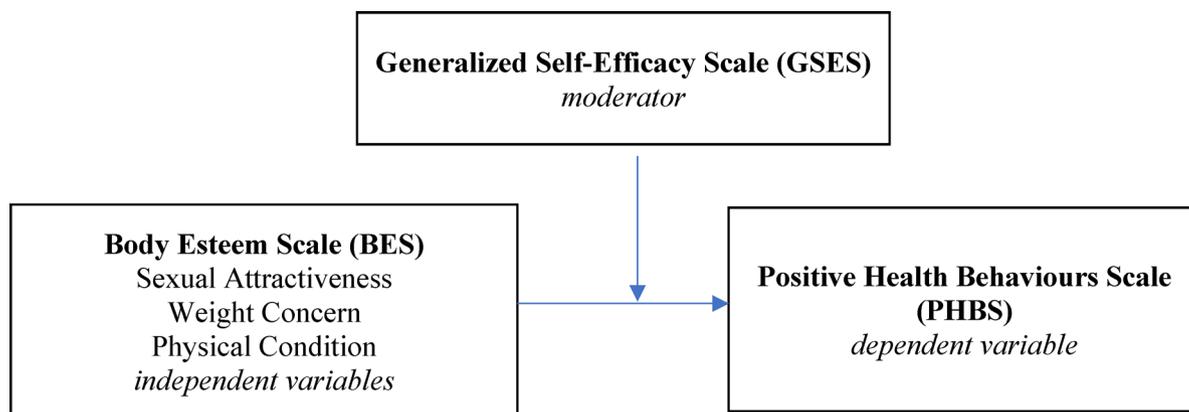
### Results

The study included 921 women aged between 18 and 45 years, with a mean age of 30.65 years ( $SD=4.90$ ). The majority of participants resided in provincial cities (59.0%), were married or in a steady relationship (79.4%), had higher education qualifications (62.3%), assessed their family's wealth as average (79.8%), did not have children (56.5%), and were in their first pregnancy (47.4%).

The mean body esteem (BES) score in the domain of sexual attractiveness was  $44.11 \pm 7.90$ , weight concern was  $32.44 \pm 7.32$ , and physical condition was  $29.20 \pm 6.71$ . The mean positive health behaviours (PHBS) score was  $50.50 \pm 14.98$ , while the mean self-efficacy (GSES) score was  $30.52 \pm 4.46$ . All analysed correlations between the variables were statistically significant. Higher body esteem was associated with more positive health behaviours ( $p < 0.001$ ). Body esteem correlated positively with self-efficacy ( $p < 0.001$ ), and self-efficacy, in turn, correlated positively with positive health behaviours ( $p < 0.001$ ) (Table 1).

The moderating role of self-efficacy (GSES) in the relationship between body esteem (BES) and positive health behaviours (PHBS) was then evaluated (Table 2).

In model 1, low, moderate, and high levels of self-efficacy were associated with a significant relationship between sexual attractiveness and positive health behaviors. In model 2, a low level of self-efficacy was associated with an insignificant relationship between weight concern and positive health behaviors. However, at moderate and high levels of self-efficacy, weight concern was significantly associated with positive health behaviors. Similarly, in model 3, a low level of self-efficacy was associated with an insignificant relationship between



**Fig. 1.** Conceptual diagram of a moderation model illustrating how the effect of body esteem (BES) on positive health behaviors (PHBS) is moderated by self-efficacy (GSES).

	M (SD)	1	2	3	4	5
1 Sexual attractiveness	44.11 (7.90)					
2 Weight concern	32.44 (7.32)	0.757** [0.728–0.783]	1			
3 Physical condition	29.20 (6.71)	0.752** [0.723–0.779]	0.726** [0.694–0.755]	1		
4 PHBS	50.50 (14.98)	0.243** [0.181–0.303]	0.203** [0.140–0.264]	0.169** [0.106–0.231]	1	
5 GSES	30.52 (4.46)	0.257** [0.196–0.317]	0.243** [0.182–0.303]	0.265** [0.204–0.325]	0.220** [0.157–0.280]	1

**Table 1.** Correlation between analysed variables. PHBS, Positive health behavior scale; generalized Self-Efficacy scale (GSES); \*\* < 0.001

