Journal of Affective Disorders 361 (2024) 702–711

Contents lists available at ScienceDirect

Journal of Affective Disorders

journal homepage: www.elsevier.com/locate/jad

Research paper

Problematic social media use and psychological distress in pregnancy: The mediating role of social comparisons and body dissatisfaction

Adele Samra *, Rachel Dryer

School of Behavioural & Health Sciences, Faculty of Health Sciences, Australian Catholic University, Strathfield, New South Wales, Australia

ARTICLE INFO

Keywords:
Problematic social media use
Social media
Social comparisons
Body dissatisfaction
Pregnancy
Psychological distress

ABSTRACT

Background: Pregnancy can be experienced as a significant transition for many women with associated body dissatisfaction, depression, pregnancy-related anxiety, and disordered eating attitudes. Problematic Social Media Use (PSMU) creates abundant opportunities for women to compare themselves with others and expose themselves to sociocultural influences which may increase body dissatisfaction and psychological distress.
Aims: This study examined whether the relationship between PSMU and psychological distress (defined as depression, pregnancy-related anxiety and disordered eating attitudes) was mediated by negative social comparisons and body dissatisfaction.
Method: A sample of 225 pregnant Australian women (M_{age} = 31.91 years, SD_{age} = 4.39) recruited online, completed self-report measures related to the variables of interest. Results: PSMU was associated with higher levels of depression, pregnancy-related anxiety, and disordered eating attitudes. Negative social comparisons and body dissatisfaction partially mediated the relationship between PSMU and pregnancy-related anxiety and depression, and fully mediated the relationship between PSMU and disordered eating attitudes.
Limitations: Cross-sectional nature of the study limited our ability to determine the direction of the relationships. Moreover, the recruitment method via social media led to high rates of non-completion.
Conclusion: The findings of this study suggest that problematic social media usage during pregnancy may increase depression, pregnancy-related anxiety and disordered eating attitudes. This study identified potential pathways that may explain this relationship, (via social comparisons and body dissatisfaction). This study highlights the potentially negative impact of social media use amongst expectant mothers and the importance of screening for body dissatisfaction in routine antenatal care.

Pregnancy is typically a time of immense change as women must accommodate significant physical and physiological changes as well as negotiate their maternal identity (Dryer and Brunton, 2021). Whilst many women adapt well to these changes, others find it challenging leaving them vulnerable to psychological distress. This distress is illustrated by the high rates of anxiety and depression in pregnant women; with prevalence rates for antenatal depression estimated to be between 7 and 20 % (Woody et al., 2017) and for antenatal anxiety to be around 35 % (Lee et al., 2007). Notably, the prevalence rate of general anxiety in pregnant women is much higher than for women in the broader population which has been estimated to be 19.8 % (Hinz and Brähler, 2011). During the antenatal period, there is a distinct form of anxiety that is commonly referred to as pregnancy-related anxiety or pregnancy-specific anxiety. Distinct from general anxiety, this multifaceted anxiety is characterised by fears and worries centred around the pregnancy, childbirth, the well-being of the mother and the unborn baby (Bayrampour et al., 2016). Pregnancy-related anxiety is estimated to affect around 14.4 % of pregnant women (Poikkeus et al., 2006) and is more consistently associated with adverse neonatal outcomes (e.g., preterm birth, low birth weight and infant abnormalities) than general anxiety or depression (Dunkel-Schetter, 2011; Dunkel-Schetter and Tanner, 2012; Zelkowitz and Papageorgiou, 2012). Pregnancy-related anxiety has also been found to significantly and independently predict postnatal depression (Robertson et al., 2004).

Given pregnant women's increased vulnerability for anxiety and depression, it is important to understand the factors that may negatively impact on their psychological well-being and place them at greater risk of psychological distress. These factors include demographic characteristics such as socio-economic status (SES; Daalderop et al., 2023), as SES can influence a person's access to quality medical care which in turn

* Corresponding author at: 5/41 Moira Crescent, Coogee 2034, Australia.
E-mail address: adeles@inlightpsychology.com.au (A. Samra).

https://doi.org/10.1016/j.jad.2024.06.057
Received 6 March 2024; Received in revised form 2 June 2024; Accepted 15 June 2024
Available online 17 June 2024
0165-0327/© 2024 The Authors. Published by Elsevier B.V. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0/).

can contribute to poorer neonatal outcomes (Kim et al., 2018). Other factors include maternal childhood adversity which is associated with decreased psychological wellbeing for pregnant women. (Wohrer et al., 2024). In contrast, social support has been reported to be a protective factor against psychological distress in pregnancy (Bedaso et al., 2021).

Another factor influencing psychological distress in pregnancy is body dissatisfaction, as physical changes to the body are one of the most visible markers of pregnancy. Whilst many women readily accommodate these changes (Clark et al., 2009), others may experience body dissatisfaction, especially those who continue to judge their appearance by their pre-pregnancy size and shape (Chan et al., 2020). Pregnant women like non-pregnant women experience body dissatisfaction from their perception of being larger than their ideal body weight (Tsuchiya et al., 2019). Representations in popular and social media revere "the perfect bump" where the pregnancy-related weight gain is restricted to the stomach area (Hicks and Brown, 2016; Krisjanous et al., 2014) and so called "Yummy Mummies" who remain slender through pregnancy and quickly bounce back to their pre-pregnancy shape (O'Brien Hallstein, 2011). Being a "good mother" is often equated with maintaining the thin ideal of a slim, toned, and desirable physique (O'Brien Hallstein, 2011). Pregnant women may start to internalise this thin ideal, believing that they must limit weight gain to meet societal expectations (Orbach and Rubin, 2014), which may contribute to body dissatisfaction during the pregnancy and postpartum period (Lovering et al., 2018). Body dissatisfaction has been associated with psychological distress in pregnancy (Chan et al., 2018, 2020). For example, body dissatisfaction has been found to predict prenatal and postpartum depression (Fuller-Tyszkiewicz et al., 2012; Silveira et al., 2015), and has been found to fully mediate the relationship between sociocultural pressure to achieve a thin ideal and pregnancy-related anxiety (Dryer et al., 2022c). The finding that body dissatisfaction is associated with depression and anxiety is concerning as depression and anxiety are potential risk factors for disordered eating during pregnancy (Chan et al., 2018).

The relationship between body dissatisfaction and pregnancy is however complex, with some studies showing that body dissatisfaction remains stable or decreases during pregnancy (eg. Clark and Ogden, 1999; Duncombe et al., 2008; Loth et al., 2011) and other studies suggesting that body dissatisfaction increases from the first to third trimester (e.g., Goodwin et al., 2000; Skouteris et al., 2005). While the use of different measures and methodological differences in the study designs may partially explain these inconsistencies, there may be other factors such as age, parity, and gestational week that influence levels of body dissatisfaction during pregnancy. For example, younger women may be more susceptible to sociocultural influences that promote a thin ideal and thereby make them more vulnerable to body dissatisfaction (Dryer et al., 2020). Previous experience of pregnancy may also reduce levels of body dissatisfaction as multiparous women may be more realistic in their expectations of anticipated weight gain, although no studies have specifically examined this issue to date. Body dissatisfaction may also vary depending on the gestational time point at which measures are taken, as women in early stages of pregnancy may have different body image concerns to women in mid to late pregnancy (Nash, 2012; Bergbom et al., 2017).

Women's level of exposure to sociocultural influences is another likely contributing factor for body dissatisfaction (Cafri et al., 2005). Of particular interest to the current study is whether the form of sociocultural pressure exerted by social media platforms (e.g., Facebook, Instagram and Tik Tok) is linked to body dissatisfaction in pregnancy. The Tripartite Influence Model proposes three sociocultural influences (peers, parents, and media) on body dissatisfaction and eating disordered symptomatology via two mechanisms; internalisation of the thin ideal and social comparisons (Keery et al., 2004). Social media platforms, provide two of these sociocultural influences (peers and the media) via both mechanisms proposed in the model; the media or, 'influencers', influence their followers to internalise a thin ideal (e.g., by promoting the "Yummy Mummy" as synonymous with being a good mother (Johnson, 2008); whilst social media platforms themselves provide pregnant women with an arena to make social comparisons with their peers (i.e., other expectant mothers).

