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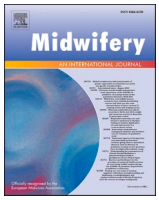

Research Article

The experience of miscarriage and its impact on prenatal attachment during the following pregnancy: A mixed-methods study

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ABSTRACT

Background: In France, miscarriage affects nearly 200,000 women every year. This life event may generate negative effects on the mother-child relationship and the mother's mental health in the following pregnancy.
Objectives: To investigate the influence of body satisfaction, partner support, resilience and previous experience of a miscarriage on prenatal attachment in pregnant women.
Design: This is a cross-sectional mixed-methods study. Women answered an online questionnaire in the period between November 2022 to April 2023.
Participants: 267 French pregnant women who had previously experienced a miscarriage were recruited for this study.
Measurements: Study outcomes included prenatal attachment, resilience, partner support, history of previous pregnancies and miscarriages, the current pregnancy, and questions relating to body experience.
Findings: Participants who reported a high investment in the current pregnancy, high partner support and a positive image of their body had higher levels of prenatal attachment. The experience of miscarriage also seems to influence prenatal attachment: pregnancy investment at the time of miscarriage had a positive influence, while medical experience had no significant impact. While the global resilience score was not related to prenatal attachment, sense of control was positively linked to prenatal attachment.
Key conclusions and implications for practice: These results highlight the importance of considering miscarriage as a perinatal loss with potential for long-lasting impact on women, which deserves particular attention from professionals. Enhancing partner support and helping women build a positive image of their pregnant body can also have a role in fostering prenatal attachment to the foetus.

Introduction

Miscarriage is defined as the loss of a foetus prior to the end of the 20th week of pregnancy, and affects nearly 200,000 women each year in France (Segura, 2021). Because of its frequency and its occurrence at an early stage of pregnancy, this loss tends to be trivialized by society (Lejeune and Carbonne, 2007). However, its consequences on mental health may be particularly apparent during the following pregnancy (Hutti et al., 2013). Since the transition to motherhood requires the development of an emotional relationship with the foetus (Kelmanson, 2022), a miscarriage can lead to a conflict of loyalty between the lost foetus and the foetus to be (Clerget, 2007), especially because most women tend to become pregnant again in the months following the loss (Lejeune and Carbonne, 2007). Thus, a miscarriage can compromise the prenatal attachment in the next pregnancy. Prenatal attachment is defined as "the unique, affectionate relationship that develops between a woman and her foetus" (Muller, 1990, p.11).

In this context, prenatal attachment patterns are often tinged with doubt, insecurity and concern about the possibility of another loss (Lamb, 2002). In a study by Meredith et al. (2017), women who had experienced perinatal loss reported difficulties in embracing their new pregnancy and establishing bonds with their unborn baby. This can be also true for women who had experienced an early prenatal loss such as a miscarriage (Ségura, 2021; Séjourné et al., 2008). Armstrong (2002), Condon and Corkindale (1997) and Kelmanson(2022) also compared pregnant women who had experienced a prenatal loss with those who had never had this experience, but their results showed no significant difference between groups in terms of prenatal attachment. These divergent results can perhaps be explained by the impact of other factors, which we would like to examine in the present study, beyond the

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experience of miscarriage itself, such as partner support, body experience and resilience.

Prenatal attachment and partner support

Several studies have shown that pregnant women's attachment to their unborn child is higher when they experience high partner support (Brandão et al., 2019; Fiskin, 2021). However, in the case of a miscarriage, parents can experience a double loss: loss of the foetus but also loss of a part of themselves (Trepal et al., 2005). The couple relationship after this perinatal loss may also be modified: 16.5 % of women report difficulties with their partner 3 months after the miscarriage and 8.4 % still experience difficulties 12 months afterwards (Stirtzinger et al., 1999; Swanson et al., 2003). In this context, women often experience a sense of failure and of incapacity which can lead to doubts about their partner's love for them (Séjourné et al., 2011). However, partner support and its relationship with prenatal attachment during a pregnancy following a miscarriage has rarely been studied.

Prenatal attachment and body experience

After a miscarriage, many women feel that their body, which was full of life during the pregnancy, is now empty (Segura, 2021). Thus, in a subsequent pregnancy, these women may have doubts about their body and its ability to carry a pregnancy to term (Meredith et al., 2017). It has been shown that pregnant women with a positive body image had a higher self-esteem and showed fewer depressive symptoms, which positively affects prenatal attachment (Bourgoin et al., 2012; Canlı and Demirtaş, 2022). Furthermore, a wide variety of feelings can be experienced with pregnancy-related body changes. These changes can be a source of both strange feelings and of anxiety, but also of reassurance, proving that the body is capable of saving the foetus from possible death (Bourgoin et al., 2012; Canlı and Demirtaş, 2022; Segura, 2021). Surprisingly, women's perception of their body and its link to prenatal attachment during a pregnancy following a perinatal loss remains understudied, even though it has been shown that body satisfaction is a protective factor against bonding disorders (Barreto and Wendland, 2022).