Models		Unstandardized coefficient	SE	T	p	LLCI	ULCI
Model 1	Constant	58.903	16.039	3.672	<0.001	27.425	90.381
	Sexual attractiveness	– 0.617	0.371	– 1.661	0.097	– 1.346	0.112
	GSES	– 0.805	0.516	– 1.559	0.119	– 1.818	0.208
	Sexual attractiveness × GSES	0.032	0.012	2.718	0.007	0.009	0.055
R = 0.305; Model R <sup>2</sup> = 0.093 F(3;915) = 31.214; p < 0.001							
Model 2	Constant	60.027	13.577	4.421	<0.001	33.382	86.672
	Weight concern	– 0.899	0.420	– 2.139	0.033	– 1.724	– 0.074
	GSES	– 0.661	0.444	– 1.487	0.138	– 1.533	0.211
	Weight concern × GSES	0.040	0.014	2.949	0.003	0.013	0.066
R = 0.284; Model R <sup>2</sup> = 0.081 F(3;915) = 26.768; p < 0.001							
Model 3	Constant	56.059	12.828	4.370	<0.001	30.883	81.235
	Physical condition	– 0.918	0.453	– 2.024	0.043	– 1.808	– 0.028
	GSES	– 0.422	0.414	– 1.021	0.308	– 1.235	0.390
	Physical condition × GSES	0.038	0.014	2.646	0.008	0.010	0.066
R = 0.262; Model R <sup>2</sup> = 0.069 F(3;915) = 22.456; p < 0.001							

**Table 2.** Summary of moderation models for the role of self-efficacy (GSES) in the relationship between body esteem (BES) and positive health behaviors (PHBS). CI, Confidence interval; LL, Lower limit; UL, Upper limit

physical condition and positive health behaviors, while at moderate and high levels of self-efficacy, physical condition showed a significant association with positive health behaviors (Fig. 2; Table 3).

In model 1, self-efficacy values ranging from 25.056 to 40.000 (on the z scale) demonstrated a statistically significant moderating effect on positive health behaviours. For model 2, the range was 26.745 to 40.000. In model 3, self-efficacy values between 28.486 and 40.000 showed a significant effect (Table 4).

