The role of episodic future thinking in perinatal mental health

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by
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Statement of Originality

I confirm that the work presented in this thesis is my own. Where information has been derived from other sources, this has been indicated within the thesis.

Linda Mortimer

Ethics Statement

Ethical approval for the research presented within this thesis was granted by the Research Ethics Committee at Goldsmiths, University of London. Ethics documentation has been provided within the appendices.

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Table of Contents

List of Figures

List of Tables

Abstract

Pregnancy is, for many women, a time of happiness and joy, as they look forward to the birth of their baby. However, for some, it signals a time of adjustment to new demands, that can result in increased levels of worry and stress. There is a growing body of evidence that shows there is an association between high maternal stress during pregnancy and premature birth, lower birth weight, smaller infant head circumference, and subsequent impaired cognitive development (Huizink et al., 2004a). Pregnant women are more future-focused, thinking about childbirth and their new lives as mothers, engaging in episodic future thinking. Episodic future thinking is our ability to mentally travel into the future and includes our ability to simulate, make predictions, set goals and plan for possible future events (Gilbert & Wilson, 2007; Szpunar et al., 2014). The current thesis sets out to clarify the factors associated with episodic future thinking that contribute to and maintain pregnancy-related anxiety, which can be utilised in a much-needed intervention that could enhance the well-being of mother and child.

In Study 1: Phase 1, eighty soon-to-be first-time mothers imagined their impending labour and the birth of their baby and early parenthood in as much detail as possible, out loud, during a semi-structured interview. They rated their anxiety for these events both pre- and post-simulation, along with their experience of a range of phenomenological qualities of their future thinking. The simulations were recorded and transcribed which allowed the researcher to identify additional qualities that related to post-simulation anxiety. Post-simulation anxiety was rated lower after imagining the events, an effect that was strongest for childbirth. Additionally, the participant rated qualities of anticipated emotional valence and the researcher rated number of specific steps in the simulations were found to relate to

post-simulation anxiety. This suggests that being able to create simulations of the future that focus on higher positive and lower negative anticipated emotions along with populating the simulations with a high number of specific steps to get from the beginning to the end of the event could lower post-simulation anxiety further.

Study 1: Phase 2 followed up on the women from Phase 1 and explored the importance of simulation accuracy in postpartum mental health. Imagining the future may have longer-term positive benefits, if expectation matches the reality of the event that is experienced. The women from Phase 1 were contacted around 8 weeks postpartum and asked to rate the extent to which the experience of giving birth and life with a newborn matched their expectations as set out in their simulations. The women gave childbirth the lowest level of simulation accuracy (whether the event matched their expectation as set out in their simulations in Phase 1) and valence accuracy (whether the experience was better or worse than imagined). However only valence accuracy was related to postpartum anxiety as measured by the GAD-7, suggesting that the women had an expectation that their childbirth experience would be different to what they expected and were anxious if it was worse. The first day at home with baby simulation accuracy on the other hand was related to postpartum anxiety, with the women rating their experience of that day as different to what they expected, and this was associated with their level of anxiety postpartum. Study 1: Phase 2 suggests that simulation and valence accuracy are important when imagining these events and have longer-term implications for mental health.

Study 2 tested the efficacy of a brief intervention for perinatal anxiety, focusing on increasing specificity in future thinking. Those in the intervention condition, who had received a series of prompts intended to increase the specificity of their simulations of

childbirth and the first day at home with their baby, had significantly lower post-simulation anxiety ratings compared to their pre-simulation anxiety, and when compared to the control group. This suggests that increasing the specificity in simulations of the future is an effective way to reduce anxiety in soon-to-be first-time mothers. Suggestions are made as to the methodological issues raised in this thesis, along with a discussion of the implications of the findings in relation to the application of episodic future thinking in the management of anxiety and possible future research.

Chapter 1: Introduction

1.1 Introduction

This thesis focuses on episodic future thinking, and its potential use as a means to reduce anxiety during the perinatal period for soon-to-be first-time mothers. The current chapter will begin by explaining episodic future thinking, and the research that has explored its qualities and function. The role of EFT in anxiety in general and during pregnancy will be discussed, before finally presenting the rationale and aims of this thesis.

Mental time travel (MTT) is defined as the process of re-experiencing or recalling the past (memory), experiencing the present (perception) and simulating the future (future thinking; Suddendorf & Corballis, 2007). Therefore, future thinking is our ability to mentally travel into the future and includes our ability to simulate, make predictions, set goals and plan for possible future events (Gilbert & Wilson, 2007; Szpunar et al., 2014). Anxiety is characterised by chronic, excessive, and uncontrollable worry (Behar et al., 2005) that tends to be future-focused, placing future thinking at the centre of our experiences of anxiety. Future thinking can be useful in the management of anxiety, as it is thought to have several adaptive functions. After all, if we can predict the future, we can then set intentions about, plan for and rehearse that future which allows us to prepare for it (Szpunar et al., 2014).

Pregnancy is a time when women are more likely to be future-orientated than non-pregnant women (Li & Cao, 2018, O'Toole & Berntsen, 2020), and this focus on thinking about the future may help them adjust to their new role in motherhood. Pregnancy is for many women a time of happiness and joy, as they look forward to the birth of their baby (Nelson, Kushlev and Lyubomirsky, 2014). However, it does also signal a time of adjustment to new demands that can result in increased levels of worry and stress, often about experiencing childbirth, the physical changes brought about by pregnancy and the health of

the unborn child, (Huizink et al., 2004a; Sjögren & Thomassen, 1997). Increased maternal

stress has been shown to negatively impact women's mental health, their perception of

their bond with their infant postpartum, as well as the development of the foetus and child,

leading to concerns about the increase of anxiety during pregnancy and its effects on the

process of thinking about childbirth and parenthood (Challacombe et al., 2021; Fairbrother,

2016; Leach et al., 2017; Nath et al., 2018; Uguz et al., 2019). There is an association

between high maternal stress during pregnancy and premature birth, lower birth weight,

smaller infant head circumference, and subsequent impaired cognitive development

(Huizink et al., 2004a).

The focus of this thesis is to establish the extent to which episodic future thinking

has an adaptive function in the regulation of emotions associated with pregnancy,

childbirth, and early parenthood; especially episodic future thinking's role in helping soon to

be first time mothers prepare for novel, highly personal events that they have not

experienced previously. The following chapter will define episodic future thinking and then

discuss the two prominent theories of future thinking: the constructive episodic simulation

hypothesis and the semantic scaffolding hypothesis. It will then look at the adaptive

functions of future thinking in helping us to regulate our emotions about a novel, highly

personal future event.

1.2 Episodic Future Thinking

Future thinking is a form of mental time travel that allows us to imagine or simulate

events that might happen in our personal future (Gilbert & Wilson, 2007; Schacter et al.,

2017; Suddendorf & Corballis, 2007; Szpunar, 2010). It involves drawing on our episodic

memory of a similar previous event to create a mental simulation of how a possible future event may play out (Schacter, 2012; Schacter & Addis, 2007; Suddendorf et al., 2009). These future scenarios are not exact replicas of past events, but call on different elements from the past, extracting, recombining, and reassembling them into possible future events that have not occurred in that form previously (Schacter & Addis, 2007). The importance of episodic memory in future thinking has led to this type of mental time travel being referred to as episodic future thinking (EFT; Atance & O'Neill, 2001). There are two defining features of EFT; the sense of pre-living an event through the subjective feeling of being in the future, derived from the autonoetic consciousness (Suddendorf & Corballis, 2007; Tulving, 1985); and the level of plausibility of the event based on elements of the episodic memory used to create the simulation (Szpunar, 2010).

The sense of pre-living an event comes from the link between semantic and episodic memory and consciousness awareness; anoetic, noetic and autonoetic consciousness (Tulving, 1985). According to Tulving, in anoetic consciousness, we are bound to the here and now and lack any awareness of the content of the memory, for example in our procedural memory for riding a bike. Episodic memory is linked with remembering and autonoetic consciousness. It is remembering through self-recollection, which involves mentally re-enacting previous events that you are present at (Gardiner, 2001). When you remember something, you have a vivid awareness of the context, emotions, and details associated with that event. It is an integral part of autonoetic consciousness, which is the capacity for self-awareness and mental time travel to the past and into the future.

Noetic consciousness on the other hand, typically relates to knowing, and to semantic memory, which is the storage of factual information and general knowledge. This

form of memory does not involve the same level of conscious reliving or re-experiencing. It is more declarative and often does not have the same level of personal connection or the richness of sensory and emotional details. There is no subjective feeling of mentally travelling back in time to the events or experiences that relate to this information (Gardiner, 2001). For example, you may know the ingredients needed to bake a cake but recall this separately to remember baking with your mother as a child.

Tulving, (1985; p1) referred to the role of the autonoetic consciousness in MTT as "the kind of consciousness that mediates an individual's awareness of his or her existence and identity in subjective time, extending from the personal past through to the present to the personal future". It is autonoetic consciousness that gives an awareness of where we are in time and allows us to travel backwards and forwards in our minds (Klein, 2016; Tulving, 2002). In this sense, the role of autonoetic consciousness in EFT can be said to give the sense of 'pre-living' as it gives us an awareness that we are engaging in a simulation of the future, and that this is separate from the present, in a similar way that we know that a memory refers to the past, and that recalling a memory can bring a sense of 're-living' (Klein, 2014; Suddendorf & Corballis, 2007). Therefore, it is the combination of the autonoetic consciousness and episodic memory that gives the subjective feeling of travelling forwards in time, and it is the function of the episodic memory is to provide the elements needed to make mental time travel possible.

The second defining feature is that EFT involves the act of imagining plausible events (Dickerson & Eichenbaum, 2010). When daydreaming an individual can imagine an endless number of possible scenarios, they can fly to the moon, or score the winning goal at the World Cup. However, unless they are a trained astronaut or play football for their national

team, these are mere flights of fancy and are highly implausible. For future thinking to occur, there should be a link to the individuals' reality which in turn is linked to their autobiographical memories (Atance & O'Neill, 2005; Atance & O'Neill, 2001; Szpunar, 2010). Plausibility is important because the content of simulations of the future is based on the elements retrieved from the episodic memory and would therefore contain elements of an individual's personal past (Schacter & Addis, 2007).