Prenatal attachment and resilience

The loss of a foetus and of an imagined or even idealized parenthood may be traumatic experiences that can be a source of strong anxiety when a new pregnancy is envisaged (Armstrong and Hutti, 1998). Miscarriages sometimes lead to symptoms of post-traumatic stress (Séjourné et al., 2008) because of the abrupt pain, bleeding and/or medical interventions that can occur. A recent study showed that nearly 18 % of women presented post-traumatic stress symptoms nine months after the loss of the pregnancy (Farren et al., 2020). Sometimes, a subsequent pregnancy can provide a form of repair for the previous difficult experience as it may help give meaning to the loss (Clerget, 2007; Meredith et al., 2017). Recent studies suggest that resilience may be a protective factor for prenatal attachment (Bonassi et al., 2018; Kinser et al., 2021; Koire et al., 2021). However, this has only been studied marginally, and never in the case of a pregnancy following a miscarriage.

Objectives

The main objective of this study was to investigate prenatal attachment in women who had previously experienced a miscarriage. In particular, we sought to explore the influence of body satisfaction, partner support, resilience and the experience of miscarriage on prenatal attachment during a subsequent pregnancy.

We expected that women who experience strong partner support, who are satisfied with their bodies, and have high levels of resilience would experience a strong prenatal attachment, regardless of the experience of the miscarriage, in line with previous studies (Armstrong, 2002; Condon and Corkindale, 1997; Kelmanson, 2022).

Methods

Participants and procedure

This is a cross-sectional mixed-methods study. Participants were pregnant women aged over 18 years, living in a relationship, who had a history of a miscarriage before the current pregnancy and were fluent in French. Participants were excluded from the study if they were diagnosed with a psychiatric disorder, if they had current serious health problems, or if their unborn child had health issues.

Expectant mothers were recruited, from November 2022 to April 2023, via groups from social networks such as Facebook, in groups related to miscarriage and pregnancy (e.g. « Deuil/fausse couche à répétition parlons-en », « La maternité entre femmes »…), the WeMoms community, as well as through our personal network. Women completed an online questionnaire on the LimeSurvey platform. The time to complete the questionnaire was estimated to be 15 min.

Ethics

Data collection ensured anonymity and confidentiality of responses. Each participant was provided with detailed information about the research and its objectives and was requested to give consent before completing the survey. The participants also had the possibility of contacting the principal investigator of the study or the charity called "Allo Parents Bébé", if they felt stress or discomfort while filling out the questionnaire. Each participant was associated with a unique code to facilitate data collection and to prevent multiple responses from the same participant to the study. The study was approved by the (blinded for review purposes) Paris Cité University Research and Ethics Committee (IRB: 00,012,023–51).

Measures

A questionnaire composed of 9 questions was used to collect women's socio-demographic information including age, socio-economic status, obstetric data, civil status, and duration of couple relationship.

Prenatal attachment was measured with the French version of the Prenatal Attachment Inventory (PAI, Jurgens et al., 2010) developed by Muller and Mercer (1993). It includes 21 items that describe the mother's thoughts, feelings and relationship with the foetus, such as "*I wonder what the baby might look like now*" and "*I know why the baby is moving*". The Cronbach's alpha was 0.90 in the present study. Each item is rated on a 4-point scale ranging from 1 ("Almost never") to 4 ("Almost always"). The PAI has no cut-off score; the total score can range from 21 (low prenatal attachment) to 84 (high prenatal attachment).

Resilience was measured using the Connor-Davidson Resilience Scale (CD-RISC) (Connor and Davidson, 2003) which assesses resilience in five dimensions: (1) personal competence; (2) tolerance of negative affect and strengthening effects of stress; (3) positive acceptance of change; (4) a sense of control; (5) spiritual influence. Items include "*I am able to adapt when changes occur*" and "*Having to deal with stress can make me stronger*". Each item is rated on a 5-point Likert scale ranging from 0 ("not at all") to 4 ("almost all the time"). This scale has been used previously with pregnant women (Kinser et al., 2021; Koire et al., 2021), and has good psychometric properties in its French version (Hamelin and Jourdan-Ionescu, 2011). The Cronbach's alpha was 0.85 in this study.

Perceived partner support was measured with the Marital Support Questionnaire (MSQ) (Brassard et al., 2011). Items assess the functions of social support: instrumental, informational, emotional, and validating ("*My spouse supports me in my attempts to achieve my goals*"). For each statement, participants indicated, on a 5-point Likert scale, whether the

statements applied to them, ranging from "never" (0) to "always" (4). A global score regrouping the items related to the perception of support from the partner was used for this study. A Cronbach's alpha of 0.88 was found for this study.