Social comparisons can be categorised as follows: upward (where the object of comparison is viewed as superior), downward (where the object of comparison is viewed as inferior) or lateral (where the object of comparison is viewed as equal) (Gerber et al., 2018). As social media users often portray an idealised version of their lives – typically sharing highlights (e.g., glamorous events and exotic holidays) and using filters and air brushing to enhance their images – comparisons are more likely to be upward (Bell, 2019; Chua and Chang, 2016). Therefore, social media users often compare themselves unfavourably believing that others are living a happier and more fulfilled life than themselves (Chou and Edge, 2012; Samra et al., 2022). This negative comparison may increase dissatisfaction with one's own appearance, with studies suggesting that social comparisons mediate the relationship between social media use and body dissatisfaction in the general population (Fardouly and Vartanian, 2015; Scully et al., 2020). Although, there has been very limited research into the relationship between social media and body dissatisfaction during pregnancy; a study by Hicks and Brown (2016) found that owning a Facebook account was associated with higher levels of body dissatisfaction during pregnancy. This study also found that social comparisons played an important role in defining body image with over half of the sample frequently comparing their body to other pregnant women (Hicks and Brown, 2016).

Whilst social media use is normative amongst women in general (pregnant and otherwise), there are concerns about the effects of excessive or 'addictive' patterns of use (Hawi and Samaha, 2017; Hussain and Griffiths, 2018). Social media utilises sophisticated predictive models based on the individual's prior viewing habits, intentionally designed to keep viewers engaged with their platforms as long as possible in order to view advertising. Features such as banners, prompts, reels and autoplay are targeted to the individual's preferences, and likes and comments are designed to be rewarding to keep users returning to the screen. This can lead to Problematic Social Media Use (PSMU), defined as compulsive use of social media despite negative effects to one's health, mental health, well-being, and relationships (Andreassen, 2015). PSMU has consistently been associated with psychological distress (e.g., depression and anxiety) in the general population (Hussain and Griffiths, 2018; Jiang, 2021; Malaeb et al., 2021; Shensa et al., 2017), with longitudinal studies finding evidence to indicate that PSMU is causally linked to psychological distress, and that this relationship is bi-directional (Li et al., 2018; Raudsepp and Kais, 2019). Further, in the general population, problematic internet use has been associated with eating disordered symptomatology, body dissatisfaction, drive for thinness and dietary restraint (Hinojo-Lucena et al., 2019; Ioannidis et al., 2021). Finally, in the general population, social comparisons have been found to mediate the relationship of both social media use and PSMU with psychological distress (Samra et al., 2022; Yoon et al., 2019). However, to our knowledge no studies to date have examined the effects of PSMU during pregnancy.

1. The current study

The main aim of the current study was to address the gap in the literature concerning the association between PSMU and psychological distress during pregnancy (defined as levels of antenatal depression, pregnancy-related anxiety, and disordered eating attitudes; Drapeau et al., 2012; Wolfi and Treasure, 2011) and whether this relationship is mediated by negative social comparisons and body dissatisfaction (as illustrated in Fig. 1). Note that we included disordered eating attitudes as an indicator of psychological distress given (1) the previously reported significant associations between body dissatisfaction, depression, and anxiety in expectant mothers (e.g., Chan et al., 2020; Roomruangwong et al., 2017), and (2) problematic eating behaviours and/or attitudes have been reported during pregnancy (e.g., Chan et al., 2018;

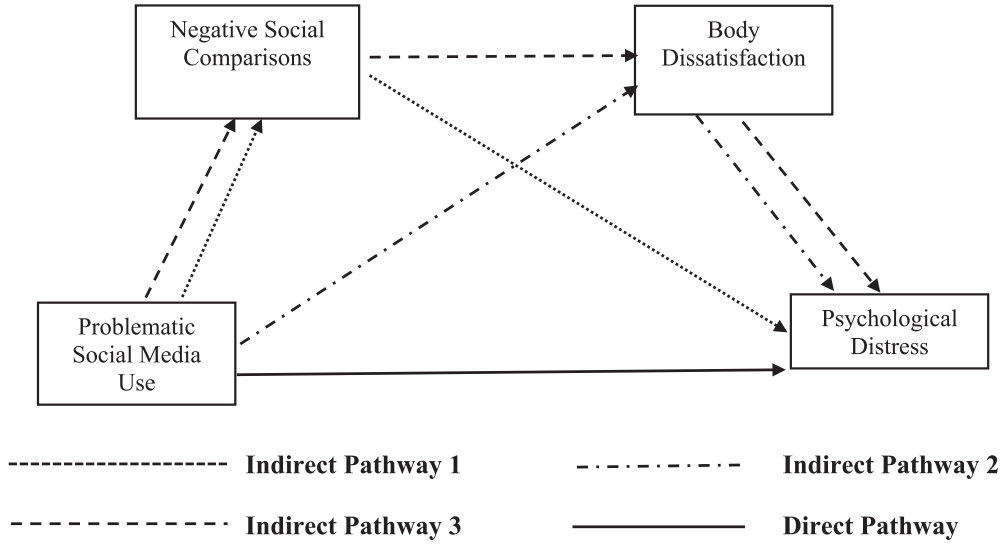


Fig. 1. Direct Hypothesized Serial Mediation Model of Key Variables.

Dryer et al., 2020). We hypothesized that PSMU would be associated with psychological distress (i.e., depression, pregnancy-related anxiety, and disordered eating attitudes); and that negative social comparisons and body dissatisfaction would partially mediate this relationship. Increased time spent using social media and increased frequency of checking social media were also expected to be associated with psychological distress.

2. Method

2.1. Participants

Following human research ethics approval, 432 women logged onto the online questionnaire for the study. Participation was limited to females residing in Australia, between the ages of 18–40 years old who were currently pregnant. As per the requirements of ethics approval, women who self-reported as having a high-risk pregnancy (as identified by their obstetrician/gynaecologist), had recently experienced infant death or miscarriage, or had pregnancies resulting from IVF were excluded to minimise the risk of harm. Participants (N = 207) were removed if they did not meet the inclusion criteria, had incomplete responses on the main measures, or invalid responses, leaving a final sample of 225 participants (M_{age} = 31.91 years, SD_{age} = 4.39, range 19 to 40 years). Participants were predominantly employed, university educated, Anglo-Australians who were currently in a relationship. This was the first child for most participants (67 %) and nearly half (49 %) were in their third trimester of pregnancy (see Table 1).

Table 1
Demographic details of sample.

Measure	N (%)
Ethnicity	
Anglo-Australian	149 (64.5)
Aboriginal/Torres Strait	1 (0.4)
Asian	15 (6.5)
European	55 (23.8)
Other	11 (4.8)
Marital Status	
Single	5 (2.2)
Married/De facto	223 (96.5)
Divorced/Separated	2 (0.9)
Other	1 (0.4)
Education	
High School	13 (5.6)
TAFE	31 (13.4)
University Undergraduate University	95 (41.1)
Postgraduate	89 (38.5)
Other	3 (1.3)
Employment	
Full-time Employed	133 (57.6)
Part time Employed <20 h/week	19 (8.2)
Part time Employed >20 h/week	40 (17.3)
Self Employed	8 (3.5)
Homemaker	21 (9.1)
Unemployed	4 (1.7)
Other	6 (2.6)
Birth Order	
1	155 (67.1)
2	61 (26.4)
3	12 (5.2)
3+	3 (1.3)
Trimester	
1	31 (13.4)
2	86 (37.2)
3	113 (48.9)

2.2. Materials

Participants provided their age, pre-pregnancy and current weight, height, ethnicity, place of birth, education, employment, relationship status, number of children, infant birth order, and gestational week.

To understand the nature of the content participants engaged with on social media they were asked to indicate the content (if any) that they typically follow on social media from the following options; expectant mother's groups, “yummy mummy” influencers, body positive mummy influencers, body positive influencers, fashion influencers, food/nutrition related, celebrities, celebrity mums, sports influencers, fitness influencers, fitness inspiration, thin inspiration, news and current affairs. Multiple responses were permitted.

