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Memory and mood changes in pregnancy: a qualitative content analysis of women's first-hand accounts

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ABSTRACT

Objective: This qualitative study aimed to explore how pregnant women and new mothers self-report changes to their mood and memory during pregnancy.

Background: Researchers have investigated the various changes that women report throughout their pregnancy. Despite this evidence base, there is a notable lack of studies that take a qualitative approach to understanding how pregnant women and women in the postpartum period experience memory and mood changes through their pregnancy.

Method: The present study involved a qualitative content analysis of women's first-hand accounts. Of the 423 participants who responded, 118 participants provided textual responses to questions about their memory and 288 participants provided textual responses to questions about their mood. Data were collected online via a free-text survey and analysed using both deductive inductive open coding.

Results: A qualitative content analysis generated four overall categories: two typologies of self-reported memory changes in pregnancy ('*short-term memory lapses*' and '*chronic memory fog*') and two typologies of self-reported mood changes ('*mood instability and constant change*' and '*low mood and parenting anxiety*').

Conclusion: These typologies represent unique profiles of the memory and mood changes that women experience during pregnancy and serve to accompany and expand the quantitative literature, which documents the changes women experience during pregnancy.

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Pregnancy is a time of immense change, turbulence, and readjustment. There is a vast literature which demonstrates how women report changes to both their *mood* and *memory* during pregnancy, but the majority of this research employs quantitative, correlational designs. Quantitative studies have evidenced how pregnancy is associated with changes, such as increased mood instability (Li et al., 2020), more depressive symptoms (Keepanasseril et al., 2021), and impaired memory functioning, as per the 'baby brain' or 'mommy brain' stereotype (Brett & Baxendale, 2001). There is a large literature, which assesses objective changes to both women's

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memory (Davies et al., 2018) and mood during their pregnancy (Ross et al., 2004). However, the quantitative and correlational nature of these enquiries may mean that the nuances of mood and memory changes are not fully captured. Indeed, whilst there is a small body of the literature that investigates women's first-hand accounts of the changes they experience during their pregnancy (Crawley, 2002; Parsons & Redman, 1991), this literature is in its infancy.

Given how both self-reported and objective mood changes and memory changes are interrelated in pregnancy (Mazor et al., 2019; Williams et al., 2015), there is value in assessing first-hand accounts of these two constructs together. In doing so, this will ensure that (1) there are no memory and mood changes that women experience in pregnancy that are 'missed' or not captured by quantitative investigations, (2) women's self-reported experiences are centred within prenatal research (Staneva et al., 2015), (3) the findings of quantitative investigations are either contested or corroborated by women's first-hand accounts. Qualitative enquiries are also necessary given the inconsistencies in much of the existing literature (see, Davies et al., 2018). In order to investigate women's first-hand accounts of memory and mood changes in their pregnancy, in this study, women's anecdotal responses to free-text responses about their memory and mood changes in pregnancy were investigated. The aim of this qualitative research study was to explore how pregnant women and new mothers self-report changes in their mood and memory during pregnancy.

Method

Participants and design

The qualitative data of 423 participants were initially collated from two online studies that we collected ($N_{Study\ 1} = 220$; $N_{Study\ 2} = 203$). These studies explored other aspects of pregnancy experiences, including the impact of social stereotypes in pregnancy. The data reported here were collected from a separate section in the two wider studies, which participants answered before continuing to other sections of the questionnaires. All participants were UK-based women who were either currently pregnant ($N = 261$, 61.70%) or 'new mothers', categorised as women with a child less than two years old ($N = 162$, 38.3%) who reflected on their pregnancy. Participants were recruited from Prolific Academic and social media (Facebook groups and Twitter). Of the pregnant participants, 13.59% were in the first trimester, 38.53% were in the second trimester, and 48.54% were in the third trimester. The average age of the participants was 29.41 ($SD = 5.78$), seven participants did not disclose their age. The majority of participants ($N = 258$, 60.99%) were White (40 were Asian, 25 were Black, and 100 were mixed ethnicity or 'Other'). 68.32% ($N = 289$) were educated to a degree-level or above. Ethical approval was granted by the local School of Psychology Ethics Committee (References PSC-673, PSYC-83).