1.3 The role of memory in episodic future thinking

1.3.1 Autobiographical Memory and EFT

Autobiographical memory is our memory of events from our personal past that combine to create a coherent story of the self. It contains both episodic memories that relate to events experienced at a particular time or place, but also semantic memories that relate to general knowledge and concepts concerning the self. According to Conway, autobiographical memory is organised hierarchically (Conway & Pleydell-Pearce, 2000) and contains autobiographical knowledge, i.e., personal factual, and cultural knowledge, and episodic memories from personal experience. This knowledge contains different levels of specificity, from broad lifetime periods to general events and event-specific knowledge. Lifetime periods refer to general knowledge of others, locations, as well as our actions, plans, and goals. They have distinct time periods with beginnings and endings, though these can be ill-defined, and may overlap with other lifetime periods. They contain temporal knowledge about the duration of a period as well as thematic knowledge about common features of that period.

The second level of specificity relates to general events. These can be single or repeated events and may include a series of memories linked together by a theme that could be referred to as 'mini-histories'. They include vivid memories around events relating to the attainment of or failure to attain personal goals, for example how easily a skill was acquired or the experience of an unsuccessful first date. The third level, event-specific knowledge is the elements of events, the details, that are vivid and are retained in the memory if they are rehearsed. Imaging future events is thought to have many similarities with autobiographical memory of past events and is said to involve episodic memory. The ability to recall specific events from our personal past can help us to envisage and plan for situations we may find ourselves experiencing in the future.

Studies that have looked at patients with deficits in autobiographical memory have helped to highlight the importance of autobiographical knowledge in EFT. For example, Race et al., (2011) rated the past and future event descriptions of eight amnesic patients with medial temporal lobe damage and compared them to matched controls. They found that the amnesic patients provided less detailed narratives for events in the future, and their level of detail given in past events was strongly correlated to the quantity of information they gave in future events (r=0.75). This was in contrast to the patients' ability in a picture description task, where they were able to tell stories relating to the pictures as well as the control group.

Race et al found a strong correlation between the details of past and future event narratives in contrast to the picture task, which highlights the specific nature of the patient's deficits in episodic memory in contrast to general narrative ability. However, there may be a difference in task difficulty that could affect the findings. While the patients could describe

21

the pictures just as well as the control group, this task may be less complex than generating

detailed narratives of past and future events. This difference in cognitive demands of the

tasks could account for the observed differences in performance.

Cole et al., (2016) provided further evidence for concordant deficits in

autobiographical memory and EFT. They presented a single case study of HCM, who had

anterograde and retrograde amnesia following cerebrovascular injuries. He exhibited

deficits in EFT, both in the quantity and the quality of his future scenarios. His future

thinking was implausible given his current mental and physical state and was beyond the

boundaries of his current autobiographical knowledge. Cole et al (2016) argued that the

type and number of episodic memories available for recall influences the content and

number of thoughts they have about the future. Thus, leading to the conclusion that

autobiographical knowledge, and specifically episodic memory, plays an important role in

future thinking.

1.3.2 Episodic Memory and EFT

The Constructive Episodic Simulation Hypothesis (CESH) was developed to explain

this link between episodic memory and the generation of simulations of the future. This

hypothesis proposes that simulations of the future require a memory system that allows the

flexible recombination of elements from the past into novel scenarios of the future

(Schacter & Addis, 2007). The development of the CESH is rooted in Suddendorf and

Corballis's (2007) assertion that episodic memory is constructive rather than reproductive

and therefore is part of several subsidiary systems that allow mental time travel to occur.

They stated that episodic memories are more than knowing a fact but are about

reconstructing the elements of a specific event that has happened to us. Suddendorf and

Corballis (2007) proposed that memories involve a mental reconstruction of some earlier event, which are then recruited into the construction of scenarios of the future that include the very elements that characterised the events from the past they are based on.

The CESH developed this idea further and went on to describe the role of episodic memory in generating simulations of future events. According to CESH episodic memory has evolved to be flexible and constructive and to contribute elements of past experiences that can be drawn on whether the individual is re-living (remembering) or pre-living (future thinking) an event. To be able to fulfil these functions, both remembering and future thinking involve shared adaptive constructive processes that include the capacity for relational processing, i.e., the linking together of disparate pieces of information (Cohen and Eichenbaum, 1993). The information to be linked comes from past memories which allows future simulations to be constructed giving the sense of pre-living behavioural, sensory, and emotional experiences within the temporal and spatial context of our memories , Dickerson & Eichenbaum, 2010; Tulving, 1985).

In summary, future thinking is part of a flexible memory system that draws on other memory systems to construct our imaginings of the future (Suddendorf & Corballis., 2007) which is combined with the autonoetic consciousness to give the sense of travelling backwards and forwards in time (Tulving, 1984). Evidence to support the CESH comes from several sources: patients with memory deficits, cognitive and behavioural studies and neuroimaging studies have all suggested an overlap between the function of episodic memory and episodic future thinking.

Patients with memory deficits

If, as the CESH states, episodic memory has such an important role in EFT it would be expected that there would be a considerable overlap in the processes that support both episodic memory and future thinking. Evidence from patients with memory deficits provides some of the earliest evidence of this link between episodic memory and future thinking (Tulving, 2002). For example, patient KC had complete retrograde and anterograde episodic amnesia after a motorcycle accident that resulted in a serious closed-head injury. According to Tulving, KC retained most of his cognitive abilities, including language and intelligence; he was able to read and write and concentrate. He also retained his ability to imagine things and recall objective facts such as his date of birth and details about where he lived. However, KC was unable to remember anything from his own life, no matter how memorable the event may have been or how many times he had been asked about it previously. He did have intact semantic knowledge gained before his accident and he could discuss physical time. However, his experience of subjectively experienced time, the autonoetic consciousness, was impaired. This affected not only his ability to recall his past but also his ability to think about the future. He was no longer able to imagine his future, suggesting that this sense of time from autonoetic consciousness is essential for both travelling mentally to the past and the future (Tulving 2002).

In a similar case study, DB had experienced presumed hypoxic brain damage following a heart attack and had difficulty remembering personal events (Klein et al., 2002). He was unable to consciously recall any memories of his personal past before the heart attack. This retrograde amnesia was also accompanied by severe anterograde amnesia, an inability to remember events that had occurred only minutes earlier. However, like KC he

had retained semantic knowledge, along with fluent speech, a general level of intelligence and ability to understand and respond to questions. Klein made a similar conclusion to Tulving, that the type of impairment experienced by DB related to a deficit in autonoetic consciousness, and that while semantic memory allowed for some mental time travel, that was not related to DB's awareness of his own experience. Both KC and DB retained the ability to know about but not re-experience previous experiences but were able to draw on general knowledge to construct possible scenarios of the future.

These studies support the CESH, indicating that there is a link between episodic memory and EFT, and particularly emphasises the role of autonoetic consciousness. One criticism of this research is that it comes from single-case studies, and therefore lacks generalisability due to the specific nature of the deficits being studied. However, there is support from more resent research by Janseen et al., (2022) who researched the pattern of deficits in episodic memory and future thinking tasks in a study of patients with Korsakoff syndrome, a neuropsychiatric disorder that is characterised by severe disruption of declarative memory. The patients with Korsakoff syndrome generated fewer internal (episodic) details in both a memory and a future thinking task, suggesting that both are grossly impoverished in Korsakoff syndrome and supporting the findings from KC and DB's studies. However, in contrast to the deficits seen in KC and DB, the Korsakoff syndrome patients also show deficits in external, semantic details, relative to controls, suggesting that whilst the single-case studies of KC and DB are useful, they provide only a partial understanding of the role of memory in future thinking.

Cognitive and behavioural studies

The CESH predicts that the pattern of phenomenological qualities of both past remembered and future thinking will show a significant overlap for both forms of mental time travel due to their mutual dependence on episodic memory. Cognitive and behavioural studies commonly ask participants to generate simulations of past and future events, and then rate their subjective experience of detail, vividness, sensorial detail, emotional valence, and visual perspective (Miloyan & McFarlane, 2019). If the CESH prediction is correct, there will be similar patterns of qualities across both past remembered and future imagined events.

Research that focuses on cognitive ageing shows that there is a decline in episodic specificity of memories with age (Levine et al., 2002) and that there is a similar decline in simulating future events, as expected if the two shared similar processes. Addis et al., (2010) compared imagining the future with imagining the past using an adapted version of the Autobiographical Interview (AI). Participants were instructed to retrieve memories of 35 events from the past 5 years, that were specific in time and place (i.e., lasting no longer than a day). Participants then generated a title and three details from each memory which were used to create stimulus sets for the AI session where they generated imagined future events based on the stimulus sets. Each future event was rated by the participants for the level of detail, emotion, personal significance, and similarity to a previously experienced event. Older adults produced fewer internal (episodic) and more external (semantic) details than younger adults for both remembered past and future events.

The episodic specificity induction (ESI) is a technique that has been adapted from the Cognitive interview, a forensic protocol that is used to increase the retrieval of episodic details in recalling events by eyewitnesses (Fisher & Geiselman, 1992). Its application to future thinking research comes from the premise that the ESI would increase the level of internal details in a future thinking task if EFT relied on the episodic retrieval processes. Madore & Schacter, (2014) showed young and older participants a brief video of people performing various tasks in a kitchen and then instructed them to either recall the video in as much detail as possible (the ESI condition) or just give their general impressions of the video. The ESI condition elicited more details for the memory and imagination tasks for both the young and older adults.

Painter & Kring's (2015) study supports this further. They coded the content of their participants' memories and future thinking and found that they had included similar specific content (i.e., who, where, time and place) in both future and past events. However, unlike other studies, the participants did not rate their own subjective experience of the narratives, they were rated by the research team. This limited the qualities available for comparison between the two tasks and whilst the researchers may produce a consistent rating across participants content, it does not fully explore the participant's experience of the similarities and/or differences of memories and future thinking.

In a later study, Madore et al., (2016) suggested that the common process between memory and EFT that is being recruited is event construction, the construction of a mental scenario that is connected in space and time and that contains details relating to settings, people, and actions (Romero & Moscovitch, 2012). To test this, Madore Jing & Schacter (2019) used the ESI, giving participants either one of two possible event construction tasks

(memory induction or an imagination induction) or a control induction that did not require

event construction, and compared their performance to a picture description task that

involved describing a picture without constructing an event. There were significant

increases in the number of episodic details for both the memory and imagination tasks

about the control and picture-describing tasks. This suggested that the memory and the

imagination tasks recruited the common process of event construction. It is also possible

that both event construction and future thinking are using a shared capacity for relational

processing that allows the linking together of disparate pieces of information that is then

further enhanced by the ESI.

