

'Baby brain' in pregnancy: A review of social psychological explanations and future research directions

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Abstract

The colloquial concept of 'baby brain' suggests that throughout pregnancy and into the immediate postpartum period, women have reduced cognitive abilities and are more distracted, forgetful, and incompetent. To date, a plethora of cognitive and neuropsychological research testing the cognitive functioning of pregnant women relative to other groups has yielded inconsistent and unclear findings. However, there is a notable lack of literature that adopts a social psychological perspective, critically assessing the contribution of social context to the 'baby brain' phenomenon. In this paper, we review the current 'baby brain' literature and outline two potential social perspectives that provide insights into this research area: *stereotype threat theory* and *objectification theory*. We argue that inconsistencies in the 'baby brain' cognitive literature may be impacted by under-explored social phenomena, which may result from activation of stereotypes or objectifying cues throughout pregnancy and into early new motherhood. We end with suggestions for future social and personality psychological research directions in the area of 'baby brain'.

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1 | INTRODUCTION

When women¹ become mothers, they are perceived to be stressed, overworked, anxious, and cognitively less able than other people (e.g., Brett & Baxendale, 2001; Crawley et al., 2008). In pregnancy and into biological motherhood,² women are framed by society to suffer from poorer memory recall, compromised executive functioning, and reduced attention (e.g., Brett & Baxendale, 2001; Crawley et al., 2008; Morgan et al., 2013). This perception of decreased cognitive abilities in pregnancy is colloquially referred to as 'mommy brain', maternal amnesia, 'preg head', or, more frequently, 'baby brain' (Brett & Baxendale, 2001). Aligned with 'baby brain', research also demonstrates how pregnant women are perceived to be less intelligent (Morgan et al., 2013), less committed employees (Correll, et al., 2007; Jones, 2017), and overly hormonal (Longhurst, 2008). This perception is aligned with the notion that women become incompetent in the transition to motherhood (Hurt, 2011) and in need of assistance from others (Hebl et al., 2007). Pregnant women are also seen to be at the continual mercy of their hormones (Longhurst, 1999), and face discrimination, prejudice, and benevolent sexism throughout pregnancy (e.g., Halpert, et al., 1993; Hebl et al., 2007; Johnson, 2008; Kitroeff & Silver-Greenberg, 2019; Longhurst, 1999; Masser et al., 2007; Sutton, et al., 2011). Such perceptions are arguably fuelled by the existence and promotion of stereotypes about pregnant women (Green et al., 1990) which suggest pregnant women are warm, caring, and maternal but also predominantly incapable and in need of assistance (Fiske, et al., 2002; Glick & Fiske, 1997). The 'baby brain' phenomenon has been subject to much inquiry from cognitive, neuropsychological, and evolutionary research (e.g., Casey, 2000; Christensen et al., 2010; Ziomkiewicz et al., 2019). However, there are inconsistencies and concerns surrounding the robustness and conclusiveness of this literature base. We next explore the existing evidence for 'baby brain', which almost exclusively stem from cognitive, neuropsychological, and evolutionary perspectives.

2 | EXISTING EVIDENCE FOR 'BABY BRAIN'

A plethora of cognitive psychologists have attempted to understand the extent to which 'baby brain' has a 'real' effect on cognitive measures, and whether the cognitive changes that women experience occur due to biological reasons (e.g., hormones, physiological changes, and differences in sleep patterns; Duarte-Guterman et al., 2019). Experimental cognitive studies have suggested that pregnancy is associated with poorer concentration, worse memory recall and motor coordination problems (Casey, et al., 1999; Davies et al., 2018; Henry & Rendell, 2007). However, while some studies report large differences in memory ability (Brindle et al., 1991; Henry & Sherwin, 2012), others report null effects between pregnant women and controls (Orchard et al., 2021; Schneider, 1989). Similarly, some studies report large changes in pregnant women's memory on both explicit (Henry & Sherwin, 2012) and implicit (Brindle et al., 1991) tests, whereas others, again, concluded that there is no difference (McDowall & Moriarty, 2000; Schneider, 1989).