Frequency of social media use was assessed by asking participants to report their average frequency in checking social media with responses ranging from hourly to never.

Time spent using social media was assessed by asking participants to indicate on average how much time they spend using social media each day with responses ranging from <5 mins to >4 h.

Pregnancy-Related Anxiety Scale - Screener (PrAS-Screener) is a 15-item scale that measures anxiety as specifically related to pregnancy (e.g. I feel I may be harmed during birth; Dryer et al., 2022a, 2022b), rated on a 4-point scale (1 = not at all to 4 = very often). Both convergent and divergent validity have been provided for the PrAS-Screener, as well as excellent internal consistency reliability, α = 0.93 (Dryer et al., 2022a).

An $\alpha = 0.89$ was obtained in the current study.

Edinburgh Postnatal Depression Scale (EPDS) is a 10-item scale assessing depression in pregnancy (Cox et al., 1987). Respondents self-report how they have felt in the past week ("I have felt sad or miserable") with response options ranging from 0 to 3. Higher scores indicate higher levels of depressive symptoms. The EDPS has been validated antenatally as having satisfactory screening validity for antenatal depression and good reliability $\alpha = 0.84$, (Bergink et al., 2011; Cox et al., 1987; Murray and Cox, 1990), including in the current study $\alpha = 0.89$.

Eating Attitudes Test (EAT 26) is an abbreviated version of the EAT 40 which is a widely used self-report eating disorder instrument, (Garner and Garfinkel, 1979). The EAT 26 consists of 26 items designed to diagnose disordered eating symptoms ("I avoid eating when I'm hungry"). Each of the items has six response options ranging from always to never. The EAT 26 is significantly correlated with body image, weight and diet and has good reliability $\alpha = 0.83$, (Koslowsky et al., 1992), including in the current study, $\alpha = 0.82$.

Body Image in Pregnancy Scale measures body image during pregnancy (BIPS, Watson et al., 2017). The BIPs has seven subscales tapping different constructs of body image ("I spend a lot of time thinking about my pregnancy weight"). The 35 items are scored on a 5-point Likert scale. The BIPs has acceptable to excellent reliability across its subscales ranging from $\alpha = 0.69$ to $\alpha = 0.92$, (Watson et al., 2017). An $\alpha = 0.93$ was obtained in this study.

Bergan Social Media Addiction Scale (BSMAS) measures problematic social media use (Andreassen et al., 2016). It consists of six items designed to capture the core features of addiction ("how often have you felt an urge to use social media more and more"), and is consistent with diagnostic addiction criteria (American Psychiatric Association, 2013). Items range from very rarely to very often and are answered on a 5-point Likert scale. Higher scores indicate more problematic social media use. The BSMAS has demonstrated good reliability $\alpha = 0.88$, (Andreassen et al., 2016), including in the current study, $\alpha = 0.84$).

Negative Social Media Comparison Scale (NSMCS) measures how negatively participants compare themselves to others on social media (Samra et al., 2022). The NSMCS consists of seven items ("When I use social media, I feel like other people are having more fun than I am"). Items are answered on a 6-point Likert scale ranging from strongly disagree to strongly agree. Higher scores indicate a negative comparison tendency. The NSMCS has evidence for convergent validity and demonstrated good reliability $\alpha = 0.89$ (Samra et al., 2022), including in the current study, $\alpha = 0.91$.

2.3. Procedure

Boosted Meta/Facebook and Instagram postings contained an invitation to pregnant women and the link to the online questionnaire. The survey took approximately 30 min to complete, and informed consent was obtained via an online consent statement. A small incentive of an opportunity to win one of four gift cards valued at AUD $40.00 was provided. As per human research ethics requirements, participants with total scores on the EPDS greater than or equal to 13 (indicating risk of depressive disorder) received a message with the contact details of support agencies and were advised to contact their GP.

The Monte Carlo Power Analysis for Indirect Effects (Schoemann et al., 2017) was used to conduct a post-hoc power analysis to test the indirect effect of PSMU via negative social comparisons and body dissatisfaction with the three separate measures of psychological distress (depression, pregnancy-related anxiety, and disordered eating attitudes) with a sample size of 225 at an alpha of 0.05. Results indicated that a sample size of 225 achieved an indirect effect with a power of 0.81 for depression, and a power of 1.0 for pregnancy-related anxiety and disordered eating attitudes which is adequate to detect an effect. All data analyses were completed with SPSS (v. 26).

3. Results

3.1. Preliminary analyses

Descriptive statistics for the main outcome measures are reported in Table 2. Inspections of histograms and plots revealed that the assumptions of normality were violated for the EAT-26 variable, which was positively skewed as the majority of the sample demonstrated low levels of disordered attitudes to eating. Considering, the violations of assumptions, the more conservative Spearman's correlation analysis which is also appropriate for categorical variables was used to determine which demographic variables would be included as covariates in the main analyses (see Table 3). Only gestational week had small significant negative correlations with the measures of psychological distress (EPDS, PrAS-Screener and EAT-26), such that lower levels of distress was experienced the further along they were in their pregnancy. Spearman's correlations indicated there were no significant correlations between any of the other demographic variables (age, parity, BMI, employment, education and marital status) ($p > 0.05$) and the measures of interest. Therefore, only gestational week was included as a covariate in the mediation analyses. It is noted that five participants, (2.2 % of the sample) viewed thin inspiration content.

As shown in Table 3, the amount of time that participants spent using social media and the frequency with which they checked social media had small significant correlations with PSMU, NSMCS, body dissatisfaction (BIPS) and pregnancy-related anxiety (PrAS-Screener). The time spent using social media also had a small significant correlation with depression (EDPS) and the time spent checking social media had a small significant correlation with eating attitudes (EAT-26). Note that the size of the correlations between these two measures of social media use and variables of interest (i.e., NSMCS, body dissatisfaction, psychological distress measures) were smaller than the size of the correlations found for PSMU and these variables.

PSMU, negative social comparisons, body image, and the measures of psychological distress were all significantly correlated with each other with small to large effect sizes (0.25–0.68, see Table 3,) as classified by Cohen (1992). Given these findings, we proceeded to test the model for all three psychological distress outcome variables (i.e., depression, pregnancy-related anxiety and disordered eating attitudes).

3.2. Mediation analyses

Mediation analyses using Hayes' (2013) PROCESS macro (4) with 5000 iterations in SPSS were conducted to test the mediation model illustrated in Fig. 1. The assumptions of linearity and homoscedasticity of residuals were violated for the measure of disordered eating attitudes (EAT-26). Therefore, the *p*-values and confidence intervals we report for direct and indirect effects for the mediation model exploring the effects on disordered eating attitudes have been corrected in PROCESS by the

Table 2
Descriptive Statistics for Key Measures.

Measure	Mean (SD)	Minimum – Maximum
Problematic Social Media Use	14.1 (4.99)	6–28
Negative Social Comparisons	26.33 (7.86)	7–42
Body Image (BIPS)	93.75	47–159
Depression (EPDS) [a]	(19.54)	2–21
Anxiety (PrAS-Screener)	8.76 (4.44)	15–59
Disordered Attitudes to Eating (EAT-26)	29.4 (8.43)	0–36
	5.77 (6.52)	

Note. $N = 231$. [a]26.2 % of pregnant women met the cut off indicating risk of depression (a score ≥ 13).
BIPS = Body Image in Pregnancy Scale, EPDS = Edinburgh Postnatal Depression Scale, PrAS-Screener = Pregnancy-related Anxiety Scale – Screener, EAT-26 = Eating Attitudes Test.