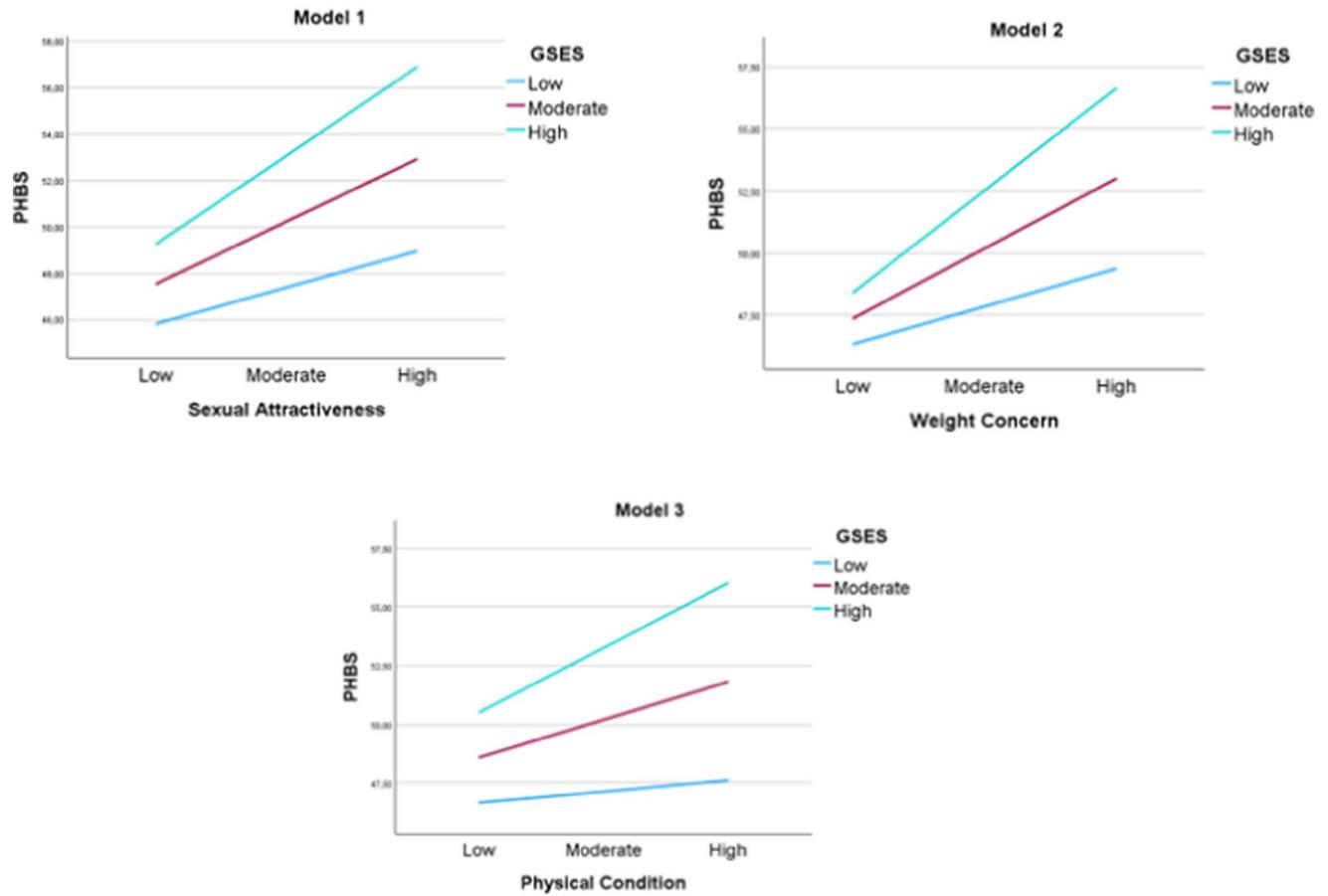
## Discussion

This study examined the relationship between self-efficacy, body image, and positive health behaviours among pregnant women, with a particular focus on the role of self-efficacy as a moderator in the link between body image and these behaviours.

Self-efficacy is an important determinant in shaping positive health behaviours and attitudes. Participants in this study displayed a moderate level of self-efficacy, approaching the threshold between average and high reference values. A high level of self-efficacy has been shown to support psychosocial adaptation during pregnancy<sup>34</sup>. Women with high self-efficacy tend to critically evaluate their health and make informed decisions regarding diet, physical activity, and weight management. They are more likely to engage in positive health behaviours, such as regular physical exercise, maintaining a balanced diet, and adhering to medical recommendations<sup>27,35,36</sup>. The findings confirmed a positive correlation between self-efficacy and positive health behaviours, further supporting its well-established role in prenatal health. However, its moderating role in the association between body image and health behaviours has received limited attention in prior research on pregnant populations, and this study contributes to filling that gap.

The level of self-efficacy during the perinatal period is particularly significant in pregnancies accompanied by complications<sup>37</sup>. A strong belief in one's ability to overcome challenges acts as a critical adaptive and motivational factor, while low mood and mental health issues predict reduced self-efficacy<sup>38,39</sup>.

The findings revealed positive correlations between self-efficacy and body image across all domains analysed. This is particularly relevant for women with negative body image during pregnancy, as high self-efficacy may



**Fig. 2.** Positive health behaviours (PHBS) explained by the interaction between the body esteem (BES) and self-efficacy (GSES).

	GSES	Effect	SE	T	P	LLCI	ULCI
Model 1	- 1 SD	26.060	0.086	2.534	0.011	0.049	0.385
	M	30.517	0.062	5.789	<0.001	0.238	0.482
	+ 1 SD	34.973	0.077	6.548	<0.001	0.352	0.653
Model 2	- 1 SD	26.060	0.140	1.534	0.125	- 0.039	0.320
	M	30.517	0.318	4.756	<0.001	0.187	0.449
	+ 1 SD	34.973	0.496	5.601	<0.001	0.322	0.670
Model 3	- 1 SD	26.060	0.072	0.689	0.492	- 0.133	0.276
	M	30.517	0.241	3.232	0.013	0.095	0.387
	+ 1 SD	34.973	0.410	4.470	<0.001	0.230	0.590

**Table 3.** Conditional effects of body esteem (BES) on positive health behaviours (PHBS) for specific self-efficacy values. CI, Confidence interval; LL, Lower limit; UL, Upper limit

protect against body dissatisfaction associated with typical pregnancy-related weight gain, thereby reducing the risk of disordered eating and psychological distress<sup>8,40</sup>. Consequently, prenatal education programs should include support aimed at helping women adapt to physiological changes and embrace a positive perception of their bodies. Encouraging activities that build self-efficacy among pregnant women can improve their body image, empower them to make healthier decisions, and ultimately enhance their overall health and quality of life.