Procedure

After providing demographic information, participants were asked to report whether they noticed changes in their memory and mood throughout their (current or recent) pregnancy (yes/no). This wording was adapted for each group, to refer to either current or recent pregnancy. If participants answered 'yes', they were given the option to textually elaborate on their answer via a free-text box. This was accompanied by the prompt '*please provide an example or description if you can*'. Of the 423 participants who responded to yes/no items, 118 participants then also provided follow-up textual responses to questions about their memory and 288 participants gave textual responses to questions about their mood changes; 168 participants gave responses to both questions. Here, we analyse both the quantitative data ($N = 423$) and the qualitative data to both questions.

Analytical approach

We adopted a qualitative content analysis (QCA) approach, informed by Assarroudi et al. (2018), which is a useful tool for analysis of online survey data (Braun et al., 2020). The aim of QCA is to establish and interpret meaning from textual or visual content. *Directed* QCA was chosen for this study because of its utility with large qualitative datasets and how it allows for richer, more interpretative insights that fill gaps in existing literature (Hsieh & Shannon, 2005). Directed QCA also allows researchers to be attentive to inductive codes, while also remaining grounded in previous literature (Assarroudi et al., 2018) and is, therefore, suitably flexible. To establish a set of deductive codes from the framework of interest, first, any studies containing self-report accounts of memory and mood changes in pregnancy were reviewed and the core self-reported typologies of memory and mood changes were noted and used as deductive codes in the data (see, Table 1).

Coding process

The entire qualitative dataset was coded, using the deductive codes from Table 1 as a guiding starting point. That is, the data were first coded deductively, before an inductive coding process, which involved looking for codes that were not captured in the first read of the data (Elo & Kyngäs, 2008). Codes were not mutually exclusive; in some instances, multiple codes were assigned to one textual response (Lindgren et al., 2020). Coding was completed using the software Dedoose (www.dedoose.com). After assigning these codes, categories were derived from the coding, which refer to distinct typologies of experiences of pregnancy-related memory and mood functioning that were present in the data. Codes collapsed into categories shared a broader meaning. In order to stay true to participants' original meaning, quotes reported here are not paraphrased and are reported verbatim, including all typographical errors and slang.

For the memory change items, a set of 14 final codes were applied to the data. Multiple codes were often ascribed to each unit of analysis (i.e. each participant's response), resulting in a total of 197 overall assigned codes. There were two typologies each with three sub-typologies (Table 2). For mood change responses, again, the literature surrounding mood changes in pregnancy was first reviewed to establish deductive relevant codes (Table 1). Example codes, sub-categories and final typologies for the mood change responses can be seen in Table 3. There were 20 final codes, which were applied to the

Table 1. Examples of deductive codes applied to the data from existing framework of the literature which investigates mood and memory changes in pregnancy. These deductive codes guided the first stage of QCA and derived from a brief narrative literature review of the evidence. The brief review was achieved using forward and backward citation searches of relevant papers identified via search engines (e.g. Web of Science and Google Scholar).

Focus of the study	Self-report study	Methodology	Relevant deductive codes
Memory changes in pregnancy	Parsons and Redman (1991)	Semi-structured questionnaire	Difficulty in concentration Absentmindedness Short-term memory
	Crawley (2002)	Open-ended questionnaire	Memory impairments Concentration deficits Lower clarity of thought Poorer attention
	Sharp et al. (1993)	Questionnaire with free text box	Difficulty following conversations Forgetting daily tasks Absentmindedness
	Orchard et al. (2021)	Self-report subjective memory measure	Memory errors Self-cued memory Environment-cued memory
Mood changes in pregnancy	Ross et al. (2004)	Self-report survey	Anxiety Depression Psychosocial stress
	Li et al. (2020)	Systematic review	Mood instability Depression Mood lability
	Clark et al. (2009)	Semi-structured interviews	Mood lability Body dissatisfaction
	Staneva et al. (2015)	Meta-synthesis of qualitative studies	Psychological distress Anxiety, depression Pregnancy-related stress

Table 2. Example codes, sub-typologies, and final typologies of memory responses.