Table 3
Correlations for Demographic and Key Variables.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Age	–														
2. Gestation	0.04	–													
3. Birth Order	0.15*	0.01	–												
4. PrepregBMI	−0.06	0.13	0.01	–											
5. PregBMI	−0.07	0.37**	0	0.92**	–										
6. Employment	0	−0.05	−0.45**	0	0	–									
7. Education	0.29**	−0.07	−0.16*	−0.07	−0.11	0.16*	–								
8. Marital status	−0.05	−0.07	−0.06	0.11	0.06	0	0.09	–							
9. Checking SM	−0.03	0.01	0.11	0.22**	0.23**	0.03	0	−0.03	–						
10. Time SM	−0.16*	0.16*	0.02	0.30**	0.35**	0	−0.18**	−0.04	0.50**	–					
11. PSMU	−0.04	−0.16*	0.08	0.03	0.03	−0.02	−0.08	−0.01	0.39**	0.40**	–				
12. PRAS	−0.13	−0.14*	−0.02	0.06	0.02	0.02	−0.10	−0.12	0.23**	0.24**	0.47**	–			
13. EDPS	−0.11	−0.07	0.08	0.03	−0.01	−0.01	−0.13	−0.08	0.13	0.20**	0.48**	0.68**	–		
14. EAT-26	−0.12	−0.20**	0.03	0.02	−0.03	0.03	−0.05	−0.06	0.21**	0.05	0.25**	0.45**	0.34**	–	
15. NSMCS	−0.04	−0.09	0.06	0.07	0.06	−0.04	−0.04	0	0.14*	0.26**	0.50**	0.58**	0.55**	0.32**	–
16. BIPS	−0.13	−0.11	0.07	0.08	0.09	0.02	−0.08	−0.01	0.17*	0.14*	0.37**	0.60**	0.50**	0.52**	0.55**

Note. $p < 0.05$, $^{**}p < 0.01$. PrepregBMI = Pre-pregnancy BMI. Preg BMI = Pregnancy BMI. SM = Social Media. PSMU = Problematic Social Media Use. PRAS = Pregnancy Related Anxiety Scale. EDPS = Edinburgh Postnatal Depression Scale. EAT = Eating Attitudes Test. NSMCS = Negative Social Media Comparison Scale. BIPS = Body Image in Pregnancy Scale.

HC3 standard error estimator (MacKinnon and White, 1985).

Three serial mediation models, using the three measures of psychological distress as separate outcome variables, (depression, pregnancy-related anxiety, and disordered eating attitudes) examined the influence of (X) PSMU on (Y) psychological distress through (M^1) negative social comparisons (M^2) and body dissatisfaction. Negative social comparisons and body dissatisfaction were examined as independent mediators, with gestation included as a covariate, (see Figs. 2, 3 & 4 in Appendix A for beta values, and Table 4 for the indirect effects and effect sizes).

As shown in Table 4, for the model examining the effect of PSMU on depression via negative social comparisons and body dissatisfaction (total model $R^2 = 0.40$, $F = 36.73$), the direct pathway between PSMU and depression was significant ($\beta = 0.19$, $t(225) = 4.44$, $p < 0.01$). Negative social comparisons partially mediated the relationship between PSMU and depression (i.e., indirect pathway 1). Body dissatisfaction also partially meditated the relationship between PSMU and depression (i.e., indirect pathway 2). The effect of PSMU on depression was also partially mediated by both negative social comparisons and body dissatisfaction (i.e., indirect pathway 3).

For the model examining the effect of PSMU on pregnancy-related anxiety via negative social comparisons and body dissatisfaction (total model $R^2 = 0.46$, $F = 48.93$), the direct pathway between PSMU and pregnancy-related anxiety was significant ($\beta = 0.13$, $t(231) = 3.30$, $p < 0.01$). Negative social comparisons partially mediated the relationship between PSMU and pregnancy-related anxiety (i.e., indirect pathway 1). However, body dissatisfaction did not independently meditate the relationship between PSMU and pregnancy-related anxiety (i.e., indirect pathway 2). Rather, body dissatisfaction with negative social comparisons partially mediated the effect of PSMU on pregnancy-related anxiety (i.e., indirect pathway 3).

For the model examining the effect of PSMU on disordered eating attitudes via negative social comparisons and body dissatisfaction (total model $R^2 = 0.29$, $F = 20.77$), the direct pathway between PSMU and disordered eating attitudes was not significant ($\beta = 0.04$, $t(230) = 1.68$, $p = 0.09$). Neither negative social comparisons (i.e., indirect pathway 1) nor body dissatisfaction (i.e., indirect pathway 2) independently mediated the relationship between PSMU and disordered eating attitudes. Notably, the effect of PSMU on disordered eating attitudes was fully mediated by both negative social comparisons and body dissatisfaction (i.e., indirect pathway 3).

4. Discussion

Given the reported association between sociocultural influences and psychological distress during pregnancy (Dryer et al., 2022c; Hicks and Brown, 2016), this study examined whether PSMU would predict psychological distress in pregnant women (i.e., depression, pregnancy-related anxiety, and disordered eating attitudes/behaviour), and whether this relationship would be mediated by negative social comparisons and body dissatisfaction. Whist previous studies have examined the relationship between Facebook use and body dissatisfaction in pregnant women (Hicks and Brown, 2016), to the authors' knowledge this is the first study to examine the links between social media use and psychological distress in a pregnant population.

In this sample approximately 26 % of participants had a score >13 on the EDPS which is the recommended cut-off score to indicate possible antenatal depression (Boyce et al., 1993). This finding is relatively consistent with the prevalence rates for depression in pregnant women (Woody et al., 2017). Of the demographic variables, only gestational week was negatively associated with psychological distress (depression, pregnancy-related anxiety, and disordered eating attitudes) such that the further along women were in their pregnancy the less psychological distress they experienced. This is consistent with a study by Ding et al. (2015) which found that pregnancy-related anxiety decreased from the first to third trimester. However, worth noting is that other studies have

Table 4
Effects of PSMU on psychological distress through a tendency for negative social media comparisons and body dissatisfaction.

	IV → M [R^2]	M^1 → M^2	M → DV	IV → DV (Direct effect)	IV → DV [R^2] (Indirect effect: Pathway 3)	95 % CI (Pathway 3)
DV: Depression						
IV: PSMU				0.19**	0.03 [0.40]	0.01–0.06
M^1: NSMCS	0.67** [0.24]	0.23**	0.14**			
M^2: Body dissatisfaction	0.12* [0.34]		0.22**			
DV:Pregnancy-related Anxiety						
IV: PSMU				0.13**	0.06 [0.46]	0.03–0.08
M^1: NSMCS	0.66* [0.24]	0.24**	0.13**			
M^2: Body dissatisfaction	0.09 [0.32]		0.36**			
DV: Disordered Eating Attitudes[a]						
IV: PSMU				0.04	0.03 [0.29]	0.02–0.04
M^1: NSMCS	0.66** [0.24]	0.24**	0.01			
M^2: Body dissatisfaction	0.09 [0.32]		0.17**			

Note. Unstandardized regression coefficients are reported. [a]All effects for Disordered Eating Attitudes have been corrected by the HC3 estimator. CI = Confidence Intervals. CIs are for Indirect Pathway 3, and those not including zero indicate a statistically significant indirect effect. $*p < 0.05, **p < 0.01$. PSMU = Problematic Social Media Use. NSMCS = Negative Social Media Comparison Scale.

found that pregnancy-related anxiety remained stable or increased from first to third trimester (Madhavanprabhakaran et al., 2015; Mudra et al., 2020;), suggesting that gestational week may have a variable relationship with psychological distress. The stronger relationship between PSMU and all three measures of psychological distress in comparison to the amount of time or the frequency with which pregnant women check social media is consistent with previous studies (Samra et al., 2022: Shensa et al., 2017) indicating that using social media problematically may be associated with greater psychological distress than simple measures of social media use.

PSMU, was directly associated with antenatal depression, and negative social comparisons and body dissatisfaction partially mediated this relationship, both independently and together (i.e indirect pathways 1 2 & 3). This is consistent with the findings reported in the literature where PSMU and body dissatisfaction have both been linked with depression in adolescent females as well as pregnant and non-pregnant women (Fuller-Tyszkiewicz et al., 2012; Li et al., 2018; Raudsepp and Kais, 2019; Silveira et al., 2015). This is also consistent with previously reported findings that social comparisons mediate the relationship between social media use and depression (Samra et al., 2022; Yoon et al., 2019), as well as the relationship between social media use and body dissatisfaction (Fardouly and Vartanian, 2015; Scully et al., 2020). Notably, these findings identify potential mechanisms linking PSMU to antenatal depression in pregnant women; using social media problematically may increase the likelihood of comparing yourself negatively to others on social media, and/or the likelihood of being dissatisfied with your body, both of which are linked to antenatal depression. This is of concern as antenatal depression is associated with adverse neonatal outcomes (pre-term birth and low birth weight; Jarde et al., 2016) as well as increased risk of postnatal depression (Faisal-Cury and Menezes, 2012; Underwood et al., 2016).