Despite some reviews boldly claiming that 'baby brain' is a real or genuine phenomenon (e.g., Davies et al., 2018; Henry & Rendell, 2007), many studies find no evidence for an effect. For example, in a seminal study of pregnant women's cognitive abilities, Brindle et al. (1991) tested pregnant women's performance on memory-based cognitive tasks in comparison with non-pregnant women. Overall, there were no performance differences on any explicit measure of memory ability. However, for first-time pregnant women (primigravid), performance was worse than non-pregnant women, but only when memory was tested implicitly (using a stem completion task). Similarly, the Personality and Total Health (PATH) Through Life Project (Christensen et al., 2010) assessed cognitive functioning longitudinally over 8 years, and found no evidence of cognitive deficits during pregnancy. Therefore, there are clear inconsistencies in this literature, and some scholars have begun to highlight the unclear or inconclusive findings that plague the 'baby brain' literature (Davies et al., 2018; Hurt, 2011).

Running parallel to the cognitive literature, neuropsychologists have also studied 'baby brain' in some depth (e.g., Grattan & Ladyman, 2020; Kinsley & Lambert, 2006). This has included investigations into maternal brain

neuroplasticity (e.g., Dahan, 2021), both during pregnancy (e.g., Hoekzema et al., 2017) and into new motherhood (Barba-Müller et al., 2019), changes in grey matter during pregnancy (Luders et al., 2020), hormonal pregnancy changes (Grattan & Ladyman, 2020), brain tissue changes (Oatridge et al., 2002) and consequent broader neurobiological changes that occur during pregnancy (Lambert & Kinsley, 2012; Voltolini & Petraglia, 2014). These studies demonstrate the brain changes that women experience during pregnancy; however, the relationship between such structural and neural changes and women's actual *performance* during this time has not been subject to rigorous investigation in the literature.

Further, neuropsychological work has also concentrated on pinpointing *where* neurological changes during pregnancy and early motherhood occur. For example, Luders et al. (2020) appraised the literature on grey matter gain after childbirth, comparing the immediate postpartum period and later after giving birth, and note that 'baby brain' (i.e., in pregnancy) may differ from 'mommy brain' (i.e., during early motherhood). The authors note that some studies show an increase in grey matter from 3 to 4 months of pregnancy compared to weeks after childbirth (Kim et al., 2010), and other studies show a decrease in brain size during pregnancy that is reversed by 6 months postpartum (Oatridge et al., 2002). However, other studies also show prolonged brain disruption up to 2 years postpartum (Hoekzema et al., 2017). As Duarte-Guterman et al. (2019) summarise, overall, pregnancy is associated with a plethora of short- and long-term changes in brain functioning, which means that pregnancy constitutes a 'unique female experience' (p. 2) that is unlike other life changes. Neurological fluctuations occur in parallel with wider changes including hormonal, cardiac, respiratory, and renal changes, as women's bodies change to accommodate their foetus (Duarte-Guterman et al., 2019). Therefore, despite the variations across specific conclusions from the neurological evidence, this literature base points to a conclusion that pregnancy does generally 'remodel brain architecture and neural function' (see a review by Brown & Schaffir, 2019).