Pregnancy significantly influences how women perceive their bodies and attractiveness, with potential impacts on both well-being and mental health. Assessing body image is a vital aspect of prenatal care, offering opportunities to educate women on managing the physiological changes that occur during this period<sup>5</sup>.

The analysis of the relationship between self-efficacy and sexual attractiveness revealed that self-efficacy moderates how women perceive changes in this domain during pregnancy. A positive association between the perception of sexual attractiveness and positive health behaviours was observed across all levels of self-efficacy.

Model 1				Model 2				Model 3			
GSES	Effect	LLCI	ULCI	GSES	Effect	LLCI	ULCI	GSES	Effect	LLCI	ULCI
10.000	-0.297	-0.799	0.206	10.000	-0.500	-1.064	0.064	10.000	-0.538	-1.152	0.076
11.500	-0.249	-0.718	0.220	11.500	-0.440	-0.966	0.086	11.500	-0.481	-1.054	0.092
13.000	-0.201	-0.636	0.235	13.000	-0.380	-0.868	0.107	13.000	-0.424	-0.956	0.108
14.500	-0.153	-0.555	0.250	14.500	-0.321	-0.770	0.129	14.500	-0.367	-0.859	0.124
16.000	-0.105	-0.474	0.265	16.000	-0.261	-0.672	0.150	16.000	-0.310	-0.762	0.141
17.500	-0.057	-0.394	0.280	17.500	-0.201	-0.575	0.173	17.500	-0.253	-0.665	0.158
19.000	-0.009	-0.314	0.296	19.000	-0.141	-0.478	0.196	19.000	-0.196	-0.569	0.176
20.500	0.039	-0.234	0.313	20.500	-0.081	-0.382	0.219	20.500	-0.139	-0.473	0.195
22.000	0.087	-0.156	0.330	22.000	-0.022	-0.287	0.244	22.000	-0.083	-0.379	0.214
23.500	0.135	-0.078	0.349	23.500	0.038	-0.193	0.270	23.500	-0.026	-0.286	0.235
25.000	0.183	-0.003	0.369	25.000	0.098	-0.102	0.298	25.000	0.031	-0.195	0.258
25.056	0.185	0.000	0.370	26.500	0.158	-0.014	0.330	26.500	0.088	-0.108	0.285
26.500	0.231	0.070	0.393	26.745	0.168	0.000	0.335	28.000	0.145	-0.025	0.316
28.000	0.279	0.138	0.420	28.000	0.218	0.069	0.367	28.486	0.164	0.000	0.328
29.500	0.327	0.201	0.454	29.500	0.278	0.143	0.413	29.500	0.202	0.050	0.355
31.000	0.375	0.254	0.497	31.000	0.337	0.206	0.469	31.000	0.259	0.114	0.404
32.500	0.423	0.298	0.549	32.500	0.397	0.257	0.537	32.500	0.316	0.167	0.466
34.000	0.471	0.333	0.610	34.000	0.457	0.299	0.615	34.000	0.373	0.208	0.539
35.500	0.519	0.361	0.677	35.500	0.517	0.334	0.700	35.500	0.430	0.241	0.619
37.000	0.567	0.385	0.750	37.000	0.577	0.364	0.790	37.000	0.487	0.268	0.706
38.500	0.615	0.406	0.825	38.500	0.636	0.391	0.882	38.500	0.544	0.292	0.796
40.000	0.663	0.425	0.902	40.000	0.696	0.416	0.976	40.000	0.601	0.314	0.888

**Table 4.** Moderator values defining Johnson-Neyman significance region for the body esteem/self-efficacy interaction on positive health behaviors. CI, Confidence interval; LL, Lower limit; UL, Upper limit

This finding suggests that a positive body image in this area supports positive health behaviours, regardless of self-efficacy levels.