Example codes	Sub-typologies	Final typologies
Lapses in memory Forgetting names	Sudden memory slips	Short-term memory lapses
Task-specific memory loss Language-related memory loss Short-term memory loss (Dis)organisation of memory	Disorientation in everyday life	
Feeling scatty Tiredness and confusion Absent mindedness Difficulty in concentration	Chronic memory impairment Memory fatigue	Chronic memory fog

data 301 times, due to overlap in coding of each unit of analysis. These were then categorised into three sub-categories and two final typologies of mood changes in pregnancy.

Second coding process

To ensure the robustness of our directed QCA and to improve the reliability of the generated codes, the third author (L.R) second-coded 20% of the dataset (58 responses to the mood items, 50 responses to memory items). Following ‘blind’ coding of 20% of the responses, agreement was reached and any disagreements in code assigning or any perceived missing codes were resolved.

Results

In order to investigate self-reports of pregnancy-related changes in memory, the frequencies of self-reported memory and mood changes in pregnancy were first assessed. A chi-squared test showed that, of the 261 pregnant women and 162 new mothers who responded to the yes/no question regarding memory and mood changes, pregnant women were more likely to self-report changes in their memory in their current pregnancy (151/261; 57.85%) than the retrospective accounts of new mothers (58/162; 35.80%) $X^2 = 19.446$, $p < 0.001$. Pregnant women also self-reported more mood changes (82/261, 31.42%) than new mothers retrospectively did (27/162, 16.67%) $X^2 = 11.151$, $p < 0.001$. For pregnant women, self-reported changes in memory and mood were not associated with the current trimester of the participant's pregnancy $X^2 = 4.514$, $p = 0.105$.

Memory changes

The final typologies of self-reported memory changes were as follows: (1) *short-term memory lapses*, (2) *chronic memory fog*, which each represented a distinct profile of pregnancy-related changes. Categories and example codes are represented in [Table 2](#). No participants in the dataset reported positive changes to their memory during and throughout pregnancy. Forty-eight participants provided short non-specific statements about forgetfulness (e.g. 'I was forgetful') which were not included in the final typologies, as they did not provide descriptive or experiential accounts of memory change in pregnancy. Within this paper, N in parentheses refers to the number of responses which included this code, and percentages indicate the proportion out of the 118 participants who responded to this item who represent each code.

Typology one: *short-term memory lapses*

The first typology of memory changes was '*short-term memory lapses*'. In this typology, most participants' responses were coded as reporting intermittent lapses of memory that affected them throughout defined tasks during the day (i.e. 'task-related lapses', $N = 71$, 60.17%). In this typology, participants' memory loss was immediate and noticeable, i.e. participants' forgot what they were doing during a certain task or mid-conversation. For example, one participant described this type of memory change as being categorised by 'waking into a room and forgetting why', which was echoed throughout the dataset. Similarly, other participants whose responses were coded in this typology recalled instances in their daily life where memory lapses occurred suddenly, which were at times disorientating and frustrating. One participant recalled, 'When asking somebody if they wanted a tea or coffee. I would then walk into the kitchen and completely forget their answer'.

Other participants also described times in their pregnancy where their memory would suddenly lapse during the day, sometimes when they were mid-way through a task or activity. These were often in the context of a conversation ($N = 29$, 24.58%) or domestic tasks such as shopping and cooking ($N = 5$, 4.24%). For example, one participant recalled that in their pregnancy they would 'forget what I'm doing mid-way through or go in the wrong cupboard'. Similarly, participants in this typology frequently referred to lapses in

memory related to locating objects, remembering the time and completing defined tasks ($N = 66$, 55.93%). For example, 'I would move things and remember at the time but 5 minutes later I would have to relook for it'.