Since there is no standardized tool in French to investigate the experience of miscarriage, we added 28 questions about the previous pregnancy, the miscarriage, the process of bereavement and the current pregnancy which were extracted from Warnier de Wailly's thesis (Warnier de Wailly, 2015). With regards to the miscarriage itself, the participants were asked about the term of the miscarriage, the reasons (if known) of the miscarriage, the course of the miscarriage and the relationship they had with their body. Questions about miscarriage-related grief (the pain they felt talking about the subject at present, presence of guilt, and their current well-being) were asked on a 5-point Likert scale ranging from 0 ("not at all") to 5 ("it's very painful", "I feel totally guilty"). Regarding the past and current pregnancies, the questions related to the desire for the pregnancy, the use of assisted reproduction techniques, the emotions they felt at the time of the pregnancy announcement, their physical sensations experienced at the beginning, and the personalization of the child (e.g. the adjectives used to describe her/him, thinking about the first name, knowledge of the sex; for the previous pregnancy: whether the child had been seen on an ultrasound scan). Regarding the current pregnancy, participants were asked if it was the couple's decision, how far along the pregnancy was (weeks of amenorrhea), and if they felt the baby moving. For certain questions relating to miscarriage (e.g. "How did you feel when you found out you were pregnant?", "What emotion did you feel when you were told you were pregnant?", "How do you feel since the miscarriage?"), participants could write out an answer in their own words in a box.

There is no validated French tool to assess the body experience of pregnant women. Therefore, we used questions emanating from the Bourgoin et al. (2012) exploratory study on body image and pregnancy experience, and we added 4 new questions: "How do you perceive your pregnant body?", "How do you experience side effects due to pregnancy?", "Are you satisfied with your pregnant body?" and "What does your partner think about your pregnant body?" Each item was rated on a Likert scale ranging from 0 (negative body image) to 3 or 4 (very positive body image). Higher scores indicated greater body satisfaction.

Data analysis

The quantitative data was analysed using Jamovi software (version 2.2.5). Descriptive analyses were carried out on our sample. Normality was checked using the Shapiro-Wilk test. To test our hypotheses, Pearson and Spearman's correlation coefficients were used to examine the associations between the different variables and prenatal attachment scores. Differences in baseline variables between the current and previous pregnancy, and differences in PAI score were evaluated with a *t*-test, the McNemmar test, an analysis of variance, and repeated-measures analysis of variance (ANOVA). Partial eta squared ($\eta 2$) was used to calculate effect sizes in ANOVA. The threshold of significance retained was $p<.05$ for all statistics.

The qualitative responses left by participants to the open questions on their grieving experience following the miscarriage were analysed with the NVivo (1.4) software using inductive thematic analysis (Thomas, 2006). Major categories were extracted from the responses to the question "how do you feel since the miscarriage?", since they were the most numerous and the most detailed responses. We first conducted a preliminary reading of the data, then we labelled the text segments made with NVivo to create categories, followed by a reduction in categories. One response could form part of more than one category.

Results

A total of 578 women participated in this study. Participants who did not meet our inclusion criteria ($N = 84$), such as not being currently pregnant or having with a psychiatric disorder, or whose questionnaires were incomplete were excluded from the study ($N = 228$), resulting in a total of 267 participants.

Characteristics of the study population

On average, participants were 30.84 years old and had experienced a mean of 1.78 miscarriages. The majority of participants were married (38.6 %) and were living with the same partner as during their miscarriage (94.4 %). Most of them had a miscarriage before 12 weeks of amenorrhea (77.2 %), which did not lead to any specific medical care (44.9 %). In the current pregnancy, they were on average at 21.1 weeks of amenorrhea [range 2–40] and most of them waited between 2 and 4 months after the miscarriage to become pregnant again (41.9 %). About 50.56 % of the women still found it painful to remember the miscarriage and almost as many felt moderately guilty (32.58 %) or not guilty at all (33.33 %). Table 1 provides the participants' main socio-demographic data.

Comparisons between the miscarriage and the current pregnancy

The feeling of discovering the pregnancy was significantly different from one pregnancy to the next (Table 2). When the previous pregnancy was discovered, the dominant feeling was one of joy (75.3 %), whereas feelings of anxiety and worry dominated when the current pregnancy was discovered (41.2 %) ($p<.001$). Physical symptoms of pregnancy were also significantly more frequent in the current pregnancy compared to the miscarriage. More women recalled an absence of symptoms (e.g. fatigue, breast tenderness, nausea and vomiting) in the miscarriage (12 %) compared to in the current pregnancy (4.9 %) ($p<.001$).

Descriptive analysis of the study variables

On average, participants had a PAI score of 54.8 (SD=12.3, range =21–82) (Table 3). The emotion experienced at the announcement of the current pregnancy had a moderate effect on the PAI score ($F = 3.27$, $p=.012$, partial $\eta 2=0.048$). On average, pregnant women who experienced indifference to their pregnancy announcement had significantly lower PAI scores than those who experienced any other emotion. Similarly, participants who referred to their unborn child (during miscarriage or in the current pregnancy) as a "baby" or "child" rather than a "foetus" had higher PAI scores. On the other hand, having desired the pregnancy and having thought about the choice of the name of the unborn child increased the PAI score during the current pregnancy. Surprisingly, not knowing the sex of the unborn child induced higher PAI scores ($F = 15.9$, $p<.001$, partial $\eta 2=0.153$). Similarly, participants who did not stop touching their belly following the miscarriage had higher scores. However, there was no significant difference in mean scores on the PAI in relation to medical miscarriage management, number of miscarriages and length of time between the current pregnancy and the miscarriage. Interestingly, women who became pregnant again within 1 month of the miscarriage had higher PAI scores than those who did not. A more detailed description of these results is available in Table 4.