The physiological, anatomical, and hormonal changes associated with pregnancy can also influence sexual activity. A decrease in sexual intercourse, especially in the first trimester, is often due to physical discomfort and psychological adjustments. An increase in desire during the second trimester is associated with reduced discomfort and greater emotional stability. In contrast, the third trimester is often characterized by a decline in desire due to concerns about fetal health and the physical challenges of intercourse<sup>41,42</sup>. Other reported changes in sexual function include reduced orgasm intensity, diminished sexual desire and satisfaction, and a higher incidence of dyspareunia<sup>43</sup>. The findings of Van den Brink et al. highlight that cultivating a positive body image can significantly enhance sexual satisfaction and overall relationship quality. Initiatives focused on fostering and maintaining a positive body image may therefore contribute to more fulfilling sexual relationships for couples<sup>44</sup>. Our results indicate that a positive perception of one's sexual attractiveness during pregnancy promotes healthier lifestyle choices. While self-efficacy strengthens this positive effect, it is not a prerequisite for the observed relationship between sexual attractiveness and positive health behaviours.

Maintaining an optimal body weight is essential for women planning pregnancy. According to the World Health Organization (WHO) recommendations on Body Mass Index (BMI), women should aim for a healthy pre-pregnancy weight<sup>45</sup>. Similarly, appropriate weight gain during pregnancy should align with guidelines from the Institute of Medicine (IOM)<sup>46</sup>. Pre-pregnancy weight and gestational weight gain are modifiable risk factors for adverse pregnancy outcomes. Therefore, women planning pregnancy should focus on achieving a healthy weight, while pregnant women should aim for appropriate weight gain<sup>47,48</sup>. Studies suggest that the connection between concerns about weight and positive health behaviours in pregnant women depends significantly on their level of self-efficacy. For women with low self-efficacy, concerns about gestational weight gain do not translate into meaningful actions to control their weight. This may stem from a perceived inability to make and sustain lifestyle changes<sup>49</sup>. Conversely, women with moderate to high self-efficacy are more likely to believe in their capacity to implement changes and engage in positive health behaviours in response to weight concerns. Hill et al. reported that women with excessive gestational weight gain had poorer body image compared to those who perceived their weight gain as appropriate. Similarly, women who attempted to lose weight before pregnancy or experienced weight-related stigma during pregnancy also reported worse outcomes<sup>50</sup>. These findings highlight that weight-related body esteem during pregnancy can positively influence health behaviours, but mainly when self-efficacy is at least moderate. This underscored the interplay between body image and psychological resources in shaping maternal health decisions. Self-efficacy is a crucial determinant. Women with low self-efficacy will need targeted support to build confidence in their ability to make lifestyle changes before weight concerns can effectively drive positive actions.

This study revealed that the relationship between physical condition and positive health behaviours is influenced by the level of self-efficacy. In the Body Esteem Scale, the Physical Condition subscale reflects participants' subjective evaluations of their physical fitness, stamina, energy levels, and muscular strength. Among women with moderate or high self-efficacy, a more positive perception of physical condition was associated with positive health behaviours. However, this connection was absent in women with low self-efficacy, suggesting that a lack of confidence in their ability to effect change diminishes the influence of good physical fitness on other healthy behaviours.

Exercise offers further benefits by reducing the risk of cardiovascular complications and enhancing overall physical performance. It strengthens muscles, reduces the likelihood of back pain, and supports proper posture. Stretching exercises increase muscle and joint flexibility, preparing the body for childbirth. Regular pelvic floor muscle exercises improve their strength and elasticity, potentially facilitating labor and reducing the risk of urinary incontinence<sup>16,19,51</sup>. Breathing and aerobic exercises further enhance lung capacity and breathing efficiency, which are particularly important in the later stages of pregnancy and during labor<sup>17,19</sup>. Despite these well-documented benefits, research indicates that physical activity levels often decline during pregnancy, particularly among overweight or obese women<sup>52</sup>. It is also important to consider that pregnant women frequently experience fatigue, nausea, and mood changes, which can reduce their physical activity and sense of agency. Additional factors such as concerns about the baby's health, difficulty adapting to pregnancy, and a lack of support from their surroundings may further contribute to decreased activity levels<sup>27,28</sup>.