Whether this 'remodelling' constitutes positive or negative changes remains unclear, however. Indeed, adding to the complexity of this literature, while some studies find support for the negative effects of pregnancy on memory and cognitive performance, some neuropsychological literature suggests that women's cognition is *improved* throughout pregnancy. For example, Kinsley and Lambert (2006) suggest that pregnancy and early motherhood is a time of heightened neuroplasticity which means that mothers' have 'bigger' and 'better' brain capabilities. This concept is also perpetuated in Ellison's (2006) popular science book 'The Mommy Brain: How Motherhood Makes Us Smarter'. In an analysis of the messages communicated in Ellison's text, Thornton (2014) explains that these scientific claims promote the concept that good motherhood has a 'biological basis' (p. 278). Indeed, in recent years, scholars have voiced concerns about cognitive investigations into 'baby brain', noting issues such as inconsistencies in data collection methods across studies (Luders et al., 2020) and challenges in capturing 'real world' cognitive multitasking in parenthood (Ablow & Measelle, 2019). These inconsistencies in neurological evidence may be contextualised by Laurent's (2019) concerns over pregnancy neuroimaging methodologies. In their discussion of the challenges in characterising 'mommy brain', Laurent (2019) notes that issues such as lack of ecological validity in neuroimaging studies means that neuropsychologists' attempts to pinpoint the complexities of the maternal brain 'inevitably result in a less than complete picture of what we wish to visualize the parental brain in action' (p. 94). Luders et al. (2020) also highlight the inconsistencies in neuropsychological studies of pregnancy brain changes, due to factors such as fluctuating sample sizes and inconsistencies in data collection methods. Therefore, as with the cognitive literature, neuropsychological investigations into 'baby brain' are littered with inconsistencies and concerns surrounding the conclusiveness of the evidence base.

3 | THE NEED FOR SOCIAL AND PERSONALITY PSYCHOLOGY APPRAISALS

Given the inconsistencies within the cognitive, neuropsychological, and evolutionary literature, and the inability for current explanations to reach a conclusive standpoint, we argue that there is value in applying a social or personality psychological perspective to provide further insights into this phenomenon (as per Crawley et al., 2008; Hurt, 2011;

Pownall, 2019). Some concerns surrounding the inconsistencies within this evidence base have been voiced in the literature; for example, Hurt (2011) argues that cognitive investigations into 'baby brain' are inconclusive and problematic. Hurt (2011) proposes 'the baby brain dilemma' (p. 381), which highlights how women's lived experiences of pregnancy are often overlooked in favour of attempts to gather empirical, objective, and scientific evidence that corroborate women's self-reports. As Thornton (2014) also notes, cognitive investigations have led to a proliferation of 'baby brain' self-help books, which appear to offer women a mechanism to 'opt out' of gendered expectations, whilst problematically positioning women as *responsible* for managing their pregnancy. This, as Thornton (2014) argues, reinforces gendered norms and dilutes women's agency. Beyond the wider question of whether cognitive studies into 'baby brain' are helpful in of themselves, scholars have also raised methodological concerns within this evidence base. For example, Brown and Schaffir (2019) argue that the cognitive literature which examines neural and cognitive function in pregnancy is inherently hampered by small samples of participants, unclear definitions of memory capabilities, and heterogeneous methodologies. Therefore, even when significant effects are found, they should be interpreted with caution. This calls into question the robustness and utility of purely cognitive experimental attempts at understanding 'baby brain' in pregnancy.

So far in the social literature, psychologists have focused on studying the pervasive levels of maternity prejudice (Longhurst, 1999; Masser et al., 2007), benevolent sexism (Hebl et al., 2007; Sutton, et al., 2011), and discrimination (Halpert, et al., 1993; Johnson, 2008; Kitroeff & Silver-Greenberg, 2019) that women face during pregnancy. These enquiries are necessary and insightful. However, given the state of the 'baby brain' literature, coupled with evidence that pregnancy perceptions have a negative impact on women and baby's health (Hackney et al., 2020), it is important to directly address how social psychological theories may help to understand the concept of 'baby brain' itself. In providing a social cognitive perspective to this ongoing discussion, this will also offer an account that acknowledges social context and centres women's experiences, rather than adopting a more paternalistic view of cognition throughout pregnancy. This will also acknowledge that pregnant women's experiences are *socially* located, rather than purely a product of biology. Indeed, as Bleier (1978) notes, biological explanations of social phenomena are generally widely accepted (and, indeed, preferred), because they instil a sense of order and structure and are perceived to be reliable (see also Eliot, 2019; Hoffman & Bluhm, 2016). In this sense, biological claims have wide popular appeal because they are thought to reflect things as they 'really are' (Fine, 2013). However, as Fine (2008) and others have argued, it is important to provide competing accounts, to avoid biological determinism and scientific paternalism.