Some participants reported anecdotes of 'discovering' artefacts of their memory lapses, such as items in the wrong place, 'I put things down in odd places where they don't belong. Like today I found I put the syrup in the laundry room not in the cupboard'.

Furthermore, a subset of responses ($N = 5$, 4.24%) in this typology were coded as pertaining specifically to memory lapses in the context of the workplace. For example, one participant explained that they experienced 'forgetting simple tasks for work like emailing people'.

Relatedly, responses in this typology also included codes such as forgetting names ($N = 2$; 1.69%), and language-related memory loss ($N = 31$, 26.27%). In this code, participants frequently reported 'searching for the right word', 'stumbling on words' or, as one participant noted, knowing 'what I wanted to say but couldn't remember the words'. Similarly, another participant recalled that in their pregnancy they: 'Did a lot of word seeking . . . wrote a lot of things down/ set reminders on my phone'. Similarly, some participants also reported more chronic memory loss in the form of struggling to remember activities and information throughout the day. For example, one participant recalled that they often 'can't remember if I've eaten that day or if I've been to the toilet'. For example:

"I have no recollection of saying and doing some small things . . . My brain seems to substitute phrases . . . without me realising so occasionally I end up saying totally bizarre or stupid things."

Overall, in this first typology participants described sudden lapses in their memory, which converged to form 'baby brain'. This typology of memory change is not well represented in the quantitative literature; for example, studies have found symptoms such as 'difficulty in concentration' and 'lower clarity of thought' but do not typically describe the lived experience of this in women's daily lives. Instead, the emphasis of the literature is on objective changes in recall, rather than the context of this recall. For example, Sharp et al. (1993) described pregnant women's performance on a range of objective tests and also noted then, when asked to freely recall subjective experiences, women mentioned specific contextual examples such as an inability to remember daily tasks and friends' names.

Similarly, the notion of language interference in pregnancy echoes other self-report findings from previous literature (Sharp et al., 1993); however, some studies have found no significant differences in verbal fluency of pregnant women versus other groups in objective measures (Logan et al., 2014). Therefore, the present study provides richer nuance to these studies, identifying more specific contexts where women notice sudden lapses in memory functioning that may not be captured in laboratory tests of memory.

Typology two: chronic memory fog

The second typology encapsulates two subcategories of women's experiences of memory changes: 'chronic memory impairment' and 'memory fatigue'. Beyond task-oriented memory lapses, the second typology observed in this dataset was defined as 'chronic memory fog', which was categorised by women who described an overall sense of confusion and fogginess (often referred to by participants as 'brain fog') throughout

Table 3. Example codes, sub-typologies and final typologies within the mood changes analysis.

Example codes	Sub-typologies	Final typologies
Stress Mood swings Irritability Angry outbursts Positive mood change	Mental health concerns Frustration	Mood instability and constant change
Pregnancy-related worry Fatigue and weepiness Nervousness Pregnancy symptoms	Low mood	Low mood and parenting anxiety

their pregnancy. This typology refers to memory deficits that were less defined and task-oriented than typology one, and instead was categorised by a general sense of fogginess, confusion, and disorientation, or ‘feeling my head is empty’, as one participant recalled. This typology encapsulates responses with codes such as ‘poorer concentration’ ($N = 4$, 3.39%) and ‘loss of focus’ ($N = 4$, 3.39%). Seven responses in this typology specifically mentioned ‘brain fog’ or ‘feeling scatty’ in their written responses. For example, one participant recalled, ‘I remember being fuzzy headed ... Having to make more lists so I didn’t forget things and if something wasn’t in the diary, it certainly would be forgotten about!’