Associations between PAI and other variables

The results reported in Table 5 show that women with a better body image had higher PAI scores. However, the body image score decreased as the pregnancy progressed. A positive but moderate correlation was found between body image satisfaction and level of partner support. Similarly, the greater the level of partner support, the greater the scores on the PAI. It was surprising to note that already having children significantly decreased the level of partner support. Although PAI scores were generally unrelated to the resilience score, there was a weak but

Table 1
- Sociodemographic and pregnancy characteristics of the study population ($N = 267$).

Continuous variables	Median	Mean (SD)	[Min-Max]
Age (in years)	31	30.836 (4.46)	[18–44]
Number of children	1	0.764 (0.922)	[0–4]
Number of miscarriages	1	1.78 (1.35)	[1–10]
Term of current pregnancy (in weeks of amenorrhea)	21	21.1 (9.51)	[2–40]
Family status variables		N	%
Civil Status			
Marriage		103	38.6
Civil partnership		79	29.6
Common-law union		76	28.5
Other		9	3.4
The current partner			
The same as the previous pregnancy		252	94.4
Different from the previous pregnancy		15	5.6
Duration of relationship			
Less than one year		2	0.7
Between one and three years		41	15.4
Between three and five years		41	15.4
More than five years		183	68.5
Education and Professional status		N	%
Level of study			
No diploma		9	3.4
National Vocational Qualification (NVQ)		34	12.7
A-Level		56	21
2 years university degree		32	12
3 years university degree		58	21.7
Master or PhD degree		78	29.2
Profession			
Farmers		2	0.7
Craftswomen, shopkeepers / business owners		10	3.7
Executives and higher intellectual professions		66	24.7
Caring, Leisure, and Other Service		127	47.6
Process, Plant, and Machine Operatives		3	1.1
Associate Professionals and Technical		23	8.6
No activity		36	13.5
The previous miscarriage		N	%
Knowledge of the reason of the miscarriage			
Yes		85	31.8
No		182	68.2
Was able to see the foetus on the first ultrasound			
Yes		180	67.4
No		87	32.6
Term of miscarriage (in weeks of amenorrhea)			
Before 12 weeks		206	77.2
At 12 weeks		32	12
After 12 weeks		29	10.9
Medical management of the miscarriage			
With a surgical intervention (curettage)		87	32.6
With a medical intervention		60	22.5
Without medical intervention		120	44.9
Pain at the reminder of the miscarriage			
No, not at all		11	4.11
Not very painful		72	26.97
It is painful		135	50.56
Very painful		49	18.35
Feelings of guilty about the miscarriage			
No, not at all		89	33.33
I feel very little guilt		43	16.10
I feel moderately guilty		87	32.58
I feel guilty		40	14.98
I feel totally guilty		8	3
Feelings experienced since the miscarriage			
I feel empty inside		64	23.97
I feel depressed		54	20.22
I feel distressed		23	8.61
I feel worthless		12	4.49
I feel lonely		47	17.6
I feel good		93	34.84
Other		59	22.1
The current pregnancy		N	%
Primipara			
Yes		130	48.7
No		137	51.3
Time between miscarriage and current pregnancy			
Less than 1 month after		34	12.7
Between 2 and 4 months after		112	41.9
Between 4 and 6 months after		35	13.1
Between 6 months and 1 year later		39	14.6
More than 1 year after		47	17.6

Abbreviations: Min, Minimum; Max, Maximum; SD: Standard Deviation.

Table 2
Comparison of pregnancy characteristics between miscarriage and current pregnancy.

Variables	*Miscarriage*		*Current pregnancy*			
	N	%	N	%	X^{2a}/ W[b]	*p-value*
Use of Assisted Reproduction Technology					0.00[a]	1
Yes	36	13.5	35	13.1		
No	231	86.5	232	86.9		
Feelings upon discovery of the pregnancy					223[a]	**<0.001**
Ambivalence	23	8.6	48	18		
Anxiety, worry	37	13.9	110	41.2		
Indifference	4	1.5	8	3		
Joy	201	75.3	78	29.2		
Other	2	0.7	23	8.6		
Physical symptoms experienced					1768[b]	**<0.001**
Nausea, vomiting	131	49.1	190	71.2		
Ligament pain	82	30.7	164	61.4		
Fatigue	186	69.7	240	89.9		
Chest swelling	139	52.1	181	67.8		
None	32	12	13	4.9		
Other	11	4.1	13	4.9		
Total symptoms experienced	549		788			
Term used for the unborn child					3.29[a]	0.350
Baby	236	88.4	229	85.8		
Child	3	1.1	6	2.2		
Foetus	28	10.5	14	5.2		
Other	N/A		18	6.7		
The pregnancy was desired					1.79[a]	0.181
Yes	253 (94.8)		259 (97)			
No	14 (5.2)		8 (3)			

[a] McNemar Test;.
[b] Wilcoxon rank.

significant relationship between sense of control and prenatal attachment. Finally, weak but positive correlations were found between resilience and body image scores, as well as with partner support scores. Of particular interest was that the higher the number of miscarriages, the greater the resilience scores were. Finally, the PAI score was positively associated with the term of the current pregnancy and negatively associated with maternal age. Regarding the variables measuring miscarriage grief, they were positively related to the number of miscarriages, and negatively correlated with the term of the current pregnancy.