PSMU was also directly associated with pregnancy-related anxiety with negative social comparisons partially mediating this relationship (i.e., indirect pathway 1). Both negative social comparisons and body dissatisfaction also partially mediated the relationship between PSMU, and pregnancy-related anxiety (i.e., indirect pathway 3). However, body dissatisfaction did not independently mediate the relationship between PSMU and pregnancy-related anxiety (ie. indirect pathway 2). In other words, body dissatisfaction only significantly predicted pregnancy-related anxiety when negative social comparisons were included. Whilst there have been few studies examining this effect during pregnancy, PSMU has been linked with anxiety (Jiang, 2021; Malaeb et al., 2021) in the general population. Moreover, body dissatisfaction has been found to fully mediate the relationship between sociocultural pressure to attain a thin ideal and pregnancy-related anxiety during pregnancy (Dryer et al., 2022a, 2022b, 2022c). Notably, our findings indicate that body dissatisfaction is not necessary for PSMU to be associated with pregnancy-related anxiety, and it is only via negative social comparisons that body dissatisfaction is associated with pregnancy-related anxiety. Therefore, social comparisons may be a key mechanism through which PSMU is linked with pregnancy-related anxiety. Pregnant women who use social media problematically and compare themselves unfavourably to others on social media may feel more insecure about themselves as future mothers (rather than just being dissatisfied with their bodies) which in turn may increase their fear, worries and concerns regarding their pregnancy. Again, this is of concern as pregnancy related anxiety is associated with adverse neonatal outcomes (preterm birth, low birth weight and infant abnormalities; Dunkel-Schetter, 2011; Dunkel-Schetter and Tanner, 2012; Zelkowitz and Papageorgiou, 2012) and predicts postnatal depression (Robertson et al., 2004).

Finally, negative social comparisons and body dissatisfaction fully mediated the relationship between PSMU, and disordered eating attitudes (i.e., a significant indirect pathway 3). These findings are consistent with recent meta-analyses which found that in the general population problematic internet use is associated with eating disorder psychopathology, drive for thinness and dietary restraint (Hinojo-Lucena et al., 2019; Ioannidis et al., 2021). It is notable that in this study PSMU was associated with disordered eating attitudes only via negative social comparisons and body dissatisfaction, indicating that it is this pathway, (using social media problematically, comparing oneself negatively to others and then feeling worse about your own body), that is linked with disordered eating attitudes. These findings suggest that for pregnant women who engage in PSMU, it may be advisable to reduce social media use as negative social comparisons can increase body dissatisfaction and the risk of disordered eating behaviours. Disordered eating during pregnancy is particularly concerning as pregnant women's nutritional intake has been linked with their child's later visual spatial skills, intelligence, and executive functioning (Mahmassani et al., 2022). Therefore, disordered eating during pregnancy could lead to deficits in the child's later cognitive functioning and abilities.

Overall, the findings of the current study indicate that PSMU has a unique relationship with each of the measures of psychological distress. The findings are also consistent with the Tripartite Influence Model (Keery et al., 2004), as the pathways via both media and peers (as investigated using social media and a tendency for social comparisons) were associated with body dissatisfaction and disordered eating.

4.1. Strengths and limitations

Strengths of this study include the examination of the pathway between PSMU and psychological distress via three separate measures of psychological distress (depression, pregnancy related anxiety and disordered eating attitudes) and the examination of the mechanisms

linking PSMU with psychological distress. However, there are methodological limitations in the current study that constrain the generalizability of the findings. In order to obtain ethical approval to conduct the study, we were required to reduce the risk of psychological harm to participants who may be more vulnerable (i.e., women over 40 years of age, whose pregnancy had been identified as high risk by a medical practitioner, women using IVF and women who had recently experienced an infant death). Further limitations include the cross-sectional nature of the study which limited our ability to determine the direction of the relationships between variables. Future prospective and/or longitudinal studies should examine the causal relationship between these variables. Another key limitation is that the study did not include measures to capture whether women were accessing quality medical care or receiving adequate social support. Social support has been shown to be a protective factor for psychological distress in pregnancy (Bedaso et al., 2021) and therefore should be explored in future studies. An additional limitation is the data recruitment method via social media as there were high rates of non-completion and a high proportion of responses 48 % were removed due to non-completion of the key measures or suspicious responses. There may also have been self-selection bias, with, participants selecting themselves into the study. However, this recruitment method was appropriate given that the goal was to recruit participants with PSMU. Finally, there are the limitations associated with collecting self-report data as the measures may reflect the participant's current mood state rather than a more stable measure of psychological distress. To overcome this limitation future studies should consider using ecological momentary assessment, to obtain repeat measures of participants levels of psychological distress.

Some pregnant women are likely to experience greater psychological vulnerability on account of the significant physical, social and emotional changes associated with pregnancy; therefore, it is important to consider factors that may influence their well-being such as sociocultural pressures via social media. Our findings suggest that PSMU is associated with psychological distress in pregnant women, including antenatal depression, pregnancy-related anxiety, and disordered eating attitudes. Moreover, the findings of this study suggest that social comparisons and body dissatisfaction may be key mechanisms linking PSMU with psychological distress. The current findings suggest that it may be advisable for health professionals to explore body dissatisfaction in the delivery of antenatal care particularly in expectant mothers who report body-image related concerns along with depression and anxiety-related symptomatology. Further, social media use may need to be explored and monitored in vulnerable pregnant populations (i.e., those with a previous history of mental health difficulties, or those who are at risk of psychological distress). Finally, education campaigns aimed at pregnant women and perinatal health professionals may need to include information regarding the risks associated with excessive social media use. These risks include the potential for negative social comparisons, which are linked to increased body dissatisfaction and psychological distress – potentially leading to worse maternal and neonatal outcomes.

This research was partly funded by a Faculty of Health Science (Australian Catholic University) student research support scheme.

CRediT authorship contribution statement

Adele Samra: Writing – review & editing, Writing – original draft, Visualization, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Rachel Dryer:** Writing – review & editing, Supervision, Methodology, Conceptualization.

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 manuscript.

Appendix A. Figures

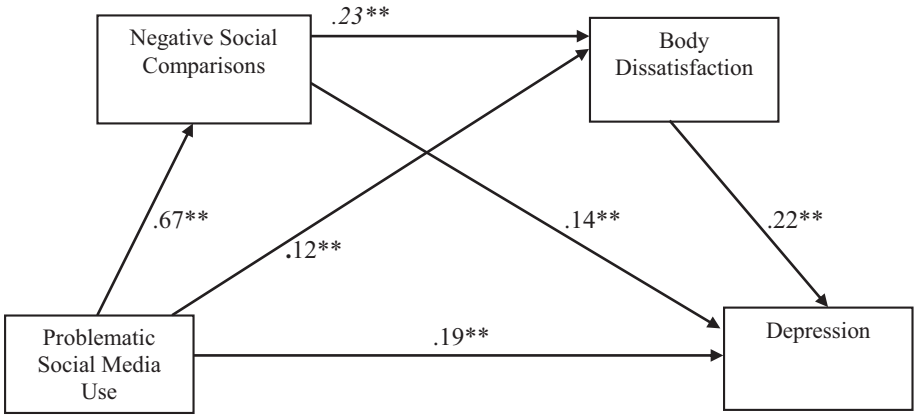


Fig. 2. Serial Mediation Model with Beta Values: Outcome Depression.
Note. $p < 0.05$, $^{**}p < 0.01$.