Another participant recalled feeling ‘scatter-brained’, and another described ‘forgetfulness and it takes a while to process information’. For example, one participant recalled that in their pregnancy they ‘suffered brain fog on a regular basis’. Some participants in this typology ($N = 4$, 2.29%) also referred to the inability to *organise* their thoughts and behaviour during pregnancy when asked to reflect upon memory changes in pregnancy. For example, when asked if they had experienced memory changes in their pregnancy, one participant reported feeling ‘less organized than usual’. Similarly, another participant noted that they ‘generally noticed a decreased ability to follow complicated thoughts’. Some participants in this typology also spoke specifically about tiredness and lack of sleep as a driver of feeling foggy in pregnancy; for example: ‘I was VERY tired, and found myself forgetting things which would normally be very simple to me/ finding simple tasks difficult’. Overall, this typology represents the chronic sense of memory ‘fog’ that participants experience in pregnancy, which relates to factors, such as organisation, tiredness, and information processing (as per Davies et al., 2018).

Mood changes

The final typologies for mood changes were: (1) *mood instability and constant change* (2) *low mood and parenting anxiety*. Categories and example codes are represented in Table 3. Again, in parenthesis, N refers to number of responses which included this code, and percentages indicate proportion out of the 288 participants who responded to this item who represent each code.

Typology one: mood instability and constant change

The first typology of the mood changes item was categorised by accounts of mood swings, shifting mood, and instability of emotions throughout pregnancy. This included codes such as experiencing stress ($N = 6$, 2.08%), feelings of irritability ($N = 40$, 13.94%),

mood swings ($N = 66$, 22.92%) and angry outbursts ($N = 54$, 18.75%). In this typology, participants frequently reported having lower tolerance and patience throughout their pregnancy, being 'snappier than usual', feeling 'extremely agitated by non-issues' and being 'short tempered'. Relatedly, also present in this typology were accounts of irritability, lower tolerance and patience, and frustration (or being 'ratty', $N = 4$, 1.39%). For example, one participant noted that they 'have noticed that I have less patience for normal everyday tasks', and another described that throughout their pregnancy they were 'More irritable at times, when something happens that I wish was different or more straightforward when dealing with customer service for example'.

This anger, agitation, or mood change was often described as being 'unnecessary', 'uncalled for' or occurring 'without being triggered at all'. For example, one participant shared that in their pregnancy they had, 'A lot shorter fuse, I flip at the smallest of things'. Similarly, another participant noted that they experienced similar 'mood swings', which was categorised by quick changes between high and low mood: 'I would fluctuate through extreme highs and lows'. This echoes the cognitive literature which shows how pregnancy is a time of heightened mood instability (Bulgakov et al., 2018). Further, participants often described 'intense tiredness' and 'fatigue' specifically, that contributed to mood swings ($N = 24$, 8.33%). For example, one participant explained that in their pregnancy they were 'more sleepy and had mixed feelings' and another participant described that they experienced 'tiredness which makes me have mood swings'. These self-reports also reflect the quantitative literature that demonstrates how pregnancy is associated with heightened levels of irritability (Bowen et al., 2012). Finally, within this typology a subset of participants in the dataset ($N = 14$, 4.86%) reported *positive* changes to their mood during and throughout pregnancy within their responses. For example, some participants reported feeling 'happier and more positive' and 'on top of the world' throughout their pregnancy. Therefore, mood changes in pregnancy can also be categorised by positive changes, as well as the more negative examples.