Table 3
Study variables: descriptive analyses.

Variables	Median	Mean ±SD	[Min-Max]
Score on variables measuring grief	5	4.61 ± 2.39	[0–11]
PAI Score	55	54.8 ± 12.3	[21–82]
Partner Support Score	14	12.7 ± 3.04	[2–16]
Body Image Score	8	7.90 ± 3.03	[0–14]
CD-RISC score	66	65.7 ± 11.3	[20–94]
Personal Competence	23	22.993 ± 4.129	[10–32]
Confidence in one's instincts	17	16.648 ± 3.870	[5–28]
Acceptance of change	8	8.213 ± 1.885	[3–12]
Sense of control	6	5.929 ± 1.329	[0–8]
Spirituality	8	7.903 ± 3.026	[0–14]

Abbreviations: Min, Minimum; Max, Maximum; SD: Standard Deviation; PAI = Prenatal Attachment Scale ; CD-RISC = Connor-Davidson Resilience Scale.

Qualitative analyses of the responses to the question "How do you feel since the miscarriage?"

The thematic analysis of the responses ($n = 59$) showed that for many women, the new pregnancy allowed them to feel "better" ($n = 27$) since they mentioned depressive mood related to the miscarriage ($n = 29$): *"Better since I am pregnant again […] I felt lonely, depressed, empty"*. It should be noted that the "time" factor was mentioned frequently ($n = 13$) as an indispensable element for overcoming the negative affects related to the miscarriage: *"I was depressed at the beginning, I felt like I would never have a baby again. I have regained hope since my current stage of pregnancy has passed the term of my miscarriage(s)"* (Table 6). Finally, it is interesting to note that the relationship between the variables measuring grief and the PAI scores was close to significance (p=.068) (Table 5).

Discussion

The main objective of this study was to assess the influence of partner support, pregnant body image, miscarriage experience, and resilience on prenatal attachment in pregnant women who had previously had a miscarriage.

Results showed that the number of miscarriages and their management by the medical staff did not influence prenatal attachment level. However, our participants had a lower average prenatal attachment score ($M = 54.8$) than women in the French validation study of the PAI ($M = 60.11$) (Jurgens et al., 2010). Armstrong and Hutti (1998) have also found that women who had experienced a perinatal loss had lower PAI scores than those who had not. Our results are consistent with those of Freedle and Oliveira (2022) that indicated that the more women experience miscarriage, the more difficult the grieving process is.

Our results also show that grief and mourning, as well as depressive feelings relating to the miscarriage, are very present in these mothers-to-be. This is in line with the findings of Séjourné et al. (2008) and Segura (2021) who indicate that the shock of the diagnosis of miscarriage, the sadness and the feelings of responsibility that follow turn the miscarriage into an extremely stressful and painful event. According to these authors, miscarriage should be considered as a process involving emotional instability, which seems to be repaired through improved well-being during the next pregnancy (Segura, 2021).

Contrary to our expectations, resilience did not emerge as a protective factor for prenatal attachment, in contrast to the results of other studies with women who had not experienced early perinatal loss, but other traumatic experiences such as having a cancer (Bonassi et al., 2018; Kinser et al., 2021; Koire et al., 2021). If resilience means the ability to recover from threats and to return to previous state (Armans et al., 2020), in our case, the threat of loss is internal to the woman's

Table 4
Distribution of PAI scores in the sample.

Variables	Miscarriage			Current pregnancy		
	Mean (±SD)	F[a]/t[b]	*p-value*	Mean (±SD)	F[a]/t[b]	*p-value*
Method of medically assisted technology		−0.637[b]	0.262		−0.407[b]	0.342
Yes	56 ± 13.2			55.6 ± 13.2		
No	54.6 ± 12.2			54.7 ± 12.2		
Feelings upon discovery of the pregnancy		1.45[a]	0.218		3.27[a]	**0.012**
Ambivalence	52.4 ± 15.605			54.3 ± 11.59		
Anxiety, worry	57.3 ± 11.269			56 ± 11.82		
Indifference	45.3 ± 13.200			40.3 ± 17.71		
Joy	54.7 ± 12.090			54.4 ± 12.88		
Other	63.5 ± 0.707			56.2 ± 9.78		
Term used for the unborn child		3.78[a]	**0.024**		2.937[a]	**0.034**
Baby	55.4 ± 11.7			55.3 ± 11.98		
Child	58.7 ± 13.3			55.3 ± 9.27		
Foetus	48.9 ± 15.7			45.4 ± 13.29		
Other				55.7 ± 14.99		
Knowledge of sex of unborn child		0.0706[a]	0.932		15.897[a]	**<0.001**
No, I did not know it	54.8 ± 12.82			49.3 ± 12.2		
Yes, it was a boy	54 ± 10.66			47 ± 11.8		
Yes, it was a girl	55.2 ± 8.66			58.6 ± 11.5		
No, I do not wish to know				58.9 ± 10.2		
The pregnancy was desired		−1.649[b]	0.100		−2.442[b]	**0.008**
Yes	55.1 ± 12.3			55.10±12.14		
No	49.5 ± 12.7			44.38±15.38		
The pregnancy was planned		–	–		−1.13[b]	0.211
Yes	–			55.35±11.47		
No	–			53.22±14.43		
Name given to the unborn child		−0.478[b]	0.633		−3.632[b]	**<0.001**
Yes	55.46±11.28			56.08±11.82		
No	54.59±12.65			49.25±13.10		
Stopped touching her baby bump after the announcement of the miscarriage		2.599[b]	**0.010**		–	–
Yes	53.23 ± 12.75			–		
No	57.21 ± 11.33			–		