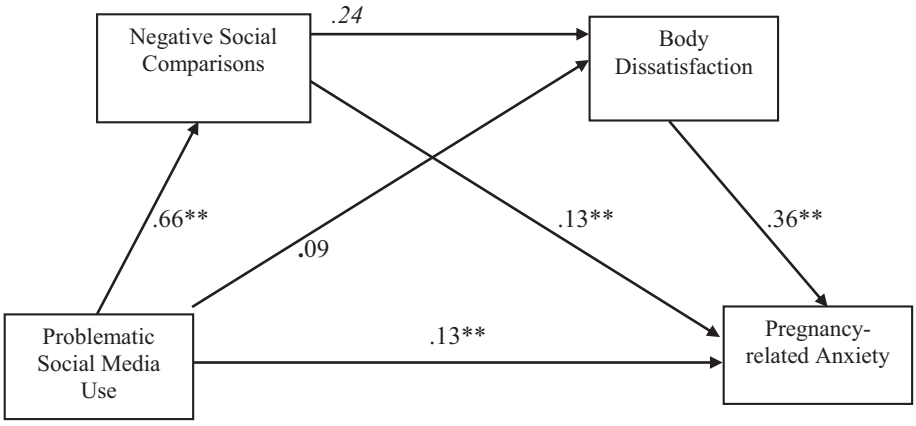


Fig. 3. Serial Mediation Model with Beta Values: Outcome Pregnancy-related Anxiety.
Note. $p < 0.05$, $^{**}p < 0.01$.

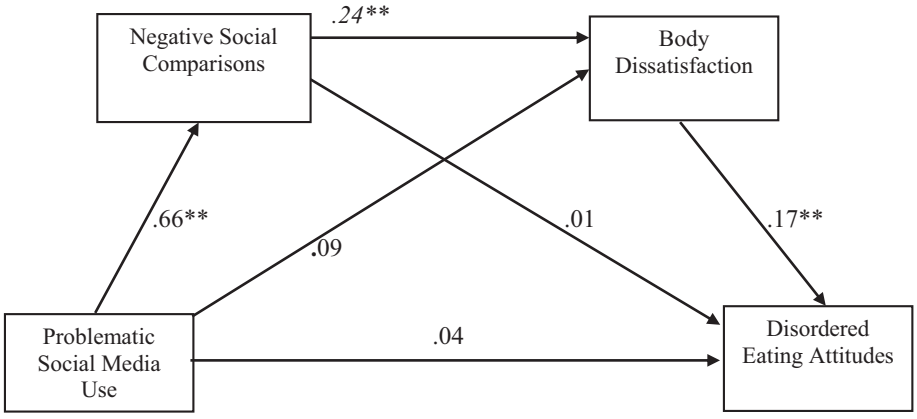


Fig. 4. Serial Mediation Model with Beta Values: Outcome Disordered Eating Attitudes.
Note. $p < 0.05$, $^{**}p < 0.01$.

References

American Psychiatric Association, 2013. Diagnostic and statistical manual of mental disorders, 5th ed. https://doi.org/10.1176/appi.books.9780890425596

Andreassen, C.S., 2015. Online social network site addiction: A comprehensive review. Curr. Addict. Rep. 2 (2), 175–184. https://doi.org/10.1007/s40429-015-0056-9.

Andreassen, C.S., Billieux, J., Griffiths, M.D., Kuss, D.J., Demetrovics, Z., Mazzoni, E., Pallesen, S., 2016. The relationship between addictive use of social media and video games and symptoms of psychiatric disorders: A large-scale cross-sectional study. Psychol. Addict. Behav. 30 (2), 252. https://doi.org/10.1037/adb0000160.

Bayrampour, H., Ali, E., Mcneil, D.A., Benzies, K., Macqueen, G., Tough, S., 2016. Pregnancy-related anxiety: A concept analysis. Int. J. Nurs. Stud. 55, 115–130. https://doi.org/10.1016/j.ijnurstu.2015.10.023.

Bedaso, A., Adams, J., Peng, W., Sibbritt, D., 2021. The relationship between social support and mental health problems during pregnancy: a systematic review and meta-analysis. Reprod. Health 18, 1–23. https://doi.org/10.1186/s12978-021-01209-5.

Bell, B.T., 2019. "You take fifty photos, delete forty nine and use one": A qualitative study of adolescent image-sharing practices on social media. International Journal of Child-Computer Interaction 20, 64–71.

Bergbom, I., Modh, C., Lundgren, I., Lindwall, L., 2017. First-time pregnant women's experiences of their body in early pregnancy. Scand. J. Caring Sci. 31 (3), 579–586. https://doi.org/10.1111/scs.12372.

Bergink, V., Kooistra, L., Lambregtse-van den Berg, M.P., Wijnen, H., Bunevicius, R., Van Baar, A., Pop, V., 2011. Validation of the Edinburgh Depression Scale during pregnancy. J. Psychosom. Res. 70 (4), 385–389. https://doi.org/10.1016/j.jpsychores.2010.07.008.

Boyce, P., Stubbs, J., Todd, A., 1993. The Edinburgh postnatal depression scale: validation for an Australian sample. Aust. N. Z. J. Psychiatry 27 (3), 472–476. https://doi.org/10.3109/00048679309075805.

Cafri, G., Yamamiya, Y., Brannick, M., Thompson, J.K., 2005. The influence of sociocultural factors on body image: A meta-analysis. Clin. Psychol. Sci. Pract. 12 (4), 421. https://doi.org/10.1093/clipsy.bpi053.

Chan, C.Y., Lee, A.M., Koh, Y.W., Lam, S.K., Lee, C.P., Leung, K.Y., Tang, C.S.K., 2018. Course, risk factors, and adverse outcomes of disordered eating in pregnancy. International Journal of Eating Disorders 52, 652–658. https://doi.org/10.1002/eat.23065.

Chan, C.Y., Lee, A.M., Koh, Y.W., Lam, S.K., Lee, C.P., Leung, K.Y., Tang, C.S.K., 2020. Associations of body dissatisfaction with anxiety and depression in the pregnancy and postpartum periods: A longitudinal study. J. Affect. Disord. 263, 582–592. https://doi.org/10.1016/j.jad.2019.11.032.

Chou, H.T.G., Edge, N., 2012. "They are happier and having better lives than I am": the impact of using Facebook on perceptions of others' lives. Cyberpsychol. Behav. Soc. Netw. 15 (2), 117–121. https://doi.org/10.1089/cyber.2011.0324.

Chua, T.H.H., Chang, L., 2016. Follow me and like my beautiful selfies: Singapore 1 teenage girls' engagement in self-presentation and peer comparison on social media. Computers in Human Behavior 55, 190–197.

Clark, M., Ogden, J., 1999. The impact of pregnancy on eating behaviour and aspects of weight concern. Int. J. Obes. (Lond) 23, 18–24. https://doi.org/10.1038/sj.ijo.0800747.

Clark, A., Skouteris, H., Wertheim, E.H., Paxton, S.J., Milgrom, J., 2009. My baby body: A qualitative insight into women's body-related experiences and mood during pregnancy and the postpartum. Journal of Reproductive Infant Psychology 27 (4), 330–345. https://doi.org/10.1080/02646830903190904.

Cohen, J., 1992. Quantitative methods in psychology: A power primer. In: Psychological Bulletin. https://doi.org/10.1037/0033-2909.112.1.155.

Cox, J.M., Holden, J.M., Sagovsky, R., 1987. Detection of postnatal depression: development of the 10-item Edinburgh postnatal depression scale. Behavior Journal of Psychiatry 150, 782–786. https://doi.org/10.1192/bjp.150.6.782.

Daalderop, L.A., Lagendijk, J., Steegers, E.A., El Marroun, H., Posthumus, A.G., 2023. Psychological distress during pregnancy and adverse maternal and perinatal health outcomes: the role of socioeconomic status. Int. J. Gynecol. Obstet. 163 (3), 920–930. https://doi.org/10.1002/ijgo.14891.

Ding, X., Mao, L., Ge, X., Xu, S., Pan, W., Yan, S., Tao, F., 2015. Course and risk factors of maternal pregnancy-related anxiety across pregnancy in Ma'anshan city. Wei Sheng yan jiu= Journal of Hygiene Research 44 (3), 371–375. https://europepmc.org/article/med/26137612.