Some social psychological work has already begun to unravel the tightly wound myths that cognitive, neuropsychological, and evolutionary psychology have perpetuated about women's experiences. For example, Shahvisi (2020) provides a useful social reappraisal of 'nesting' behaviours during pregnancy, calling into question the supposedly hormonally determined behaviour of preparing a space for a baby during pregnancy. There is a small but growing body of literature which directly tests how social explanations may contribute to the 'baby brain' phenomena. Most notably, Crawley et al. (2008) attempted to empirically assess whether perceived cognitive impairments during pregnancy are a product of stereotyping, or a real decline due to organic, physiological changes. The authors concluded, following use of both self-report measures and cognitive tasks, that pregnant woman generally rate their cognitive abilities as worse than pre-pregnancy despite only mild differences between the groups on the objective memory tasks. However, the pregnant participants only performed worse than non-pregnant participants in two out of 13 performance measures from a range of objective measures. This suggests that while there is a mild performance difference in cognitive tasks, favouring non-pregnant participants, the perceived difference is supported by objective measures of performance. This provides initial evidence for the contribution of social stereotypes to the 'baby brain' phenomena.

Now, we will outline two prominent social psychological theories that may help to understand the phenomenon of 'baby brain' in pregnancy: *stereotype threat theory* and *objectification theory*. We have chosen to concentrate on these two theories because, crucially, they both (a) attempt to account for discrepancies on actual *performance*, thus allowing a direct challenge to the cognitive evidence, (b) are driven by the same social cognitive mechanisms, (c) are particularly well-researched in women. Moreover, it is important to note that, in applying these two theories

to the study of 'baby brain', this is not to say that 'baby brain' itself is not clearly affected by real, pragmatic, situational or biological reasons. Sleep disturbances, physical discomfort, and anxiety are all important factors which are likely to drastically influence cognitive performance during pregnancy and into the immediate postpartum period. However, stereotype threat and objectification theory are both broadly concerned with how social phenomenon may *exacerbate* performance deficits or heighten any existing differences. As Tomeh and Sackett (2022) recently argued, there is a misperception within this literature that removal of stereotype threats can thus lead to equitable performance across groups. Rather, these theories do not posit that removal of threat or objectifying cues can 'cancel out' performance differences, but instead demonstrate how activation of negative stereotypes can worsen performance differences that do exist. We now summarise each of these theories, and demonstrate how they may be appropriate frameworks to (re)consider 'baby brain' through a social lens.

4 | EXPLANATION 1: STEREOTYPE THREAT THEORY

One social psychological theory which may provide insights into 'baby brain' is *stereotype threat theory* (Steele, 1997; Steele & Aronson, 1995). This theory suggests that exposure to information concerning self-applicable negative stereotypes undermines performance on tasks associated with that stereotype (Schmader et al., 2008; Steele, 1997; Steele & Aronson, 1995; Wakefield et al., 2012). According to stereotype threat theory, when people think that their behaviours will confirm a negative stereotype about a group that they are a member of, this worsens performance in the stereotyped domain (Steele, 1997; Steele & Aronson, 1995). For example, exposure to explicit gender-mathematics stereotype-based information, including 'women are poorer at mathematics' or 'men are better at mathematics,' (Martens et al., 2006; Spencer et al., 1999) can induce women's performance concerns (e.g., Doyle & Voyer, 2016; Shapiro & Neuberg, 2007), prompting a 'state of self-evaluative threat' (Koenig & Eagly, 2005, p. 489), which worsens performance in this domain, compared with controls (Schmader et al., 2008). Researchers have found stereotype threat effects related to race and academic performance (Gonzales et al., 2002; Steele & Aronson, 1995), social class and standardised tests (Spencer & Castano, 2007), age and memory (Hess, et al., 2003) and gender and math performance (Ambady et al., 2004; McIntyre et al., 2003; Pronin et al., 2004; Spencer et al., 1999). These findings have also been applied to threatened performance in tasks such as memory (Beilock et al., 2007; Hess et al., 2003; Levy, 1996), mental rotation (Moè & Pazzaglia, 2006) and anagram completions (Wakefield et al., 2012). Further, stereotype threat effects have been found when stereotype information is both explicit (Spencer et al., 1999) and when the stereotype is communicated more implicitly (Smith & White, 2002).