Abbreviations: SD: Standard Deviation;.
[a] F = ANOVA Fisher's;.
[b] t = T-test.

Table 5
Correlations between the study variables.

	Grief over miscarriage	Body image satisfaction	Partner support score	CD RISC score	PAI score
Number of children	- 0.007[d]	−0.070[d]	**- 0.256**[c,a]	0.048	−0.014
Number of miscarriages	**0.137**[a,d]	0.057[d]	0.001[d]	**0.146**[a]	0.054
Term of current pregnancy	**- 0.128**[a,d]	**−0.130**[a,d]	−0.056[d]	−0.011	**0.471**[c]
Maternal age	−0.097	**0.238**[b]	0.177[b]	0.086	**−0.206**[c]
Grief over miscarriage	–				
Body image satisfaction	0.038	–			
Partner support	−0.080	**0.299** [c]	–		
PAI total score	0.112	**0.240**[c]	**0,194**[b]		
				0.120	
CD RISC score	−0.039	**0.173**[b]	**0.194**[c]	–	–
Personal competence	0.031	**0.200**[b]	**0.185**[b]	–	0.104
Trust in one's instincts	−0.113	**0.139**[a]	**0.216**[b]	–	0.067
Acceptance of change	−0.010	0.063	0.043		0.038
Sense of control	0.086	**0.197**[b]	**0.125**[a]	–	0.222[c]
Spirituality	−0.086	**0.132**[a]	**0.334**[c]		0.022

[a] $p < .05$,.
[b] $p < .01$,.
[c] $p < .001$.
[d] : Spearman coefficient.

Table 6
Main categories extracted from participants' comments on their feelings since the (last) miscarriage.

Main categories (number of items)	Subcategories (number of items)	Participant's quotes
Melancholic feelings (29/59)	depressed feelings (11)	*"I am currently pregnant again. Before this pregnancy I was very depressed because of my miscarriage."*
	feeling of emptiness (7)	*"After the miscarriage, I felt depressed and empty. It took me a long time to get over it."*
	Feeling of sadness (6)	*"I feel sad"*
	Loss of self-confidence and lack of understanding from others (5)	*"I was depressed at first, feeling like I would never be able to bear a baby again. I've regained hope since my current stage of pregnancy has exceeded the term of my miscarriages."*
		"Misunderstood"
Wellness (27/59)	Pregnancy (17)	*"These feelings disappeared as soon as I got pregnant again."*
	Renew (8)	*"Better since I'm postponing life again"*
	Acceptation (2)	*"I feel better. No choice but to accept it"*
Time (13/59)	Need of time to feel better (4)	*"Now I feel fine, but I needed time".*
	Time to overcome the miscarriage stage (9)	*"The first few months were very complicated, but now the pain is fading."*
Anxiety, worry (6/59)	Anxiety (3)	*"I'm pregnant again, but until I have the baby in my hands I'm cautious".*
	Worry and stressful (3)	*"But a lot of stress for the beginning of a pregnancy following a miscarriage."*

body. She is, in a sense, her own threat, and returning to previous state puts her at risk of suffering again if a prenatal loss occurs. One might consider that the pregnancy situation entails a new definition of resilience that would be specific to this period of life and that would take into account the internal and uncertain feature of pregnancy outcomes. This could explain why the stronger the participants' sense of control, the higher their prenatal attachment. These results are consistent with those of Côté-Arsenault and Donato (2011) who found that pregnant women who had experienced a perinatal loss consciously establish a type of "cushioning". This self-protection mechanism allows them to counterbalance the feeling of being out of control both physically and emotionally during the miscarriage, so as not to be surprised again by a painful and uncontrollable loss. It was interesting to note that the resilience scores were higher as the number of miscarriages was greater.

This search for control could be reinforced or find its origin in the feelings of anxiety and worry that the majority of participants felt when their following pregnancy was announced. These results are in line with Clerget (2007) who found that fear is the feeling most frequently experienced by pregnant women who have experienced a perinatal loss. According to this author, this fear may be a way of protecting oneself and anticipating a new loss, while obtaining the protection of the entourage and the medical staff. Withholding positive feelings may also be used to avoid suffering by preparing for the worst (Armstrong, 2004; Côte-Arsenault and Mahlangu, 1999; Garel et al., 2005). The participants in our study who felt worry and/or anxiety at the time of the pregnancy announcement had higher prenatal attachment scores than those who felt another emotion. These results seem partially consistent with those of Armstrong and Hutti's (1998) study which found no significant correlation between prenatal attachment and anxiety in women who had previously experienced a perinatal loss. This could be explained by the fact that the new pregnancy was desired by the vast majority of participants, indicating an investment in the pregnancy even though there were conflicting emotions associated with it. Furthermore, the fact that the participants felt in control of their future and were convinced that the events in their lives had a meaning may have helped them to invest in a new pregnancy. They seemed to believe that this loss was part of their family history, and that it helped them to counterbalance the feeling of emptiness that followed the miscarriage.