Another frequently observed similarity between memory and future thinking is that

both show an effect of temporal distance. For example, D'Argembeau & Van der Linden,

(2004) asked participants to recall past events or imagine future ones that took place in a

specific place, at a specific time, and that for the future events were plausible to their

future. They were then asked to rate the events for the level of sensorial detail, clarity,

valence and intensity of emotions, and importance of the events. They were also asked to

give the temporal distance of the events. Their findings showed that events that are

imagined as occurring in the near past or near future (the past/coming days or months)

were represented in more sensorial and contextual detail than events imagined as occurring

in the distant past or distant future (the past year or next year). Similarly, Spreng & Levine,

(2006) asked their participants to create specific past and future events that had happened

or were likely to happen, and then date when the event either occurred or was likely to

occur. They found that their participants tended to spend more time thinking about past

and future events that are temporally near than about those that are temporally distant.

Research on autobiographical memory shows the importance of visual perspective on the recall of memories, with most memories being retrieved from a field perspective; seeing the memory as if through one's own eyes and a minority of memories recalled from an observer perspective or seeing the memory through someone else's eyes (Nigro & Neisser, 1983). Field memories tend to be more emotionally rich, more recent, and less frequently rehearsed (Berntsen & Rubin, 2006; D'Argembeau et al., 2003). D'Argembeau & Van der Linden, 2004b asked participants to report the visual perspective they used in past-remembering and future thinking and found that while there was a difference in the visual perspective reported depending on how temporally distant the event was, this was found for both past and future events. Temporally close events were more likely to be seen from an observer perspective, and temporally distant from a field perspective, for both memory and imagination tasks.

Exploring vividness in past and future thinking, Thakral et al., (2019) examined whether vividness of simulations can be predicted by the level of vividness of the episodic memories they were sampled from. It would be expected that if episodic memory and future thinking were shared cognitive processes there would be co-variance across memories and simulations. They asked participants to recall past memories comprised of a personally familiar location and person. These pairs were then recombined to be used in novel simulations of the future. They also rated the level of vividness for both the memory and the simulation. They found that the vividness of the memory co-varied with the vividness of the simulation, suggesting that the simulations were based on the content of the memory. There is a potential issue with this study: the novel simulations were based on past experiences, the participants recalled elements from their past to use in their future

simulations. It would therefore be expected that there would be an overlap in the content and the experience of these two narratives as the methodology ensured they were similar. The current study takes the approach that participants will imagine the future, then experience it before returning to recall it, which is expected to control for methodological issues such as this.

Participants in MTT research are often asked to rate the emotional valence associated with past or future events: the level of positive and negative emotions associated with the events. This often highlights a key difference between past and future thinking. D'Argembeau and Van der Linden in their 2004 study, asked participants to rate the level of positive vs negative emotions in their past and future imagined events, and then rated the simulations for whether the events were positive or negative. They found that future positive events were rated as more positive than past positive events, and future negative events were rated as more negative than past negative events, supporting the CESH. However, Painter and Kring (2015) coded the content of memories and simulations for emotional content. They found that people are more likely to construct positive futures that are similar to positive past memories but are less likely to do this for negative futures. This suggested that positive valence may differentially influence memories and future thinking and that not all qualities of past and future thinking overlap. The studies carried out by both D'Argembeau and Van de Linden and Painter and Kring rely on self-report measures for assessing emotional valence, focusing on a split between positive and negative. Emotional experiences are often more complex than this and may involve mixed feelings that are not captured when participants are asked to rate events on a simple positive-negative scale.

Neuroimaging studies

It would be expected that past remembering, and future thinking would evoke similar patterns of neural activity as they use overlapping neural structures (Okuda et al., 2003). fMRI scans have allowed the exploration of the brain activity involved in both past remembered and future thinking and have identified a striking overlap in the activity of the two processes, especially in what is termed the default mode network; areas of the brain that include the medial temporal and frontal lobes, the posterial cingulate, the retrosplenial cortex and the lateral parietal and temporal areas (Addis et al., 2007; Szpunar et al., 2007). This default network is said to underly both remembering and simulating the future as it becomes activated when engaging in both activities. Furthermore, both activities can be selectively impaired through brain damage, for example, patients with damage to the hippocampus suffer from debilitating deficits of memory, losing the ability to remember details about their past and to form new memories following brain damage (Eichenbaum & Cohen, 2001).

The ESI has also been utilised in neuroimaging studies that test the hypothesis that remembering and imagining rely on a common core network of brain regions that overlaps substantially with the default network. Madore et al., (2016) used fMRI scanning to measure brain activity while participants imagined the future while receiving either a specificity induction or one of two control conditions. The specificity induction led to increased activity in key brain regions previously implicated in detailed event construction, including the hippocampus and the inferior parietal lobule. This suggests that both episodic memory and future thinking share the cognitive process of event construction, as the ESI increases the

constructive retrieval process from memory and enhances the constructive nature of future

thinking by activating the core network (Madore et al., 2016).

1.3.3 Semantic Memory and EFT

Irish and her colleagues (Irish et al., 2011, 2012; Irish & Piguet, 2013) argue that

semantic memory may provide a framework for many complex cognitive functions that

include future thinking. Semantic memory can be thought of as conceptual knowledge,

containing our general knowledge of objects, the meanings of words, facts, and people. It

contrasts with episodic memory as it lacks connection to any particular time or place. For

example, knowing that Paris is the capital of France (conceptual knowledge of a fact) is

separate from the experience of walking along the Seine on a spring day (autobiographical

memory of a specific and personal event). However, semantic memory plays a more

essential role than simply providing facts, it is also seen as essential for a wide range of

cognitive processes including language, reasoning, problem-solving, planning and social

interaction (Binder et al., 2009).

Studies of patients with semantic memory loss either from brain injury or the

neurodegenerative disorder of semantic dementia have given insight into the role of

semantic memory, in both episodic memory retrieval and future imaginings. Semantic

dementia is the progressive and amodal loss of semantic or general conceptual knowledge

of the world (Hodges & Patterson, 2007) that is attributed to the deterioration of the central

modal semantic hub that leads to profound semantic deficits (Irish and Piguel, 2011).

However, despite these deficits semantic dementia patients display otherwise relatively

preserved cognitive functions while retaining recent episodic memory.

Irish & Piguet, 2013 compared two forms of dementia: Alzheimer's disease (AD) and semantic dementia (SD). Patients with AD typically present with anterograde episodic memory difficulties relating to the encoding and retrieval of recent events. However, while they showed episodic memory deficits, their semantic processes were spared at the early stages of the disease. In contrast to this is SD; here patients exhibited a progressive loss of semantic or conceptual knowledge of the world retaining cognitive processes including the recall of recent episodic memories (Irish and Piguet, 2013).

Irish et al., (2012a) compared future thinking in patients with semantic dementia, Alzheimer's disease, and healthy controls. They gave the participants a range of tests that included generating past or future events in response to a cue word, to explore episodic and semantic future thinking and memory retrieval. When recalling past events AD patients recalled significantly fewer past internal details than controls. However, SD patients recalled internal details at the same level as the healthy controls and significantly more than the patients with AD. When it came to future events, both patient groups were equally impaired relative to the controls. When it came to semantic tasks, as would be expected, the SD patients exhibited more pronounced semantic deficits than those displayed by AD patients. They scored lower across both semantic past and future tasks compared to both controls and AD patients. Nevertheless, AD patients also showed some impairment in semantic retrieval and simulation compared to the controls.

This study highlights the clear distinction between the role of episodic and semantic memory in future thinking, with different impairments being evident according to the type of dementia being experienced. The addition of a healthy control group for comparison

strengthens the findings of this study, rather than only comparing patient's performance on the tasks across the two types of dementia.

Irish et al., (2012a) concluded that this was suggestive of a profound episodic future thinking deficit in SD patients despite there being relatively preserved episodic memory for recent events. They suggest that this indicates semantic memory plays a critical role in supporting the simulation of future events, in combination with contributions from episodic memory. This led to the development of the semantic scaffolding hypothesis (SSH; Irish et al., 2012a; Irish & Piguet, 2013). The creation of future simulations required not only episodic detail but also the relevant abstracted representations from semantic memory, that is the appropriate schema, to provide the contextual elements that allow a coherent scenario to be created (Irish et al., 2013). SSH highlights the significant role semantic memory has in the provision of the schemas and meanings that are needed to create a plausible scenario of a future event.

They suggest that semantic processing underlies, or provides the scaffolding, not only for episodic memory but also its role in future thinking. Fundamentally, the SSH starts from the viewpoint that the contents of episodic memory involve both episodic and semantic representations which are recombined in a two-step process. First semantic associations between disparate details are made that draw on abstracted representations that are accessible depending on the specific task requirements, followed by a process of integrative binding to flexibly recombine these into a coherent spatiotemporal framework.

The SSH claims that the novel nature of the simulations would lead them to rely on external details, to fill in the gaps left by this lack of personal memory with conceptual and

factual knowledge. Irish et al., (2012a) found that the majority of future events that the SD

patients in their sample described were events they had previously experienced. The SD

patients replayed these events in their entirety, simply recasting the past as the future

despite being told to generate events they had not experienced before. This led Irish and

her colleagues to suggest that the construction of novel future events relies on semantic

knowledge, as it requires the individual to draw on their general knowledge of the world. SD

uniquely makes this unavailable and so the patient relies on previous episodes to create

novel scenarios and simply casts past events into the future.

1.3.4 The interaction of episodic and semantic memory and EFT

Szpunar et al., (2014, 2016) developed a Taxonomy of Prospective Cognition (see

Figure 1 below) intending to differentiate between the different modes of future thinking

and how they function in relation to episodic and semantic memory. The four modes are

generating simulations of the future, predicting the likelihood of a future event occurring

and the emotions relating to this, setting intentions around the goals related to a future

event and organising or planning the steps needed to arrive at the future outcome. They

propose that the modes build on each other at various levels, for example when planning a

future event, we may draw on simulations of that future event, predict the likelihood of this

simulation occurring and how we will feel about the event while formulating our intentions

about it. Szpunar et al also suggest that the modes of future thinking interact, for example

increasing the level of specificity in a simulation may improve the quality of a plan, or

predicting that a future event will have a positive outcome may mean we are more likely to

set an intention to carry it out.