Drapeau, A., Marchand, A., Beaulieu-Prevost, D., 2012. Epidemiology of psychological distress. In: LAbate, L. (Ed.), (2012). Mental illnesses - understanding, prediction and control (pp. 105-134). InTech. https://doi.org/10.5772/30872.

Dryer, R., Brunton, R. (Eds.), 2021. Pregnancy-Related Anxiety: Theory, Research, and Practice. Routledge. https://doi.org/10.4324/9781003014003.

Dryer, R., von der Schulenburg, I.G., Brunton, R., 2020. Body dissatisfaction and Fat Talk during pregnancy: predictors of distress. J. Affect. Disord. 267, 289–296. https://doi.org/10.1016/j.jad.2020.02.031. Epub 2020 Feb 11. PMID: 32217229.
Dryer, R., Brunton, R., He, D., Lee, E., 2022a. Psychometric properties of the pregnancy-related anxiety scale—screener. Psychol. Assess. https://doi.org/10.1037/pas0001110.
Dryer, R., Brunton, R., Krägeloh, C., Medvedev, O., 2022b. Screening for pregnancy-related anxiety: Evaluation of the Pregnancy-Related Anxiety Scale–Screener using Rasch methodology. Assessment. https://doi.org/10.1177/10731911221103309.
Dryer, R., Chee, P., Brunton, R., 2022c. The role of body dissatisfaction and self-compassion in pregnancy-related anxiety. J. Affect. Disord. 313, 84–91. https://doi.org/10.1016/j.jad.2022.06.068.
Duncombe, D., Wertheim, E.H., Skouteris, H., Paxton, S.J., Kelly, L., 2008. How well do women adapt to changes in their body size and shape across the course of pregnancy? J. Health Psychol. 13 (4), 503–515. https://doi.org/10.1177/1359105308088521.
Dunkel-Schetter, C., 2011. Psychological science on pregnancy: stress processes, biopsychosocial models, and emerging research issues. Annual Review Psychology 62, 531–558. https://doi.org/10.1146/annurev.psych.031809.130727.
Dunkel-Schetter, C., Tanner, L., 2012. Anxiety, depression, and stress in pregnancy: implications for mothers, children, research, and practice. Curr. Opin. Psychiatry 25 (2), 141–148. https://doi.org/10.1097/YCO.0b013e3283503680.
Faisal-Cury, A., Menezes, P.R., 2012. Antenatal depression strongly predicts postnatal depression in primary health care. Brazilian Journal of Psychiatry 34, 446–450. https://doi.org/10.1016/j.rbp.2012.01.003.
Fardouly, J., Vartanian, L.R., 2015. Negative comparisons about one's appearance mediate the relationship between Facebook usage and body image concerns. Body Image 12, 82–88. https://doi.org/10.1016/j.bodyim.201410.004.
Fuller-Tyszkiewicz, M., Skouteris, H., Watson, B.E., Hill, B., 2012. Body dissatisfaction during pregnancy: A systematic review of cross-sectional and prospective correlates. J. Health Psychol. 18 (11), 1411–1421. https://doi.org/10.1177/1359105312462437.
Garner, D.M., Garfinkel, P.E., 1979. The eating attitudes test: an index of the symptoms of anorexia nervosa. Psychol. Med. 9, 273–279. https://doi.org/10.1017/S0033291700030762.
Gerber, J.P., Wheeler, L., Suls, J., 2018. A social comparison theory meta-analysis 60+ years on. Psychol. Bull. 144 (2), 177–197. https://doi.org/10.1037/bul0000127.
Goodwin, A., Astbury, J., McMeeken, J., 2000. Body image and psychological well-being in pregnancy. A comparison of exercisers and non-exercisers. Aust. N. Z. J. Obstet. Gynaecol. 40 (4), 442–447. https://doi.org/10.1111/j.1479-828x.2000.tb01178.x.
Hawi, N.S., Samaha, M., 2017. The relations among social media addiction, self-esteem, and life satisfaction in university students. Soc. Sci. Comput. Rev. 35 (5), 576–586. https://doi.org/10.1177/0894439316660340.
Hayes, A., 2013. Introduction to mediation, moderation, and conditional process analysis. Journal of Education Measures 51 (3), 35–37.
Hicks, S., Brown, A., 2016. Higher Facebook use predicts greater body image dissatisfaction during pregnancy: the role of self-comparison. Midwifery 40, 132–140. https://doi.org/10.1016/j.midw.2016.06.018.
Hinojo-Lucena, F.J., Aznar-Díaz, I., Cáceres-Reche, M.P., Trujillo-Torres, J.M., Romero-Rodríguez, J.M., 2019. Problematic internet use as a predictor of eating disorders in students: A systematic review and meta-analysis study. Nutrients 11 (9), 2151.
Hinz, A., Brähler, E., 2011. Normative values for the hospital anxiety and depression scale (HADS) in the general German population. J. Psychosom. Res. 71 (2), 74–78. https://doi.org/10.1016/j.jpsychores.2011.01.005.
Hussain, Z., Griffiths, M.D., 2018. Problematic social networking site use and comorbid psychiatric disorders: A systematic review of recent large-scale studies. Front. Psych. 9, 686. https://doi.org/10.3389/fpsyt.2018.00686.
Ioannidis, K., Taylor, C., Holt, L., Brown, K., Lochner, C., Fineberg, N.A., Czabanowska, K., 2021. Problematic usage of the internet and eating disorder and related psychopathology: A multifaceted, systematic review and meta-analysis. Neurosci. Biobehav. Rev. 125, 569–581. https://doi.org/10.1016/j.neubiorev.2021.03.005.
Jarde, A., Morais, M., Kingston, D., Giallo, R., MacQueen, G.M., Giglia, L., McDonald, S. D., 2016. Neonatal outcomes in women with untreated antenatal depression compared with women without depression: a systematic review and meta-analysis. JAMA Psychiatry 73 (8), 826–837. https://doi.org/10.1001/jamapsychiatry.2016.0934.
Jiang, Y., 2021. Problematic social media usage and anxiety among university students during the COVID-19 pandemic: the mediating role of psychological capital and the moderating role of academic burnout. Front. Psychol. 12, 612007 https://doi.org/10.3389/fpsyg.2021.612007.
Johnson, A., 2008. The yummy mummy manifesto: baby, beauty, balance, and bliss. Ballantine Books. ISBN: 0812975820, 9780812975826.
Keery, H., Van den Berg, P., Thompson, J.K., 2004. An evaluation of the tripartite influence model of body dissatisfaction and eating disturbance with adolescent girls. Body Image 1 (3), 237–251. https://doi.org/10.1016/j.bodyim.2004.03.001.
Kim, M.K., Lee, S.M., Bae, S.H., Kim, H.J., Lim, N.G., Yoon, S.J., Jo, M.W., 2018. Socioeconomic status can affect pregnancy outcomes and complications, even with a universal healthcare system. Int. J. Equity Health 17, 1–8. https://doi.org/10.1186/s12939-017-0715-7.
Koslowsky, M., Scheinberg, Z., Bleich, A., Mark, M., Apter, A., Danon, Y., Solomon, Z., 1992. The factor structure and criterion validity of the short form of the eating attitudes test. J. Pers. Assess. 58 (1), 27–35. https://doi.org/10.1207/s15327752jpa5801_3.
Krisjanous, J., Richard, J.E., Gazley, A., 2014. The perfect little bump: does the media portrayal of pregnant celebrities influence prenatal attachment? Psychol. Mark. 31 (9), 758–773. https://doi.org/10.1002/mar.20732.
Lee, A.M., Lam, S.K., Lau, S.M.S.M., Chong, C.S.Y., Chui, H.W., Fong, D.Y.T., 2007. Prevalence, course, and risk factors for antenatal anxiety and depression. J. Obstet. Gynaecol. 110 (5), 1102–1112. https://doi.org/10.1097/01.AOG.0000287065.59491.70.
Li, J.B., Mo, P.K., Lau, J.T., Su, X.F., Zhang, X., Wu, A.M., Chen, Y.X., 2018. Online social networking addiction and depression: the results from a large-scale prospective cohort study in Chinese adolescents. J. Behav. Addict. 7 (3), 686–696. https://doi.org/10.1556/2006.7.2018.69.
Loth, K.A., Bauer, K.W., Wall, M., Berge, J., Neumark-Sztainer, D., 2011. Body satisfaction during pregnancy. Body Image 8 (3), 297–300. https://doi.org/10.1016/j.bodyim.2011.03.002.
Lovering, M.E., Rodgers, R.F., George, J.E., Franko, D.L., 2018. Exploring the tripartite influence model of body dissatisfaction in postpartum women. Body Image 24, 44–54. https://doi.org/10.1016/j.bodyim.2017.12.001.
MacKinnon, J.G., White, H., 1985. Some heteroscedasticity consistent covariance matrix estimators with improved finite sample properties. J. Econ. 29, 305–325. https://doi.org/10.1016/0304-4076(85)90158-7.
Madhavanprabhakaran, G., D'Souza, M.S., Nairy, K.S., 2015. Prevalence of pregnancy anxiety and associated factors. International Journal of Africa Nursing Sciences 3, 1–7. https://doi.org/10.1016/j.ijans.2015.06.002.
Mahmassani, H.A., Switkowski, K.M., Scott, T.M., Johnson, E.J., Rifas-Shiman, S.L., Oken, E., Jacques, P.F., 2022. Maternal diet quality during pregnancy and child cognition and behavior in a US cohort. Am. J. Clin. Nutr. 115 (1), 128–141.
Malaeb, D., Salameh, P., Barbar, S., Awad, E., Haddad, C., Hallit, R., Hallit, S., 2021. Problematic social media use and mental health (depression, anxiety, and insomnia) among Lebanese adults: any mediating effect of stress? Perspect. Psychiatr. Care 57 (2), 539–549. https://doi.org/10.1111/ppc.12576.
Mudra, S., Göbel, A., Barkmann, C., Goletzke, J., Hecher, K., Schulte-Markwort, M., Arck, P., 2020. The longitudinal course of pregnancy-related anxiety in parous and nulliparous women and its association with symptoms of social and generalized anxiety. J. Affect. Disord. 260, 111–118. https://doi.org/10.1016/j.jad.2019.08.033.
Murray, D., Cox, J.L., 1990. Screening for depression during pregnancy with the Edinburgh Postnatal Depression Scale (EPDS). J. Reprod. Infant Psychol. 8, 99–107. https://doi.org/10.1080/02646839008403615.
Nash, M., 2012. Making 'postmodern' mothers: pregnant embodiment, baby bumps and body image. Palgrave Macmillan. https://doi.org/10.1057/9781137292155.
O'Brien Hallstein, D., 2011. She gives birth, she's wearing a bikini: mobilizing the post-pregnant celebrity mom body to manage the post-second wave crisis in femininity. Women's Stud. Commun. 34 (2), 111–138. https://doi.org/10.1080/07491409.2011.619471.
Orbach, S., Rubin, H., 2014. Two for the price of one: the impact of body image during pregnancy and after birth. Department for Culture, Media and Sport and Government Equalities Office. Chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://maternalmentalhealthalliance.org/wp-content/uploads/Susie-Orbach-and-Holli-Rubin-Two-for-the-Price-of-One.pdf.
Poikkeus, P., Saisto, T., Unkila-Kallio, L., Punamaki, R.L., Repokari, L., Vilska, S., Tiitinen, A., Tulppala, M., 2006. Fear of childbirth and pregnancy-related anxiety in women conceiving with assisted reproduction. International Journal of Obstetrics Anaesthesia 2 (3), 153. https://doi.org/10.1097/01.aoa.0000288288.53081.1c.
Raudsepp, L., Kais, K., 2019. Longitudinal associations between problematic social media use and depressive symptoms in adolescent girls. Prev. Med. Rep. 15, 100925 https://doi.org/10.1016/j.pmedr.2019.100925.
Robertson, E., Grace, S., Wallington, T., Stewart, D.E., 2004. Antenatal risk factors for postpartum depression: a synthesis of recent literature. Gen. Hosp. Psychiatry 26 (4), 289–295. https://doi.org/10.1016/j.genhosppsych.2004.02.006.
Roomruangwong, C., Kanchanatawan, B., Sirivichayakul, S., Maes, M., 2017. High incidence of body image dissatisfaction in pregnancy and the postnatal period: associations with depression, anxiety, body mass index and weight gain during pregnancy. Sex. Reprod. Healthc. 13, 103–109. https://doi.org/10.1016/j.srhc.2017.08.002.
Samra, A., Warburton, W.A., Collins, A.M., 2022. Social comparisons: A potential mechanism linking problematic social media use with depression. J. Behav. Addict. https://doi.org/10.1556/2006.2022.00023.
Schoemann, A.M., Boulton, A.J., Short, S.D., 2017. Determining power and sample size for simple and complex mediation models. Soc. Psychol. Personal. Sci. 8 (4), 379–386. https://doi.org/10.1177/1948550617715068.
Scully, M., Swords, L., Nixon, E., 2020. Social comparisons on social media: online appearance-related activity and body dissatisfaction in adolescent girls. Ir. J. Psychol. Med. 1-12 https://doi.org/10.1017/ipm.2020.93.
Shensa, A., Escobar-Viera, C.G., Sidani, J.E., Bowman, N.D., Marshal, M.P., Primack, B. A., 2017. Problematic social media use and depressive symptoms among US young adults: A nationally-representative study. Soc. Sci. Med. 182, 150–157. https://doi.org/10.1016/j.socscimed.2017.03.061.
Silveira, M.L., Ertel, K.A., Dole, N., Chasan-Taber, L., 2015. The role of body image in prenatal and postpartum depression: A critical review of the literature. Archives Women's Mental. Health 18 (3), 409–421. https://doi.org/10.1007/s00737-015-0525-0.
Skouteris, H., Carr, R., Wertheim, E.H., Paxton, S.J., Duncombe, D., 2005. A prospective study of factors that lead to body dissatisfaction during pregnancy. Body Image 2 (4), 347–361. https://doi.org/10.1016/j.bodyim.2005.09.002.