Stereotype threat theory has important real-world implications for stereotyped or stigmatised groups. For example, research has evidenced the negative consequences associated with exposure to a stereotype threat, such as lower career aspirations in counter-stereotypical areas (Davies et al., 2005), higher task-related anxiety (Bosson et al., 2004), feelings of dejection (Keller & Dauenheimer, 2003) and dissociation with the stereotyped group (e.g., Davies et al., 2005; Major et al., 1998). There has also been much debate surrounding the social cognitive *mechanisms* that cause stereotype threat effects to occur. For example, stereotype threat has been linked to increased performance anxiety (Bosson et al., 2004; Osborne, 2001, 2007) arousal (Ben-Zeev et al., 2005; Blascovich et al., 2001), and stress (Sherman et al., 2009). One factor which affects stereotype threat effects is an individuals' motivation to avoid confirming the stereotype to be true (Logel et al., 2012). Identification with the domain under threat is of clear importance to activate stereotype threat effects, in that motivation to disprove stereotypes in an unvalued domain is likely to be lower. Stereotype threat effects occur when the individual under threat places high importance on their performance in the domain (Hess et al., 2009; Nguyen & Ryan, 2008; Shapiro & Neuberg, 2007).

The threat of underperformance motivates individuals to disprove a stereotype (Davies et al., 2016; Jamieson & Harkins, 2007), and preoccupation with the consequence of confirming a negative stereotype therefore interferes with one's ability to perform. Jamieson and Harkins (2010) also note that belief salience is a key factor in eliciting stereotype threat effects. Research has also suggested that conditions which activate stereotype threat affect

performance by decreasing performance expectations (Cadinu et al., 2003) and increasing self-doubt (Steele & Aronson, 1995). Stereotype threat effects are also particularly harmful when they target an *identity* or social group that is integral to one's overall sense of self (Shih et al., 1999). Investment in the social identity that is targeted by the threat, therefore, is another important moderator (Brown & Pinel, 2003; Nosek et al., 2002). This is echoed by Shapiro and Neuberg's (2007) Multi-Threat Framework of stereotype threat, which stresses that threats must be rooted in 'one's overall self-construal' to be most effective (Bergeron et al., 2006); Pennington et al. (2016) found that when under a self-as-target and group-as-target threat, participants' performance was worse when tested alone, compared with testing sessions in single-sex groups. This is in line with the Multi-Threat Framework (Shapiro & Neuberg, 2007) of stereotype threat, which makes a crucial distinction between stereotypes that threaten '*group-as-target*' versus '*self-as-target*' stereotypes.