Additionally, the taxonomy proposes that episodic and semantic memory are engaged on a gradient, rather than dichotomously, combining differing levels of personal episodic memory with the more general or abstract content of semantic memory. They suggest that the taxonomy can be used to explain how episodic and semantic memory can combine at differing levels, across different modes of future thinking. It is also possible that this framework can be applied to explaining why those with mood and anxiety related disorders show deficits in future thinking, as the ability to engage in the different modes are influenced by anxiety.
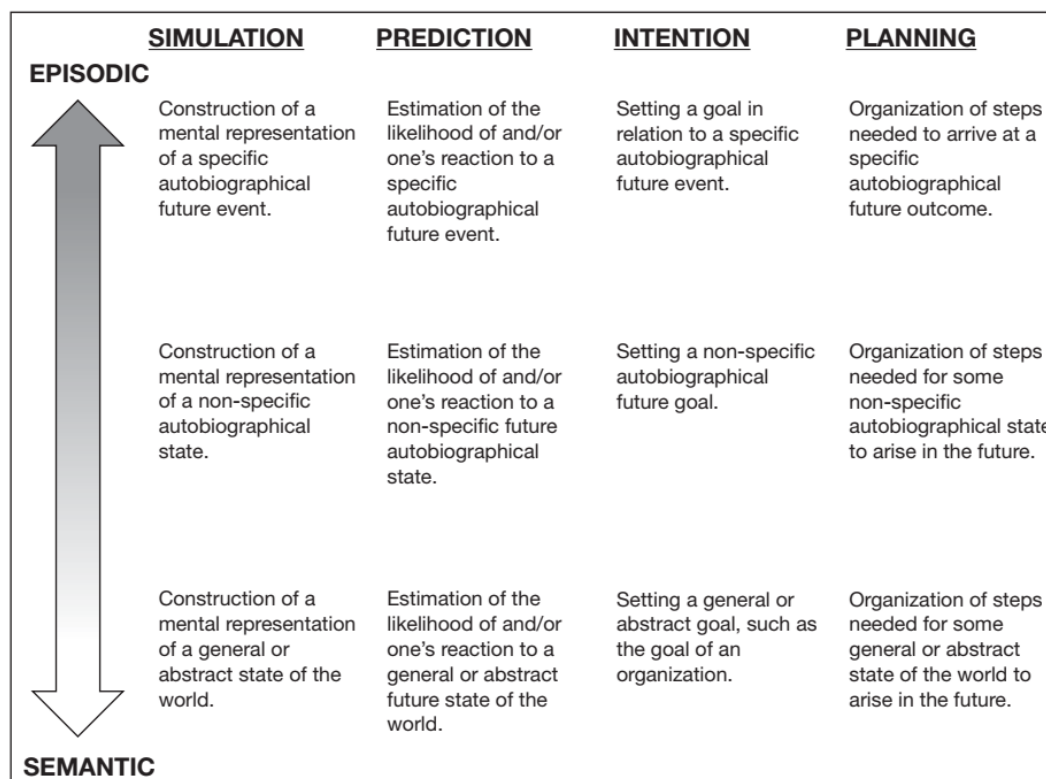
Figure 1

A Taxonomy of Prospective Cognition (Szpunar et al., 2014)

An additional factor that may influence the extent to which episodic and semantic memory are drawn on in future thinking is event familiarity. Wang, Yue and Huang (2016) carried out

two experiments intended to compare the proportion of episodic and semantic memory used in an EFT task. They found that more episodic memory was used when participants were imagining familiar future events compared to novel ones, with familiar events taking longer to imagine. This supports Szpunar et al's taxonomy, suggesting that familiarity is a moderator of the mental representations being generated with less familiar being more general or abstract and more familiar containing more specific autobiographical details.

1.4 Episodic Future Thinking and Anxiety

Having a constructive and flexible memory system allows people to form multiple simulations of the different ways that the future may play out, without actually having to engage in behaviour that is related to it (Jing et al., 2016). It is likely that some of these thoughts would relate to emotionally significant events and could result in intense emotional reactions that would then influence an individual's intentions, motivations, and behaviours (Baumgartner et al., 2008). Two particularly relevant models of anxiety, the Avoidance of Model of Worry (AMW: Behar et al., 2009) and Intolerance of Uncertainty Model (IUM: Dugas et al., 2010) claim that worry has an avoidance function and is a type of non-imagery based future-oriented thinking that is comparable to rumination (Nolen-Hoeksema et al., 2008). Worry tends to have negative content that is maintained through a general and abstract verbal loop (Wu et al., 2015).

This negative content may be maintained through the retrieval of past experiences from autobiographical and episodic memory (Clark, 1999; Mathews & MacLeod, 2005). Those with anxiety disorders selective retrieve personally relevant information from the

past, in particular information that confirms their negative interpretation of the current or anticipated situations (Clark, 1999). Additionally, patients with anxiety disorders are more likely to retrieve memories that contain disorder-relevant threatening content rather than content that is neutral or positively valanced (Zlomuzica et al., 2014).

Emotional valence is important in EFT, with positive future events are more frequent and imagined faster than negative ones, and contain more sensory details, and greater feelings of pre-experiencing (D'Argembeau & Van der Linden, 2004c; de Vito et al., 2015; Rasmussen & Berntsen, 2013). This suggests that personal futures are seen in a positive, optimistic light and this emotional component may play a role in managing emotions relating to the future. Quoidbach et al., (2009) found that positive future-oriented thinking led to a significant increase in happiness ratings over a two week period. Nonetheless, future-oriented thinking of a neutral character did also lead to a significant decrease in anxiety after two weeks whereas that of a negative character did not, suggesting that it is the absence of negative future-oriented thinking that leads to reductions in self-reported anxiety.

Barsics et al., (2016) set out to examine future thinking in a natural setting, looking at the frequency, conditions of occurrence, characteristics and perceived functions of future thinking that was accompanied by emotions. Referring to these as EmoFT (emotional future thinking) they found that they occurred frequently, in various contexts and whilst the individual was carrying out a wide range of activities. Half of these were abstract in nature, while the other half related to a specific event. There was a positivity bias, which reflected other findings that show that most people have a positive view of their personal future, with positive events being generated faster and having more detail than negative events.

Barsic et al., (2016) distinguished between anticipatory and anticipated emotions. Anticipatory emotions are emotions experienced in the present in response to the prospect of a future event, i.e. I am feeling excited at the thought of giving birth. Anticipated emotions are the emotions that are expected to be experienced in the future, i.e. I will feel excited while I give birth. Barsics et al found that there was a positivity bias for anticipated emotions, but no difference for anticipatory emotions. That is participants reported expecting to feel positive in future events more than they expected to feel negative. This suggests that the positivity bias seen in future thinking relates to how the individual anticipates they will feel in the future, rather than how they feel at the moment of thinking about the future. In the current research, anticipated emotions will be used to assess the relationship between positive and negative valence and anxiety related to the future. It is expected that there will be a positivity bias, with those who anticipate feeling more positive will have lower general and pregnancy related anxiety.

Behar et al., (2012) focused on the role of repetitive thinking about the future in worry, and its impact on potentially negatively valanced future events. They suggested that repetitively thinking about a potential future event led to that thinking to become more abstract and was associated with less imagery activity during negative, but not positive thinking. This could be the result of the individual moving from an imagery-based response to a potentially anxiety inducing event to a verbal linguistic, thought based response that acts to inhibit both vivid mental imagery and the somatic and emotional activation that fear elicits which is needed for habituation (Behar et al., 2005, 2005, 2009; Borkovec, 1985). Essentially, by suppressing mental imagery the individual is unable to process the anxiety that the future event is eliciting, and they experience higher levels of fear than if they could

call on vivid mental imagery and process the somatic and emotional response these produced.

Theories of anxiety emphasise the importance of visual imagery in the regulation of emotions, with individuals with general anxiety disorder (GAD) and non-worriers reporting mostly verbal thought during worry rather than visual images (Borkovec & Inz, 1990). When it comes to future thinking, a similar pattern emerges. Wu et al (2015) showed there was a difference in the way those with GAD and healthy controls created simulations of hypothetical but feasible future events. Those with GAD created simulations with less detail and vividness. In a similar finding, individuals with anxiety who are asked to think of future positive and negative personal experiences will produce fewer positive future experiences and higher levels of worry than non-anxious controls (MacLeod & Byrne, 1996).

Imagery is considered particularly important in helping individuals to habitualise to the somatic symptoms and affective responses to anxiety. Worry, by suppressing visual imagery in future simulations in favour of ones that are verbal in nature prevents this happening (Newman & Llera, 2011). D'Argembeau & Van der Linden (2006) found that when participants were asked to project themselves into the future, those with more vivid visual imagery evoked events that were more important and more intense and reported that they felt more emotions than participants with less vivid visual imagery. They also found that those who used suppression as an emotion regulation strategy experienced fewer sensory, contextual, and emotional details when representing both past and future events.

Interventions based on EFT that are used to reduce worrying usually manipulate the phenomenological qualities of scenarios about the future and provide useful evidence supporting the function of EFT in managing worry and anxiety. Skodzik et al., (2017) trained high worriers to use more mental imagery in everyday life as an intervention to reduce pathological worry. The technique significantly improved not only people's ability to generate vivid and detailed mental images but also the frequency of mental images during worrying, while reducing excessive and uncontrollable worrying. In a similar study, Jing et al., (2016) used an episodic specificity induction technique (ESI) to increase the level of detail generated when individuals are imagining constructive behaviours relating to worrisome events. They found that this increase in detail in simulations of the future was related to improved psychological well-being related to those events. This suggests that changing the way people imagine the future and the frequency with which they generate mental images can reduce the worry and therefore the anxiety they experience around this future.

It is therefore possible that modifying the qualities of simulations will help to regulate the emotions related to them. Increasing the frequency and level of visual imagery and detail in a simulation have both been found to improve psychological wellbeing related to the events being imagined (Jing et al., 2016; Skodzik et al., 2016). Soon to be first time mothers may experience high levels of uncertainty when it comes to childbirth and early parenthood, leading them to produce future scenarios that are more abstract and contain lower visual imagery, particularly if they contain fewer positive details.