Tsuchiya, S., Yasui, M., Ohashi, K., 2019. Assessing body dissatisfaction in Japanese women during the second trimester of pregnancy using a new figure rating scale. Nurs. Health Sci. 21 (3), 367–374. https://doi.org/10.1111/nhs.12608.

Underwood, L., Waldie, K., D'Souza, S., Peterson, E.R., Morton, S., 2016. A review of longitudinal studies on antenatal and postnatal depression. Arch. Womens Ment. Health 19, 711–720. https://doi.org/10.1007/s00737-016-0629-1.

Watson, B., Fuller-Tyszkiewicz, M., Broadbent, J., Skouteris, H., 2017. Development and validation of a tailored measure of body image for pregnant women. Psychol. Assess. 29 (11), 1363. https://doi.org/10.1037/pas0000441.

Wohrer, F., Ngo, H., Didomenico, J., Ma, X., Roberts, M.H., Bakhireva, L.N., 2024. Potentially modifiable risk and protective factors affecting mental and emotional wellness in pregnancy. Front. Hum. Neurosci. 18, 1323297. https://doi.org/10.3389/fnhum.2024.1323297.

Wolfi, G., Treasure, I., 2011. Medical and psychological consequences of eating disorders. In: Morris, J. (Ed.), ABC of Eating Disorders. John Wiley & Sons, pp. 20–32.

Woody, C., Ferrari, A., Siskind, D., Whiteford, H., Harris, M., 2017. A systematic review and meta-regression of the prevalence and incidence of perinatal depression. J. Affect. Disord. 219, 86–92. https://doi.org/10.1016/j.jad.2017.05.003.

Yoon, S., Kleinman, M., Mertz, J., Brannick, M., 2019. Is social network site usage related to depression? A meta-analysis of Facebook-depression relations. J. Affect. Disord. https://doi.org/10.1016/j.jad.2019.01.026.

Zelkowitz, P., Papageorgiou, A., 2012. Easing maternal anxiety: an update. Womens Health 8 (2), 205–213. https://doi.org/10.2217/whe.11.96.