We propose that the concept of stereotype threat may explain inconsistencies in 'baby brain' literature. That is, if pregnant women are either subtly or explicit reminded of the 'baby brain' stereotype in a memory testing context (i.e., in a laboratory study of memory), this may lead to performance disruption. The existence, and activation of, negative stereotypes about pregnant women's memory functioning could explain discrepancies across objective testing contexts. Indeed, while stereotype threat has been retested extensively in recent years with a particular focus on the 'girls are poorer at mathematics' stereotype, to date no research has investigated stereotype threat as a potential explanation of the 'baby brain' perception. Memory performance has been found to be affected by a stereotype threat manipulation in previous experimental work (Beilock et al., 2007), which suggests that this paradigm may be useful in understanding 'baby brain' effects. In theory, stereotype threat is a wholly compatible explanation to the perception of women as cognitively less able throughout pregnancy and into motherhood, because it makes the crucial connection between social perceptions and observable, quantitative performance. However, importantly, this theory has not yet been tested. Indeed, any social psychological work which assesses any potential social, cultural, or societal explanations to 'baby brain' remains entirely in its infancy (Crawley et al., 2008).

5 | EXPLANATION 2: OBJECTIFICATION THEORY

The second potential social psychological theory that may shine light on the 'baby brain' effect is Fredrickson and Roberts (1997) objectification theory. There is also a plethora of research which shows how cognitive performance suffers when gendered group membership is made salient via an *objectification* manipulation. Objectification theory suggests that due to the implicit sense of body inspection that exists in modern society, women are constantly socialised by society to view themselves as more object-like and thus less human (Fredrickson & Roberts, 1997). *Self-objectification* refers to when this objectification is *internalised* by women which manifests behaviourally as a preoccupation with physical appearance, body shame, and appearance anxiety (Fredrickson et al., 1998). Self-objectification occurs when women internalise the heteronormative perspective that their personal value derives from their value as sexual, physically attractive objects to be gazed upon, and thus inspect their own bodies critically (Tiggemann & Lynch, 2001).

Importantly, self-objectification theory shows how the expectation by women of a focus on their appearance can deplete their *cognitive* resources, which thus leads to impairment on cognitive tasks (Hebl et al., 2004; Kahalon, et al., 2018; Quinn, et al., 2006). In a classic portrayal of the impact that self-objectification has on cognitive outcomes, Fredrickson et al. (1998) tested the impact of self-objectification on women's mathematics performance. Participants completed a mathematical test whilst wearing either a swimsuit (thus eliciting self-objectification) or a jumper (control condition). For women whose appearance was most salient, in the swimsuit condition, they later performed significantly worse on the maths test. Importantly, this effect occurred only for female participants and the same effect did not replicate for men, which suggests that the performance deficit effects were a result of activated gender schemas that were associated with appearance.

Therefore, as with stereotype threat theory, this approach may be a useful framework to explore factors that impact 'baby brain' in pregnancy. In theory, much like stereotype threat theory, self-objectification theory may

explain cognitive underperformance by pregnant women in memory tasks, if women are inadvertently objectified during testing contexts. This may again explain the inconsistencies across cognitive investigations of 'baby brain' in pregnancy. Objectification theory is a particularly useful framework for understanding pregnancy-based cognition, given how it connects bodily experiences with cognitive performance, and pregnancy is inherently an embodied experience. Moreover, the link between objectification and impaired cognitive performance has demonstrated robustness across different groups of women in different testing contexts (Fredrickson et al., 1998; Gay & Castano, 2010; Gervais et al., 2011; Hebl et al., 2004; Kahalon et al., 2018). Winn and Cornelius (2020) provide a useful recent systematic review of this effect, demonstrating the robustness of the effects of objectification and its relationship with decreased cognitive ability. Moreover, self-objectification has been found to impede performance on a number of cognitive outcomes, including the Stroop test (Quinn et al., 2006), a Letter Number Sequencing task (Gay & Castano, 2010) and a Sustained Attention to Response Task (Guizzo & Cadinu, 2017), owing to the 'cognitive tax' of self-objectification (Aubrey & Gerding, 2015).