Another characteristic of future thinking that is related to anxiety is visual perspective: whether the future simulation is seen from field (third person) perspective or

from one's own eyes, an observer (first person) perspective. Liang et al., (2021) found that adolescents with high social anxiety were more likely to simulate an anxiety provoking future social event from an observer perspective than those with low social anxiety. This suggests that the observer perspective may play a role in maintaining social anxiety, which may reflect the function that that episodic memory plays in maintaining social anxiety. According to Laing et al, the observer perspective is associated with self-focused attentions, shifting attention towards internally generated information (their own thoughts feelings and behaviours) which in the socially anxious tends to be negative and leads to heightened levels of anxiety, which may be increased by a tendency to retrieve memories of past social failures (Hinrichsen & Clark, 2003).

1.5 Pregnancy related anxiety and future thinking

Fear of childbirth which encompasses women's expectations and feelings of fear and anxiety relating to giving birth is one aspect of women's worries during pregnancy (Hofberg & Brockington, 2000). In its most extreme form fear of childbirth can present like a phobia and can induce heightened distress and anxiety that lasts throughout pregnancy (Hofberg & Brockington, 2000). The recent MBRACE reports highlight the impact mental health conditions have on women's wellbeing during pregnancy. For example, the Saving lives, improving Mother's care report (MBRRACE-UK, 2023) found that deaths from direct causes such as childbirth-related infections or suicide have increased between 2019-2021, even when controlling for deaths due to covid. Mental health conditions accounted for 10% of women's deaths during pregnancy or up to six weeks postpartum, with suicide being the leading direct cause of death at between 6 weeks and 12 months after the end of pregnancy. Additionally, women from Black ethnic backgrounds were four times more likely

to die and those from Asian ethnic backgrounds were twice as likely to die compared to White women. Those living in the most deprived areas have the highest mortality rate and 12& of women who died during or up to a year after pregnancy in the UK between 2019-2021 had multiple severe disadvantages.

The MBRRACE report highlights the importance of addressing women's vulnerability to mental health conditions during and after pregnancy. It is common for women to experience some anxiety in the perinatal period as a rational emotional response to a new experience, and this anxiety may be beneficial in certain situations (Harrison and Alderdice, 2020). It becomes an issue when this anxiety is extreme or persistent, suggesting there is an anxiety disorder present. Anxiety disorders in pregnancy can include generalised anxiety disorder, as well as obsessive compulsive disorder and post-traumatic stress disorder, which are all characterised by symptoms of anxiety. Fawcet et al (2020) estimated the prevalence of anxiety disorders in pregnant and postpartum women in a meta-analysis of 26 studies. They found that the prevalence of anxiety disorders in pregnancy was 1.1% for PTSD, 4.8% for specific phobia, and the prevalence of having at least one or more disorder was estimated to be 20.7%. They suggest that around 1 in 5 women meet the diagnostic criteria for at least one anxiety disorder.

There is also a significant body of evidence that a woman's stress during pregnancy is associated with her child's later emotional or cognitive problems. Women's reports of depression and anxiety symptoms are associated with earlier delivery and smaller infant size at birth which are both risk factors for impaired cognitive and social development (Martini et al., 2022). Additionally, mothers who report infant behaviour problems also report more depression and anxiety and more mother-infant bonding problems in the first six months

(Frankel et al., 2021). Maternal mental health is also intertwined with poor sleep quality, which can be both an antecedent and a consequence of poor mental health as mothers with children younger than 2 years had more disrupted sleep (Sanchez-Garcia, Cantero and Carvajal-Roca, 2021).

The current study has a particular interest in anxiety related to childbirth and the first days of parenthood for women who have not experienced these previously. The focus is the thought processes involved in imagining these future events, specifically how they engage in episodic future thinking relating to childbirth and parenthood, and the pregnancy related anxiety associated with them. Bayrapmour et al., (2016) identified three critical defining attributes of pregnancy related anxiety, 1] affective responses that includes the prominent emotional response of fear of the unknown or fear of a specific event, such as labour and birth or foetal abnormalities, 2] cognitions such as excessive worry about varying aspects of pregnancy and birth, and the postpartum period and 3] somatic symptoms characterised by physical presentations of anxiety that may include but not restricted to problems with sleep, racing heart, shortness of breath, fatigue, stomach pain, nausea, and vomiting.

Furthermore, Sheen and Slade (2017) carried out a meta-synthesis aimed at identifying the key elements that contribute to fear of childbirth. They reviewed 24 qualitative studies that described women's view of birth, looking at their fear, anxiety, concerns as well as phobias. They identified six key elements of fear of childbirth: fears of the unknown, potential for injury, pain, capacity to give birth, losing control and adequacy of support from care providers. The theme of uncertainty and fear of the unknown therefore appears to be an important contributor of anxiety during pregnancy.

According to the Intolerance of Uncertainty Model of anxiety (IUM; Dugas et al., 1998) this uncertainty plays a key role in the development and maintenance of anxiety. Uncertainty or ambiguous situations are found to be stressful and upsetting which leads to the individual having difficulty functioning effectively on a cognitive and emotional level, leading them to identify things to worry about, which in turn leads them to experience chronic worry as a tendency to see problems as threats (Dugas et al., 2004). Those who are due to give birth for the first time may be more vulnerable to this uncertainty and this may be reflected in the way they imagine childbirth and parenthood.

It is possible that there is a relationship between anxiety and the qualities of future thinking, with women who have lower anxiety when imagining childbirth and early parenthood would show differing patterns of simulation qualities to those with high anxiety. This would suggest that EFT may have an adaptive function in managing anxiety, and manipulating the way the future is simulated may enhance this further. It is proposed that the way that soon to be first time mothers think about childbirth and early parenthood will be associated with the pregnancy related anxiety they experience.

There is a limited amount of research looking at episodic future thinking and pregnancy related anxiety, however what there is gives an indication that there are certain simulation qualities that are important in the regulation of anxiety in pregnancy. Brown et al., (2002) explored pregnant women's simulations of arriving at hospital in good time when in labour, and their related worry about this. Participants were provided with the beginning of an imaginary scenario (being at home alone at midday and going into labour) and the end of the scenario (arriving at the hospital with time to spare) and were asked to give a step-by-step account of what would happen in between these two points (Means End Problem

Solving task; MEPS). The simulations were recorded and transcribed and rated for goodness of simulation using seven criteria that included logical sequencing, (logical connections between each step) temporal ordering (how temporal order is communicated), minimisation of uncertainty, sensitivity to contingency (planning for alternative possibilities), adequacy of problem space coverage, smooth flow of the scenario and realistic time allocation. Brown et al noted that women who gave less coherent simulations had lower subjective probabilities for a successful outcome, expressed more worry, which could be seen as supporting the relationship between increased anxiety and qualities of simulation for women pregnant for the first time. However, the simulation focus in this study was on getting to the hospital on time, an event which could arguably be imagined by recourse to prior experience of making an appointment on time and may have less emotional significance than other aspects of pregnancy and birth.

O'Toole & Berntsen, (2020) took a different approach, and compared nulliparous women with a non-pregnant control group on a mental time travel task that asked them to generate memories and future predictions in response to a series of neutral words. Both groups of participants were assessed at two time periods; for the pregnant women this was before and after giving birth. The control group were assessed at identical time intervals to the pregnant women. The study elicited a number of interesting results; at the first assessment, the pregnant women were more likely to exhibit future thinking, and this generally travelled further into the future than the control group. The majority of the pregnant women gave 'birth' when asked to state their most important upcoming event, in contrast to none of the control group. Those birth-related events that were generated in response to the neutral word cues were more specific, came to mind more involuntarily,

were associated with a stronger physical reaction and were more likely to be seen from a first-person perspective than non-birth related events. There was a negative correlation between the total number of birth related events the pregnant women generated and worry, suggesting that the lower the number of birth related events the women created the higher the level of worry they experienced. This suggests that simply thinking more about birth related events that would occur in the future is associated with experience lower levels of worry.

However, the number of specific birth related events was negatively associated with positive affect, and positively associated with symptoms of psychological distress, negative effect, and worry. O'Toole and Berntsen interpreted this as showing the specificity was detrimental for pregnancy mental wellbeing, that is contrary to previous research looking at the relationship between specificity of future thinking and emotional disorders. They suggest that the pregnant women who expressed high worry also perceived the upcoming event of birth as a stressor, leading them to focus on these, and create scenarios that were higher in specificity in an attempt to manage this stress by using the scenarios to mentally rehearse a potentially stressful future.

Favrod et al., (2018) investigated the phenomenology of spontaneous childbirth-related mental images of nulliparous women during their third trimester of pregnancy and how these were associated with imagery characteristics (valence, positive/negative percentage ratio, and impact on behaviour and decision-making) and fear of childbirth. They used the STAI-T and EPDS to measure anxiety and depression, along with the Spontaneous Use of Imagery Scale (SUIS) which looks at the spontaneous use of imagery in everyday life, and the Wijma Delivery Expectancy Questionnaire (W-DEQ A) to assess fear of childbirth.

They then carried out the Childbirth-related Mental Imagery Interview (CMII), a qualitative measure of mental imagery that asked participants to describe the content of their most recent, most positive, and most negative spontaneous mental images related to childbirth, before being asked questions about the sensory modalities present in the images. Other imagery characteristics looked at included the valence of the image and point of view (first- or third-person perspective).

When looking at the simulation characteristics, Favrod et al also noted that participants reported having spontaneous mental images of childbirth, that were rich in detail and included the sensory modalities. Positive images were more likely to be seen from a first-person perspective, with negative mental images seen from a third person perspective and scoring lower for many of the visual characteristics (sharpness, colour, brightness, more often in two dimensions and still) than positive mental images. However, the study did not look at the statistical significance of these characteristics in relation to positive and negative imagery or their relationship with fear of childbirth. They did report that most of the positive future mental images focused on the moment when they would meet their baby for the first time after birth. In contrast, contents of negative mental images were related to a fear of complications, such as instrumental delivery, pain or obstetrical injuries with some women reporting that these images helped them 'test' different birth scenarios and prepare for them.