A positive perception of the pregnant body enhanced prenatal attachment to the unborn foetus, as found in a recent study (Canlı and Demirtaş, 2022). This was also in line with the findings of DiPietro et al. (2003) which showed that the more positive the women's body image, the better they would feel about the pregnancy. Body image was also shown to be a predictor of postpartum bonding, while Barreto and Wendland (2022) found that body satisfaction is a protective factor for bonding disorders.

Our results also show that the new pregnancy may have a "highly restorative value" (Hanus, 2001, p. 13), both on the maternal identity and on their body experience which could have been altered by the miscarriage. This was strongly illustrated by the participants' responses to the open-ended questions which indicated that this new pregnancy was a major lever for "getting better" following the miscarriage. In fact, a miscarriage often means the failure of a motherhood project and, according to Ammarine (2022), a new pregnancy may figuratively fill the

womb with feelings and with the new hope of becoming a parent of a living child. It may be that motherhood is over-invested following the loss, considering the significant increase in physical symptoms reported in the new pregnancy, as if they were reinforcing and attesting to the maternity and femininity of the pregnant woman (Séjourné et al., 2011). Furthermore, if greater vigilance to fetal movements is an opportunity for parents to begin their parenthood (O'Leary and Warland, 2012), it would be interesting to investigate whether in the case of a pregnancy following an early prenatal loss, greater vigilance to physical symptoms could be a sign of an investment in the unborn foetus and an acceptance of the parenthood to come.

This investment in the pregnant body was also reflected in an increase in the PAI score as the pregnancy progressed, as also highlighted in the study by Koire et al. (2021). In contrast, the study by Kelmanson (2022) found a negative relationship between prenatal attachment and gestational age. The explanation given for this result was that women may be particularly elated in early pregnancy and show greater emotional involvement. However, in our study, the greater the gestational age, the greater the emotional involvement with the unborn foetus and the greater the propensity to accept the miscarriage. Women who have experienced a miscarriage seem to need time to invest in and believe in this new life, which in turn allows them to mourn the miscarriage and the foetus that did not survive.

Surprisingly, while the time factor seems to be essential for the investment in the new pregnancy, the foetus, and the mourning of the miscarriage, we did not find results pointing the need of a certain length of time between the new pregnancy and the miscarriage. On the contrary, it seemed that the closer the pregnancy was to the miscarriage, the higher the PAI score was. Our results contradict the study by Gaudet et al. (2010) who argued that early conception after a perinatal loss represents a risk for prenatal attachment, as the pregnancy could then interfere with the grieving process following the loss. Our study did not find a significant relationship between prenatal attachment and miscarriage grief, although the positive relationship was close to significance. However, our results echo Kelmanson's (2022) hypothesis that a rapid subsequent pregnancy may allow for a quicker "mental recovery", a quicker restoration of both the female identity (Séjourné et al., 2011), and the social identity of mother (Séjourné et al., 2008), and thus for the continuation of the restorative psychological work (Clerget, 2007). By refusing to remain fixed on the previous loss, the mother-to-be can then mentally invest in her unborn foetus more intensely.

An ambivalence concerning the emotional investment in the unborn child was also reflected in the items relating to the personalisation of the unborn child and the previously deceased foetus. Women who did not wish to know the sex of their unborn child had higher prenatal attachment scores than those who did. As in the study by Szivos and Wendland (2020), not knowing the sex of the unborn child could protect women from disappointment regarding the sex of the child and prepare them to fully welcome their child as it is, once born. However, these results are contrary to other studies that indicate that knowledge of the sex of the unborn foetus significantly increases prenatal attachment (Jurgens et al., 2010), and separates the identity of the new baby from the deceased foetus (O'Leary and Warland, 2012). Furthermore, our results show that personalising the unborn child (first name, or term used to designate the child) increases prenatal attachment. Similarly, personalising the deceased foetus by naming it "child" significantly increased the prenatal attachment in the subsequent pregnancy. According to Côté-Arsenault and Dombeck's study (2001), women who personalized the deceased foetus have the sense that they have lost someone important and consequently may be more anxious in the next pregnancy. This is especially visible in our results, as women had a stronger prenatal attachment when they continued to touch their belly after the miscarriage announcement. This could show a maternal concern for the deceased foetus, accompanying it as best as possible (through the only possible physical link: touch) towards its exit from the maternal womb. Thus, it seems important to accompany women in the loss of their foetus, in order to help them preserve their maternal identity, but also so that in the next pregnancy they can fully invest in the unborn child (Bourne and Lewis, 1984). It is interesting to note that since January 1st, 2024, a new law has been established in France to legalise three days of paid leave for couples who have undergone a miscarriage (Law Number, 2023).