Unlike stereotype threat theory research, there are some empirical studies that assess objectification in the context of pregnancy. For example, Heflick and Goldenberg (2014) demonstrated how pregnant women are regular targets of *literal* objectification. This is exacerbated by the colloquial view of pregnant women as a 'human incubator' or as a 'womb for rent' (Beech et al., 2020). Therefore, social and personality psychologists should continue to investigate the link between objectification and cognition in pregnancy, to provide further nuance and social context to the current 'baby brain' literature. Further, as with stereotype threat theory, the core tenets of self-objectification theory suggest that there may be important contextual factors at play in the testing conditions of cognitive 'baby brain' studies themselves (i.e., presence of objectifying cues), which is a notion that has currently not been considered in the literature to date. This, as with stereotype threat theory, may explain the inconsistencies across the 'baby brain' literature.

6 | FUTURE RESEARCH DIRECTIONS

We have outlined that the cognitive evidence for 'baby brain' is currently unclear and full of inconsistencies. We propose that focusing more explicitly on social psychological theories that investigate the relationship between social phenomena and cognitive performance (stereotype threat theory and objectification theory) may help clarify these inconsistencies. Therefore, we argue that social and personality researchers could make useful contributions to understanding in this area, in order to better understand the 'baby brain' effect. We propose a shift in this research agenda; instead of asking research questions that do not acknowledge or account for social context (e.g., 'Do pregnant women underperform on a memory task, relative to controls?'), a concern for social phenomena and social context should be embedded into this research agenda. In particular, future research should more actively acknowledge that pregnancy constitutes a temporary and embodied *social identity*. As some work has noted, throughout pregnancy women must create, or envision, a new sense of self (Bailey, 1999). Due to this, pregnancy women experience a process of losing their sense of autonomy, reforming and re-negotiating their social identity, and reconstructing their personality (Laney et al., 2015). Research has also noted that women's transition to motherhood is associated with complex feelings surrounding identity and body image; as Ogle et al. (2011, p. 40) summarise, in pregnant women engage in a process of 'recapturing, redefining, and reclaiming' their bodies. Arguably, this intensified time of identity management and ongoing body image negotiation is unique to the group of pregnant women, given how pregnancy constitutes a highly visible but also temporary life experience. Therefore, studies that investigate pregnant women's cognitive performance that do not fully acknowledge the complex negotiation of identity and body image that pregnant women experience can lack depth and context. This demonstrates the value in appraising 'baby brain' from a social and personality psychology perspective.

To remedy concerns with the existing 'baby brain' literature, future research should strive to more explicitly appreciate how pregnancy is a time of heightened societal pressures and expectations, social identity fluxes, and

body image concerns. Indeed, the existence of these intensified social phenomena will impact any 'objective' investigation into women's cognitive performance during pregnancy, and so must be carefully considered and factored into research studies. To achieve this, there are broadly two approaches that social and personality psychologists can take to strengthen the 'baby brain' research area: (1) researchers can embed a concern for social phenomenon in designing new 'baby brain' quantitative studies, (2) alternatively, researchers can abandon the quest for objective differences, and instead focus on understanding women's lived experiences. For the former of these suggestions, this may initially be achieved in practice using experimental or correlational social psychological paradigms. For example, research studies could ask 'does the presence of stereotyping or objectification mediate any effects, such as reducing performance in pregnant women, relative to controls? (as per Pownall et al., 2021)' or 'does pregnancy social identity moderate any cognitive performance differences?'. Incorporating relevant social measures that align with the proposed explanations, such as levels of trait self-objectification, pregnancy social identity, or stereotype awareness, as either mediators or moderators, would also provide richer insights. This will be a useful first step in incorporating a concern for identity and social context into the 'baby brain' research area.

Alternatively, for the latter of these suggestions, there may also be value in adopting more critical qualitative methodologies in this field of study. For example, researchers could ask 'do pregnant women *experience* changes to their memory or cognition in pregnancy?' or 'is the concept of "baby brain" a feature of women's lived experience throughout their pregnancy?'. This will shift the focus from a more paternalistic approach to the study of 'baby brain' and ensure that scientific understanding of cognition in pregnancy is grounded in women's own accounts of their experiences. This will also respond to calls for prenatal research to be more attentive to women's lived experiences (e.g., see Staneva et al., 2015). These future research directions will ultimately prompt the 'baby brain' research area to move beyond the superficial, paternalistic account of women's memory performance during pregnancy, in order to embed a wider appreciation of women's unique social context and lived experiences.