The findings from these studies therefore suggest that the way soon to be first time mothers imagine their birth related future is related to their mental wellbeing during pregnancy. However, as useful as these findings are, what is needed is a more comprehensive understanding of not only the relationship between the different simulation

qualities and mental well-being, but also the extent to which simulating childbirth and early parenthood can help to reduce the anxiety women experience around these events. Furthermore, the current study will also explore the predictive nature of scenarios of the future in a follow-up study that revisits participants after they have given birth to see if simulation accuracy is important to their well-being postpartum. Despite a wealth of research, no previous study has examined the importance of simulation accuracy in optimal adjustment to a stressor.

1.6 Thesis Aims

The prevalence and impacts of anxiety in pregnancy makes the investigation of potential interventions an important focus for research. Women are more future orientated during pregnancy, focusing on their impending childbirth and future role of motherhood. Gaining an understanding of the qualities of simulations that relate to anxiety during pregnancy, and on into motherhood could have important practical implications for the development of a research based intervention that can help decrease anxiety during pregnancy and potentially the ongoing impact this anxiety has for the infant and their mother. Therefore, the overall aim of this thesis is to gain a clearer understanding of how women imagine childbirth and those early days and weeks of parenthood, during pregnancy and postpartum, and to use this to develop a brief intervention that has the potential to reduce anxiety associated with imagining the future.

The first aim of this thesis was to explore the role of episodic future thinking in the regulation of emotions associated with giving birth for the first time and becoming a mother; a highly personal, potentially anxious making future event that has not been

experienced previously. Therefore, study one examined how imagining the future impacts on anxiety in soon to be first time mothers who have not previously experienced childbirth and early parenthood. It did this in two phases:

1. Phase 1 asked soon to be first time mothers to imagine childbirth and early parenthood, allowing us to examine whether imagining novel highly personal events would reduce the anxiety associated with these events. Phase 1 also included an exploration of the phenomenological qualities of the simulations and the extent to which they related to pregnancy related anxiety and the women's overall mental wellbeing during pregnancy (See Chapter 3)

2. Phase 2 followed up the women postpartum, to investigate the importance of simulation accuracy in longer term mental wellbeing, in addition to the predictive value of simulation quality in relation to the women's wellbeing. Phase 2 also looked at the relationship between the qualities of simulations and memories for the same events (see Chapter 4)

The second aim of the thesis was to explore whether the findings from Study 1 could be used to develop a brief intervention that would further reduce anxiety in soon to be first time mothers in relation to childbirth and early parenthood. To this aim and using what was now known about the role EFT plays in the emotional regulation of anxiety relating to childbirth and early parenthood, Study 2 provided a series of prompts intended to increase the level of detail in women's simulation of childbirth and measured the effect this had on the women's post-simulation anxiety (see Chapter 5).

Chapter 2: Methodology

2.1 Introduction

The purpose of this chapter is to provide the rationale of the measures of the independent and dependent variables of the two studies in this thesis. There is an explanation of how and why pregnancy related anxiety was measured separately from general anxiety, why the measures of general anxiety and probable depression were selected, which events were chosen for the women to imagine, how future thinking was measured in Study one, phase 1, and how simulation accuracy and event memory were measured in Study one, phase 2. The final section of this chapter describes the development of the intervention task for Study two.

2.1 Defining and Measuring Pregnancy-Related Anxiety

When it comes to researching future thinking, the usual approach is to ask individuals to generate novel but plausible future events to imagine, often from a cue word or from a previous memory meaning that the participant is likely to have experience of the event previously. One problem with previous research is that the events varied across participants, as they generate any event that came to their mind based on cue words or their own individual memory. It is possible that there are differences in the selection of events to be imagined, which are controlled for in this thesis by selecting a novel event that will be experienced by all of the participants, and that none of the participants have experienced previously. To achieve this, soon-to-be first-time mothers were recruited to imagine the novel events of childbirth and early parenthood. It is therefore important that women's experience of anxiety during pregnancy is measured given that previous research suggests that pregnancy is associated with higher rates of common anxiety disorders, such

as general anxiety disorder (Matthey & Ross-Hamid, 2011). There are also considerable amounts of variation in how anxiety in pregnancy is presented, much of which cannot be explained by symptoms of general anxiety, or as a comorbidity with depression (Bayrampour et al., 2016; Huizink et al., 2004b). Anxiety in pregnancy may therefore comprise a distinct form of anxiety that is not fully captured by other common categories of anxiety disorders. Any attempt to understand the relationship between anxiety in pregnancy with how women think about childbirth and early parenthood must come from an understanding that pregnancy-related anxiety (PrA) is distinct from general anxiety.

Bayrapmour et al., (2016) identified the need for a clarification of what exactly PrA is and set out to identify its characteristics and dimensions through a concept analysis. They explored 38 studies that examined anxiety during pregnancy, either prospectively or retrospectively and assessed the items in the scales used in these studies to measure PrA. This led them to identify three critical defining attributes of PrA:

- Affective responses included the prominent emotional response of fear of the unknown or fear of a specific event, such as labour and birth or foetal abnormalities.
- Cognitions such as excessive worry about varying aspects of pregnancy and birth, and the postpartum period could include being preoccupied with thoughts and having strange ideas.
- Somatic symptoms that were characterised by physical presentations of anxiety that included but were not restricted to problems with sleep, racing heart, shortness of breath, fatigue, stomach pain, nausea, and vomiting.

There are similarities between each of these attributes and those that define general anxiety. Bayrampour et al's., (2016) affective response includes an emotional response of the fear of the unknown, which according to Barlow (2000) is an emotional response to a cognitively perceived threat and leads to a state of helplessness in which an individual is unable to predict, control or acquire the desired outcome. According to the intolerance of uncertainty model of anxiety (IUM; Dugas et al., 1998) this uncertainty plays a key role in the development and maintenance of anxiety. Uncertainty or ambiguous situations are found to be stressful and upsetting which leads to the individual having difficulty functioning effectively on a cognitive and emotional level, leading them to identify things to worry about, which in turn leads them to experience chronic worry as a tendency to see problems as threats (Dugas et al., 2004).

Fear of the unknown was the most pronounced emotion found by Bayrampour et al, (2016) and could be the result of women feeling they lacked control over their bodies, medical decisions being made about them and their foetus, or that they may lose control during childbirth due to the pain of labour. At the simplest level, asking soon to be first time mothers to imagine childbirth and early parenthood allows a deeper understanding of how they think about this 'unknown', and how it relates to their level of pregnancy and general anxiety during pregnancy and early parenthood.

The second of Baryrampour et al's (2016) attributes is the cognitive response that leads to excessive worry during pregnancy. Hirsh and Mathews (2012) suggest that worry arises from an interaction between involuntary processes and a bias in interpreting situations as a threat, and voluntary processes such as attentional control. This leads to a threat bias where situations and stimuli are interpreted as threats, which in turn brings about intrusive

negative thoughts, and the development of worry in a predominantly verbal form, in an attempt to resolve the threat. As Baryrampour et al (2016) points out, pregnancy related anxiety presents with excessive worry about pregnancy and childbirth, and this is a situation that is not easily resolved until the pregnancy is over. Women report being preoccupied with aspects of their pregnancy and birth, again with a focus on the uncertainty of the outcome of pregnancy or feeling out of control of the situation.

Having focused on these attributes, Bayrampour et al (2016) went on to define PrA as:

> *Nervousness and fear about the baby's health, the mother's health and appearance, experience with the healthcare system, social and financial issues in the context of pregnancy, childbirth and parenting that are accompanied by excessive worry and somatic symptoms. Severe cases of anxiety may be associated with behavioural consequences such as negative attitudes and excessive reassurance seeking and avoiding behaviours.*

When it comes to measuring anxiety during pregnancy, it is becoming clearer that general anxiety measures are not useful for screening for PrA as they are too broad to pick up the range of specific pregnancy fears such as fear of incompetence, worries about pain, loss of control during delivery, fear for their own and the infant's life and the changes that pregnancy and childbirth would bring to their lives (Huizink et al., 2004). Additionally, Huizink et al (2004) proposed that assessment of general anxiety during pregnancy may also lead to an underestimation of anxiety specifically related to pregnancy, especially as many of the somatic symptoms identified by Bayrampour et al are common physical symptoms of pregnancy.

Huizink et al (2004) found that general anxiety and depression measures were only able to explain a small part of the variance of these fears, accounting for between 8% and 27% of the three factors. This strongly suggest that PrA should be considered as a set of specific worries that relate to the woman's current situation of being pregnant, and that the fears and concerns about pregnancy are at the heart of this anxiety. Therefore, only measuring general anxiety would not give a full picture of the prevalence of anxiety in the pregnant sample recruited for the studies in this thesis. or how it relates to how women imagine childbirth. The Pregnancy Related Anxiety Questionnaire (PRAQ-R) was therefore used to measure PrA.

The Pregnancy Related Anxiety Questionnaire (PRAQ-R), a 10 item scale, was devised to measure specific worries and fears related to pregnancy that loads on to 3 factors a] women's fear of childbirth, b] their worries about the health of their unborn infant, and c] their worries about their appearance. The items are scored from 1 to 5 (1 – absolutely not relevant and 5 – very relevant) with an increase of scores indicating an increase of pregnancy related anxiety, with a maximum score of 50. The 10 items load onto 3 subs-scales: fear of giving birth (items 1 4 & 7), worries about having a handicapped child (3, 8, 9, 10) and concern about one's appearance (items 2, 5, 6). It is available in multiple languages that includes English, Dutch, Finnish and Swedish (Huiznik et al, 2004; Huiznik et al., 2016; Brunton et al., 2019).

The PRAQ-R has been tested for its predictive validity, with high scores on the PRAQ-R during pregnancy related to behavioural problems and developmental delays in the infant in the first year of life, independent of general anxiety measures (Huizink et al., 2003; Huizink et al., 2004). Huiznik et al., (2004) examined whether symptoms of general anxiety and

depression were associated with pregnancy anxiety, calculating correlation coefficients and multiple regression analyses with the three factors of pregnancy anxiety as the dependent variable, and trait, state anxiety and prenatal depression as the predictors. Trait anxiety, state anxiety and depression explained 17% of the variance of fear of giving birth, 17% of fear of bearing a physically or mentally handicapped child and 10% of concern about one's appearance during early pregnancy. In mid pregnancy this changed to 11% of the variance of fear of giving birth, 27% of the variance in fear of bearing a physically or mentally handicapped child and 8% of the variance in concern about one's appearance during early pregnancy. The predictors did not explain a significant part of the dependent variables in late pregnancy.