The findings of this study suggest that interventions aimed at enhancing both self-efficacy and body image in pregnant women could be particularly effective in fostering positive health behaviours. Strengthening self-efficacy is crucial for adopting and sustaining behaviours that influence maternal health, pregnancy outcomes, and fetal development. These positive health behaviours include maintaining a balanced diet, engaging in regular physical activity, ensuring adequate sleep and rest, avoiding harmful substances, supporting mental health, and attending routine prenatal check-ups<sup>13,53</sup>.

Pregnant women's health behaviours are influenced by various factors beyond body image and self-efficacy. Social and cultural norms, relationships with family members and partners, psychological factors such as emotional well-being, past pregnancy experiences, and situational factors like access to prenatal care all play significant roles in shaping health behaviours during pregnancy<sup>14,24,53,54</sup>.

The study revealed that self-efficacy acts as a moderator in the relationship between body image and health behaviours among pregnant women, underscoring its role in influencing these behaviours and mediating the impact of body image on them. The strength of this relationship varies depending on specific aspects of body perception, particularly concerns about weight and physical condition. The positive effects of self-efficacy on health behaviours emerge only at moderate or high levels of self-efficacy. A positive body image alone does not guarantee healthy behaviours if a woman lacks confidence in her ability to manage these aspects of her life, highlighting the importance of specific "thresholds" of self-efficacy. In the context of sexual attractiveness, the positive association with positive health behaviours is consistent across all levels of self-efficacy. This connection may serve a protective function, mitigating the negative consequences of a poor body image, such as unhealthy dietary habits and emotional distress.

### Practical implications

The study underscores the importance of educational and support programs in prenatal care that strengthen self-efficacy and foster a positive body image, alongside knowledge of healthy behaviours. Such programs could include guidance on recommended weight gain, relaxation techniques, and physical exercises specifically designed for pregnant women.

Considering the adverse physical and psychological effects of body dissatisfaction during pregnancy, implementing strategies to reduce the stigma associated with excessive weight gain is crucial<sup>4</sup>. Health institutions should promote healthy lifestyle habits through media campaigns advocating positive body image. Furthermore, incorporating cognitive-behavioural therapy into prenatal care, alongside the development of digital applications and online platforms providing personalized support, may empower women by strengthening their confidence and motivation. The implementation of these practical strategies could enhance the quality of prenatal care, promote maternal well-being, and lead to improved health outcomes for both mothers and their children.

### Strengths and limitations of the work

This study is among the first to comprehensively examine self-efficacy as a moderating factor in the relationship between body image dimensions and positive health behaviours in pregnant women. Advanced statistical analyses identified significant interactions and threshold values for self-efficacy, highlighting potential areas for targeted interventions. By exploring various aspects of body image, this study provides a nuanced understanding of its impact on health behaviours, avoiding oversimplification. The findings add a new perspective on self-efficacy's role, guiding future research and informing potential interventions. This holistic approach integrates psychological and health-related factors, enhancing our understanding of the determinants of health in pregnant women. However, the study's correlational design limits causal inference. Future research should investigate the long-term effects of interventions to boost self-efficacy and positive body image.

### Conclusions

Positive body image is a factor influencing health behaviours in pregnant women. Those who view their bodies more positively are more likely to adopt healthier behaviours during pregnancy. Self-efficacy plays a moderating role in the relationship between body image and positive health behaviours. The impact of body image on positive health behaviours is more pronounced in women with higher levels of self-efficacy, though this relationship varies across different aspects of body image. In the domain of sexual attractiveness, the positive association with

positive health behaviours is evident across all levels of self-efficacy. By contrast, for concerns related to weight and physical fitness, the beneficial influence on positive health behaviours becomes apparent only at moderate and high levels of self-efficacy. This suggests that high self-esteem in these areas alone does not guarantee healthy behaviours unless accompanied by confidence in one's ability to manage these aspects of life.

### Data availability

The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request.

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## Author contributions

Conceptualization, A.B.; methodology, A.B., J.G.G. and G.B.; formal analysis, D.Ć., B.P. and B.K.B.; investigation, D.Ć. and B.P.; data curation, B.K.K. and D.Ć.; writing—original draft preparation, A.B., J.G.G., D.Ć., B.P. and B.K.B.; writing—review and editing, J.G.G. and D.Ć.; supervision, A.B. and G.B. All authors approved the final version to be published and agree to take responsibility for all aspects of the work.

## Declarations

## Competing interests

The authors declare no competing interests.

## Additional information

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