With regard to partner support, our hypothesis was confirmed, although the link with prenatal attachment was moderate. While many couples separate following a miscarriage (Van Aerde and Gorodzinsky, 2001), it has also been shown that women who experience a miscarriage have higher partner support scores than those who do not (De Ville et al., 2013). According to these authors, satisfaction with partner support is linked to the resolution of miscarriage grief since it fosters development of appropriate coping strategies. In our study, we also observed that the perceived image of the pregnant body was positively linked to partner support. It appears that the partner makes it possible to exonerate and restore women's confidence in their maternal and feminine skills (Garel et al., 2005). The positive relationship between partner support and resilience scores also supports our hypothesis. The study by Zerach and Magal (2017) showed that dyadic adjustment moderates the link between stress exposure during pregnancy and postnatal post-traumatic stress syndrome, and this would also allow for a decrease in depressive symptoms related to the trauma of miscarriage (De Ville et al., 2013). Thus, partner support is an important protective factor when a woman endures a miscarriage, both for the recovery of the feminine identity and the development of prenatal attachment in the following pregnancy.

This study has limitations that deserve to be acknowledged. Firstly, the fact that the participants were recruited from social groups and online communities dedicated to motherhood, and that most of respondents had a high level of education, does not allow the results obtained in this study to be generalised to the entire French population who have experienced a miscarriage. Secondly, in the absence of standardized questionnaires, we had to create questions to assess the experience of pregnancy and miscarriage. However, this study was conducted with an adequate sample size which increases the representativeness of the population. Thirdly, we have no data on whether the women received any kind of psychological support and whether this may have had an impact on the variables measured in this study. Also, this study has generated a particularly enthusiastic response, with many free comments that indicated a real need for these women to speak out and be heard.

Implications for practice and research

Specific care during the subsequent pregnancy could help women and couples regain a certain amount of control over the new pregnancy. Similarly, partners are an important protective factor for women and they should not only be involved in prenatal care but should also receive psychological support for themselves. Joint discussion groups could be offered to couples in maternity hospitals in order to support them in this new pregnancy.

Also, healthcare providers, specially midwives and psychologists, could discuss the effect of the previous loss and explore mothers' thoughts and feelings during obstetric mandatory appointments in the first trimester (supported by the national health system in France). They could contribute to a better adjustment to the subsequent pregnancy and the parenthood process. Indeed, the first appointments are often an opportunity to retrace the couple's obstetric history, but it could also be a more in-depth exploration of the significance of the loss for the parents and how it may affect the current pregnancy. It is essential that professionals are well trained to deal with these issues when meeting future parents.

Similarly, particular attention could be paid to childbirth preparation courses (available in all maternity hospitals in France, and fully covered by national health system), which enable parents to fully project

themselves into the new parenthood. For example, specific groups of parents who have suffered a miscarriage could be set up to facilitate appropriate guidance. Also, because a positive image of the pregnant body is a protective factor for prenatal attachment, it would be particularly relevant to offer women body-focused techniques during these classes, such as haptonomy or hypnosis, in order to restore their body image, to strengthen the bond with the unborn foetus and to develop their parental identity (Vinit, 2009). While haptonomy is generally limited to private practice, hypnosis and relaxation techniques are offered in most public gynaecology-obstetrics departments in France.

Further studies can be launched to assess the needs of pregnant women and couples who have suffered a miscarriage and to determine which specific interventions are the most effective for them in maternity wards.

Conclusion

The results of this mixed-methods study show that prenatal attachment in pregnant women who have previously experienced a miscarriage is positively influenced by their body image and the partner support they receive. However, prenatal attachment is only moderately influenced by the experience of miscarriage itself and is not related to the resilience capacities of the pregnant women. These findings contribute to a better understanding of women who had experienced a miscarriage, their feelings and the impact of this event on their well-being. They underline the importance of not trivialising miscarriages and of providing the best possible support for women in order to encourage maternal investment in the next pregnancy.

Statement of significance

- Problem or issue: A miscarriage may have an impact on prenatal attachment in a subsequent pregnancy. For women who have experienced a miscarriage, prenatal attachment can also be explained by body satisfaction, partner support and resilience.
- What is already known: Women who had experienced a perinatal loss may have difficulties in embracing their new pregnancy and establishing bonds with their unborn baby.
- What this paper adds: Prenatal attachment in pregnant women who have previously experienced a miscarriage is positively influenced by their body image and the partner support they receive. However, prenatal attachment is only moderately influenced by the previous experience of miscarriage itself and is not related to the resilience capacities of the pregnant women. Nevertheless, the impact of miscarriage remains very present in the mothers-to-be, and the new pregnancy makes a major contribution to their well-being.

Ethical approval

This research was approved by the Paris Cité University Research and Ethics Committee (CER-U-Paris, IRB: 00012023–51).

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CRediT authorship contribution statement

Myriam Chemouny: Writing – original draft, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jaqueline Wendland:** Writing – review & editing, Validation, Supervision, Project administration, Investigation, Conceptualization.

Declaration of competing interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Supplementary materials

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