Reck et al., (2013) found that childbirth-specific anxiety assessed by the PRAQ-R was an important predictor of total birth duration in contrast to general anxiety measured by the STAI. More recently Chan et al., (2020) evaluated the reliability and validity of a Chinese-Cantonese version of the PRAQ-R in a sample of pregnant women in Hong Kong, China. It also aimed to determine whether PrA changed significantly across trimesters and if it differed from general anxiety and depression. A sample of 186 Chinese pregnant women were assessed at three time points in their pregnancy, at the first, second and third trimesters. Chen et al's study found high internal consistency for all items of the PRAQ-R (x=0.88 to 0.91) across the three trimesters. A regression analysis showed that general anxiety and depression combined explained only a small proportion of the variance in pregnancy related anxiety as measured by the PRAQ-R subscales (10-29%) supporting the assumption that PrA is differentiated from general anxiety and depression.

Additionally, The PRAQ-R was developed to be used with nulliparous women, with a question that asked specifically if the woman is concerned about childbirth 'I am worried about the delivery *because I have not done it before*'. Whilst latter versions of this measure (PRAQ-R2) changed this question to a more general question: "I am worried about the delivery" so the measure can be used with nulliparous and multiparous women, the original version is used here as it corresponds with focus of the research question relating to the novelty of childbirth in the sample.

2.2 Measuring general anxiety and depression

The measure of general anxiety used in this thesis is the GAD-7, a brief self-report scale intended to identify probably cases of general anxiety disorder (GAD). It was developed as a screener for generalised anxiety disorder in primary care settings (Löwe et al., 2008) but has increasingly been used as a measure for anxiety in both general and anxiety disorder research (Dear et al., 2011). One advantage of using this measure is its high concurrent validity with other measures of anxiety. Johnson et al., (2019) in a study of patients undergoing treatment for anxiety (N = 1201) found that correlations between GAD-7 and other measures of anxiety were between 0.58 and 0.83 for both pre- and post-treatment (Beck Anxiety Inventory, PHQ, SCL - Global Severity index, and SCL anxiety sub scale: Johnson et al., 2019).   Another advantage of the GAD-7 is that it is brief, and easy to administer, especially when it is being used alongside other measures. This means the burden to participants is low. The GAD-7 has been included in this research as a baseline measure of anxiety, it provides a measure of general anxiety that can be used to compare

the sample with the general population. It is also expected that if the PRAQ-R is measuring pregnancy related anxiety as opposed to general anxiety there would be a low correlation with the GAD-7.

The Edinburgh Post-Natal Depression Scale (EPDS; Rubertsson et al., 2014) is a 10 item self-report instrument that was developed to screen for major depression in the postpartum period. Whilst it was initially designed for use postpartum it has increasingly been used to screen those at risk for developing depression during pregnancy, both in clinical settings and in research. The EPDS has been shown to be a valid measure of depression in pregnancy (Rubertsson et al., (2014) and was selected for the study because the women would be familiar with it as a screening tool commonly used during antenatal and postnatal appointments in the UK. Additionally antenatal anxiety has been shown to be one of the strongest risk factors for postnatal depression (Coelho et al., 2011). In a longitudinal study of worry in pregnancy and postpartum Osborne et al., (2021) found that women with postpartum depressive symptoms as measured by the EPDS were significantly more likely to have been high worriers in pregnancy.

Anxiety is the main focus of this study; however, it is also important to consider the potential relationship depression has with imagining childbirth and parenthood. Met-analytic reviews have demonstrated that deficits in EFT are common in clinical depression and may contribute to its maintenance (Hallford et al., 2018). Symptoms of anhedonia respond well to interventions based on EFT, suggesting that effortful future thinking can help those with major depressive disorder manage their difficulty in imagining future events in ways that are specific, detailed and contain emotionally evocative mental imagery (Hallford, Cheung, et al., 2022). Given that the prevalence of depression in pregnancy is

between 10% to 15%, with a similar level postnatally (Pearson et al., 2018) it is important

that the prevalence and any possible relationship with EFT is measured in the current thesis.

2.3 Study 1 (phase 1 and 2)

2.3.1 The three events

In adulthood there are few events that fit the criteria of being truly novel, never experienced and personally relevant. Giving birth for the first time and starting life as a new mother is unique in this way as soon to be first time mothers have not experienced childbirth before but are going to in the near future. Not only that, but all the women in the study are all going to go through similar experiences, i.e., childbirth and early parenthood, unlike other research in EFT that asks participants to generate personally relevant future events that vary from person to person. Selecting these as the focus of the simulation tasks in this thesis gives an opportunity to explore an actual, novel and personally relevant future event, that all women will go through. As far as the researcher is aware, this is the first study to not only ask participants to imagine the future in this way, but to also follow them up after they have experienced the events, assess the relative importance of the accuracy of their simulations to their wellbeing post-event, and to also compare their memories for the events with their simulations. Hence the three events were selected for the women to imagine: childbirth, the first day at home with the baby and a typical day with the baby at 6 weeks postpartum, three events that all pregnant women will experience. The rationale for why these particular events were chosen is given below:

- Childbirth - as the end point of pregnancy is giving birth, and much of the pregnancy related anxiety measured during pregnancy relates to childbirth, the women were asked to imagine going into labour and giving birth, to see what it was about the way

they imagined this event that related to that anxiety. This could potentially inform

any future interventions designed to reduce anxiety in pregnancy.

- First 24 hours at home with the baby - This event is a natural progression from

  imagining childbirth. The women may prepare for this day in practical ways during

  pregnancy, for example buying car seats and cots and getting a nursery ready.

  However, imaging the actual details of what they will do that day may be less likely

  to be thought about, and so gives a contrasting and potentially less anxious-making

  event than childbirth for the women to imagine that still has a high level of novelty

  about it.

- Typical day at six weeks - At around six weeks postpartum the infant will be feeding

  every few hours, sleeping on and off throughout the day and night. The woman is

  likely to still be on maternity leave at this point, so their time is primarily focused on

  the infant who still needs a great deal of care and attention. This time was chosen as

  it contrasts again with childbirth and the first day at home in the requirements of

  what is being imagined, it is not a major life event the way that giving birth or

  bringing the baby home is but is what life would be like ongoing. However, it is still

  asking the women to imagine something they may not have experienced before.

2.3.2 The simulation task in phase 1 (pregnancy)

Much research into episodic future involves methods such as imagining possible futures

based on cue words or keeping a diary of future thinking in everyday life. In the current

research, the future events were already selected for their unique level of personal

relevance as the women were going to experience them, so there was no need for

participants to generate events to imagine. Instead, they were asked to imagine being at the

start of the event and getting to the end. Szpunar et al (2014) suggests that one possible adaptive function of episodic future thinking is its role in planning, specifically organising the steps needed to arrive at a specific autobiographical outcome. A method that was designed to measure this type of planning is the Means End Problem Solving task (MEPS: Platt & Spivack, 1975). This task is used to explore means end thinking, the behavioural strategies that individuals use to achieve a desired outcome, such as giving birth or successfully getting through that first day at home with a newborn.

The original MEPS task consisted of 10 vignettes that contain interpersonal problems faced by a hypothetical protagonist (Platt and Spivack, 1975). The vignette had a beginning, stating the problem and an ending, where the problem was resolved. The task was to fill in the middle of the vignette to explain how this happened. There were different ways that the task could be scored depending on the focus of the research (Penn, Spaulding, and Hope, 1993). For example, scoring the number of means (discrete behavioural or cognitive steps that take the protagonist closer to the goal), obstacles (something that acts as a block to a means or step) or time (whether there is consideration of the time that a solution may take) produces quantitative data. A qualitative approach focused on the extent to which the means were appropriate to the desired outcome, and the effectiveness or the likelihood that the solution proposed would bring about the result or end goal.

A criticism of the original MEPS is that it used a hypothetical situation involving a hypothetical protagonist with the potential that the responses could have been seen as imaginary rather than realistic to the individual, especially when some of the more improbable situations were used, such as 'stealing a diamond without getting caught'. A further criticism is this could produce less appropriate responses and this what Penn,

Spaulding, and Hope (1993) found when they compared hypothetical and what they termed 'personal perspective' MEPS; scenarios where the individual imagined themselves in the situation. They found that the personal perspective produced more socially appropriate responses than the hypothetical ones. This suggests that MEPS provides a useful procedure for exploring means-end thinking when the individual is thinking about how to resolve a problem from their own viewpoint and where the situations are realistic, making it ideal for a personally relevant event that the participant will actually experience in the future.

The MEPS task has been used in number of studies into future thinking; Brown et al., (2002) used the MEPS task to explore the use of availability heuristics in future thinking of soon to be first time mothers, by asking them to imagine going into labour and arriving at the hospital in time to give birth. Both Madore and Schacter (2016) and Jing et al., (2016) tested the hypothesis that manipulating the level of specificity when imagining future events would increase the number of steps given in a MEPS task. While Madore and Schacter were comparing younger vs older participants, Jing et al were interested in whether this manipulation would influence the emotional regulation and wellbeing of their participants.

One of the aims of the current study was to measure the difference in detail in the simulations the women give when imagining childbirth and early parenthood. The MEPS was used in the following way in Study 1. The participants were given the beginning of the event to be imagined (i.e. going into labour, arriving home from the hospital after giving birth, or waking up on a typical day at around six weeks after giving birth), and the end point (i.e. giving birth, the end of the 24 hour period on the first day or at six weeks). They were asked to imagine going from the beginning to the end point in as much detail as possible out loud,

and the simulations were recorded and transcribed. The researcher was then able to count

the number of means or discrete behavioural steps given in the simulations that could take

the women closer to the end point of the event, as a measure of their means end thinking.

The MEPS task is suitable for examining future thinking as it is known to rely on the episodic

memory process, especially if the problem is ill-defined (Vandermorris et al., 2013).

Additionally, those with emotional disorders such as depression and anxiety show poorer

performance on MEPS task, relative to healthy controls (Goddard et al., 1997).