Furthermore, there may also be alternative social theories, beyond the two covered here, that could be useful in conceptualising 'baby brain'. For example, social comparison theory (Festinger, 1954) may be a useful framework to further consider pregnant women's experiences of changes in cognition. Indeed, it may be that women's perceptions of their memory changes differ not only based on the presence of stereotyping and objectification, but only on the presence of other women who serve as a source of comparison. A social comparative approach has been used in other relevant literature in this area. For example, Chrisler et al. (2006) investigated how women's perceptions of their premenstrual symptoms differ when a social comparison dimension was involved. That is, women showed a tendency to believe that other women's premenstrual symptoms are worse than their own. This body of research has considered wider social issues related to the study of PMS, including an investigation of how women experiencing PMS are constructed in popular press (Chrisler & Levy, 1990), an analysis of how PMS is pathologized (Chrisler & Caplan, 2002), and a social comparative approach to how women perceive their own PMS symptoms (Chrisler et al., 2006). These approaches are compatible with the study of 'baby brain' and should be used to inspire wider work in this area. To date, however, there are no published studies which directly consider how social comparison theory may provide insights into women's appraisal of their own cognitive functioning in pregnancy, representing another notable gap in the 'baby brain' literature which may be filled by wider social psychological investigations into this effect.

7 | CONCLUSION

In conclusion, to date, investigations into 'baby brain' almost exclusively derive from cognitive, neuropsychological, evolutionary, or biological perspectives. Future work should also continue to investigate how different individual and contextual dimensions may contribute to the 'baby brain' effects that are reported within the cognitive literature. For example, there is literature which shows how personality factors impact women's memory performance during pregnancy; Casey (2000) concluded that personality factor of conscientiousness and self-reported pregnancy anxiety

predicted forgetfulness and absentmindedness in pregnancy. Therefore, women who experience more pregnancy anxiety may also experience more task-performance related anxiety in the face of a stereotype threat, and thus perform worse when in a state of stereotype threat. Overall, we argue that it is important that research should continue advancing social and personality appraisals of cognitive change in pregnancy, such as those outlined in this paper, in order to further understand women's experiences in this unique stage of reproductive life. Indeed, if 'baby brain' research continues to disregard social context, researchers' ability to fully understand women's experiences during this stage of life will remain limited.

ACKNOWLEDGMENTS

We would like to warmly thank the Section Editor, Dr. Michael Bernstein, for his encouragement and belief in the ideas surrounding this paper. Madeleine Pownall was supported by a PhD Scholarship awarded by the School of Psychology, University of Leeds.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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ENDNOTES

- ¹ We recognise that not only people who self-identify as a woman can and do become pregnant. This wording choice reflects (a) the self-identification of the participants in the studies that we cite, (b) convention in this area of literature. For wider consideration of gender diverse people and pregnancy, see the Trans Pregnancy Project (e.g., Riggs et al., 2020).
- ² We recognise that motherhood can occur following pregnancy, adoption, fostering, or surrogacy. These journeys into motherhood, including step-motherhood, are legitimate experiences of women's transition to motherhood. The focus of this paper, however, is studies that address 'biological motherhood' and pregnancy, due to the evidence that demonstrates how pregnancy and new biological motherhood is associated most prominently with 'baby brain' perceptions and allows us to directly challenge hormonal and cognitive explanations (Davies et al., 2018).

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How to cite this article: Pownall, M., Conner, M., & Hutter, R. R. C. (2022). 'Baby Brain' in pregnancy: A review of social psychological explanations and future research directions. *Social and Personality Psychology Compass*, 16(7), e12696. <https://doi.org/10.1111/spc3.12696>