Typology two: low mood and parenting anxiety

Beyond the irritability and mood swings present in typology one, typology two was categorised by participants reporting more chronic, unwavering anxiety ($N = 27$, 9.38%), nervousness ($N = 10$, 3.47%) and, in some cases, depression ($N = 9$, 3.14%) throughout their pregnancy. The most common code in this typology was feelings of heightened or excessive experience of emotions ($N = 85$, 29.51%). For example, one participant reported that they were, 'Much more emotional (would cry at things which I previously didn't)'. Some participants in this typology also explicitly wrote about their *parenting*-related anxiety ($N = 9$, 3.13%). This covered aspects such as experiencing anxiety about parenting a first child, and nervous anticipation of life with a new-born; for example, one participant recalled that they were frequently 'Stressing about the safety and future of my child' and another participant wrote that: 'majority of the time I was anxious ... anticipating how difficult it would be'. This reflects the survey literature, which demonstrates how pregnant women experience prenatal anxiety (Dunkel Schetter & Tanner, 2012), in response to increased emotional vulnerability in pregnancy, which can persist into parenting (Huizink et al., 2017).

Participants in this typology were often coded as responses that contained references to 'crying', 'weeping', or 'being teary' throughout their pregnancy. For example, 'I was more weepy than usual. I would cry just looking at baby pictures'. Parenting-related anxiety was also linked to tiredness, fatigue, annoyance, and an increased dependence on partners and peers. These codes also co-occurred with mood swings too. For example, one participant described that their intense tiredness and parenting-related meant that they were more frequently 'depending on my family to do my routine job. Bcoz I was tired'. Another participant commented that they had 'fear that I might not be a good enough mother'. This typology aligns with both the 'good enough mothering' mandate that women must adhere to in their pregnancy and into motherhood (e.g. see, Pedersen, 2016).

As well as feeling teary and experiencing stress related to parenting anxiety, participants in this typology also talked more broadly about feeling 'not myself at all' and 'just a bit off', which was often prompted by pregnancy-related changes, such as cravings ($N = 2$, 0.69%) and morning sickness ($N = 3$, 1.04%); for example, one participant commented that they felt 'low early on in pregnancy due to severe morning sickness'. Relatedly, some participants in this typology ($N = 3$, 1.04%) reported that their low mood was prompted by body dissatisfaction. For example, one participant reported that 'everything felt like a herculean task for me given my small body frame and a growing belly'. This typology also highlights how concerns about one's body, mood, and relationships are interlinked in pregnancy (Clark et al., 2009).

Discussion

Overall, this study aimed to provide an account of women's memory and mood experiences during pregnancy, in order to accompany and expand the quantitative literature in this area. This study employed a relatively large, albeit homogeneous, sample of pregnant women and new mothers, and investigated how women self-report changes to their memory and mood. The qualitative content analysis generated two dominant typologies: self-reported memory changes in pregnancy ('*short-term memory lapses*' and '*chronic memory fog*') and two typologies of self-reported mood changes ('*mood instability*' and '*low mood and parenting anxiety*'). These typologies largely reflect the quantitative literature, which uses survey instrument methodologies to investigate pregnancy changes. Therefore, this demonstrates that across both qualitative and quantitative explorations, women report both subjective and objective changes to memory and mood in pregnancy. Taken together, this suggests that the domains of memory and mood should be considered in the context of maternity healthcare, given the impact of these changes on women's lived experience of pregnancy.

Conclusion

Overall, this analysis confirms that findings from quantitative enquiries into mood and memory changes in pregnancy are largely reflective of women's self-reported experiences. This study has also found typologies of changes that may not be captured by laboratory tests of memory or mood functionality (e.g. the 'sudden lapses' in memory that women reported). However, there are limitations to this study. In particular, women in this sample may have pre-existing or post-natal mental health conditions, which we

did not account for or measure. Therefore, the extent to which this sample is representative of a wider perinatal population is not clear. This study also represents a survey with relatively short data; therefore, future work should incorporate richer qualitative data collection methodologies to explore this further. This work may also investigate the impact that memory and mood changes have on maternity service provision, critically exploring how maternity services can be appropriately attentive to women's subjective experiences of memory and mood changes. Similarly, future work could also investigate whether the self-reported changes that women experience correlates with actual performance on quantitative tasks.

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Data availability statement

Data are available here: <https://osf.io/k6xq9/>

Ethical approval statement

Ethical approval was obtained from the local School of Psychology Ethics Committee.

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