2.3.3 The Phenomenological qualities of episodic future thoughts

When thinking about future events, an individual imagines what it would be like to be in

that particular future situation, and in doing this imagines the setting, the characters within

it, the actions taken (D'Argembeau & Van Der Linden, 2004). This is referred to as the

phenomenological qualities of the event being imagined and is defined as the subjective

experience of thinking about the future (Miloyan & McFarlane, 2019). One way to measure

this experience is to ask participants to rate their scenarios on a range of qualities, with a

multiple point rating scale such as a Likert scale used to assess the level of each

characteristic experienced when imagining the future. Miloyan & McFarlane (2019) found

this approach was used in 60% of the studies they reviewed when looking at the way

simulation content was measured.

The qualities commonly used often derive from and relate to those included in studies of

autobiographical memory (Miloyan & McFarlane, 2019) where they are used to estimate the

likelihood of their occurrence and relative importance in recalling memories. Common

ratings include detail, vividness, sensory detail, visual perspective, emotional valence, and

intensity. The rationale for using the same qualities in future thinking research comes from

the evidence that memory and thinking about the future have similar subjective experiences, and that the episodic memory is used in the construction of simulations of the future (discussed in detail in Chapter One). Keeping the number of times they imagine the future to a minimum helps to reduce this issue, as would comparing the participants ratings across the events. A practice effect would be indicated if the participants reported higher levels of the qualities for later events, compared to the first one.

A further issue with validity is whether the individuals interpret the qualities in the same way; what is considered detailed by one person may not be thought so by another, or in a different context or point in time. One aspect of this thesis is an assessment of these subjective ratings, by having the researcher rate the transcriptions of the simulations for the phenomenological qualities and then compare the researcher ratings with the participants subjective ones. Both self-ratings and researcher ratings of simulation qualities have strengths and weaknesses; individuals are best placed to explore their own subjective experience of imagining the future, and a researcher rating adds a level of objectivity to the ratings. Previous research has focused on one vs the other, and the current research uses both, allowing for the validity of the participants ratings to be assessed. Therefore, the simulations were recorded, transcribed and two independent researchers rated them for the following:

- Level of detail and vividness measured using a 7 point Likert scale that mirrored the participant ratings.
- The number of times sensory details, positive emotions and negative emotions were expressed.

Two new variables were added based on the reading of the transcripts:

- Emotional intensity: observers rated how intense the emotions were on a 7 point Likert scale to give some indication of the participants subjective experience of how their emotions felt.

- Specific steps: observers counted the number of individual steps the participants mentioned that explicitly related to them getting from the beginning to the end of the event. This relates to the level of specificity that the participants were expressing in their simulations.

It was then possible to measure the strength of the relationship between the observed qualities as seen in the transcriptions of the simulations and the participants own subjective experience of them, advancing our understanding of EFT.

2.3.4 The memory task in phase 1 (pregnancy)

In phase 1 the participants use of episodic memory in their simulations was explored to gain a greater understanding of the contribution of memory processes to future thinking of novel events. Conway's hierarchical model of autobiographical memory (Conway & Pleydell-Pearce, 2000), states that autobiographical memory contains autobiographical knowledge, i.e., personal factual and cultural knowledge, and episodic memories from personal experience. These function at different levels of specificity from broad lifetime periods to general knowledge and event specific knowledge. Participants in Study 1 were asked to state where their ideas came from when they were imagining the three events, in an open question which was recorded and transcribed. A rating scale was used based on Conway's model that allowed the following ratings to be used:

- Semantic - general conceptual knowledge that can be acquired through sources such as books, TV programmes or birth classes. This is non-autobiographical.

- General autobiographical knowledge – general memories that cannot be dated and are not linked to a specific event.

- Episodic – general event memories or 'mini-histories' and/or event specific knowledge relating to their own experiences. These would be autobiographical in nature.

The ratings were carried out by the researcher and an independent rater to ensure inter-rater reliability and gave a measure of the extent to which participants called on episodic memories relating to their own experiences or wider more general knowledge that is semantic in nature.

2.3.5 The memory task in phase 2 (postpartum)

In phase 2 the women were asked to rate the phenomenological qualities of their *memories* for the three events postpartum. It is common when comparing past remembered and future imagined scenarios participants are asked to recall a previous experience and imagine a similar future one. However, in phase 1 & 2 the comparison happened the other way, the women imagined the future first, for an event they were going to experience, then after the event they recalled the past. This unique approach allowed for a direct comparison between the imagined future and the past remembered events, with the following qualities rated by the women:

- The levels of detail, vividness, coherence, and sensory detail on a 7 point Likert scale from 1=not at all to 7=a considerable amount.

- The visual perspective they experienced (first vs third person) when recalling the event.
- Whether they had experienced positive and negative emotions during the event on a 9 point Likert scale from 0=none to 8=a considerable amount.

- How frequently they had thought about the memory for the event.

The memory self-ratings could then be explored in relation to the simulation qualities and also the level of self-rated anxiety post-simulation from Study 1, and the measures of pregnancy related and general anxiety, and depression postpartum. Figure 3 below outlines the procedure for Study 1, showing the two phases of the study.
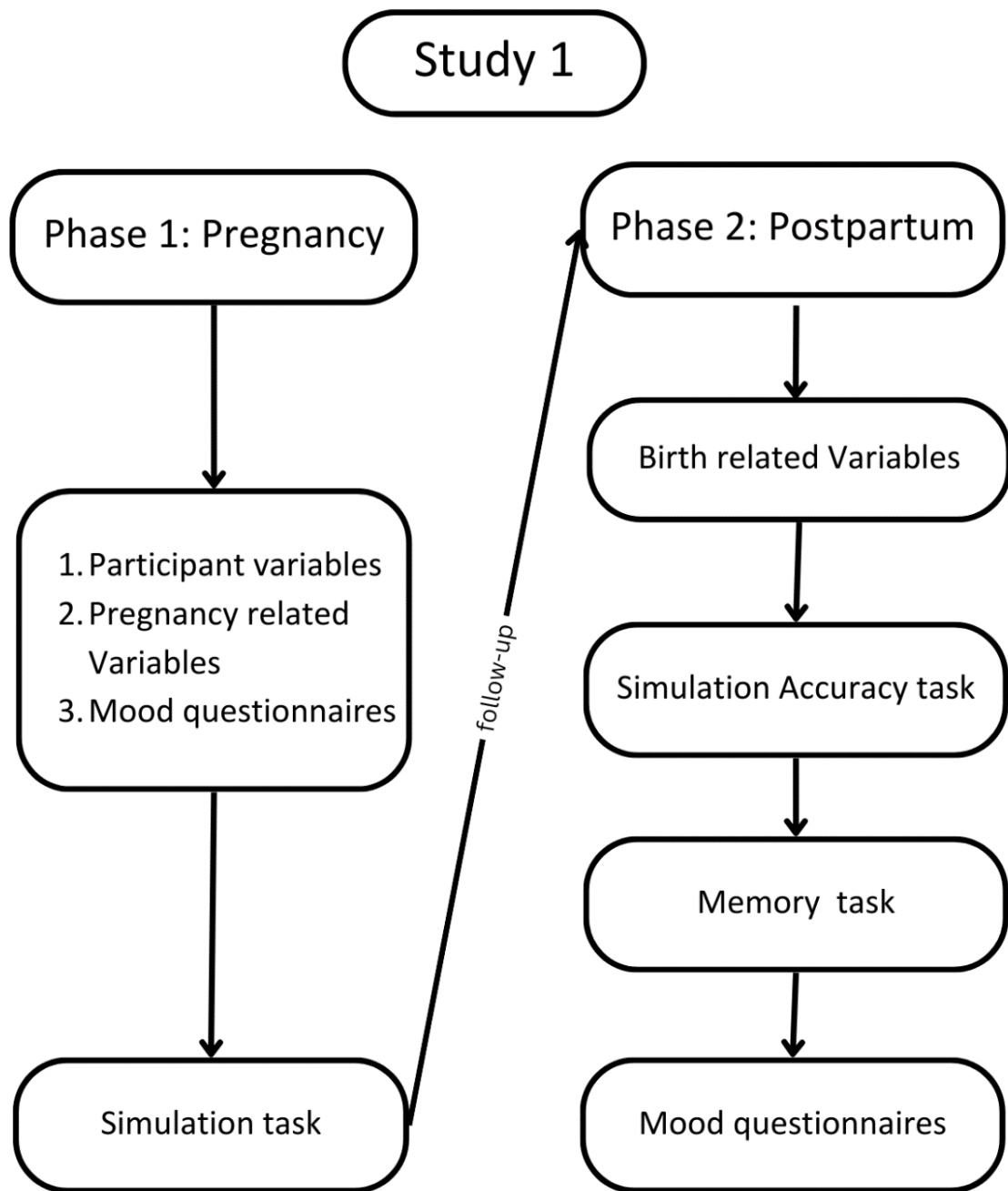
Figure 2

Procedure for Study 1, Phase 1 and 2

Chapter 3: Study 1, Phase 1

3.1. Introduction

Anxiety tends to be future focused, characterised by chronic, excessive, and uncontrollable worry (Behar et al., 2005). The Cognitive Avoidance Theory of Worry (Borkovec, 1994., Borkovec, Alcaine & Behar, 2004) suggests that worry functions as a cognitive avoidance response to perceived future threats. Worry acts as an attempt to prevent bad events from happening or helps to prepare for their future occurrence. It also mutes aspects of our somatic response to threats, preventing the habituation to emotional responses. This ultimately prevents the emotional processing that would lead to the extinction of worry, and ultimately leads to avoidance of emotional experience in order to prevent emotional arousal (Newman and Llera, 2011). Worry is also mostly verbal in nature, with negative, non-imagery based content that is maintained through a general and abstract verbal loop (Wu et al., 2015).

Episodic future thinking (EFT) is thought to have a number of adaptive functions that relate to the planning and rehearsing for the future which therefore could aide emotional regulation (Szpunar et al., 2014). The level of episodic detail (the number of contextual details about an event) and specificity (occurring in a defined place and time) of future simulations is key in the adaptive processes of planning and problem solving (Brown et al., 2012) and emotional regulation (Jing et al., 2016). It is therefore proposed that engaging in detailed EFT that was high in specificity would be associated with lower levels of both general and pregnancy related worry and anxiety and have the potential to help soon to be first time mothers regulate their anxiety about childbirth and early parenthood.

To investigate this assumption, phase 1 of this study explored soon to be first time mothers' future thinking in relation to childbirth and early parenthood, and their anxiety before and after engaging in future thinking. It was expected that the women would report lower levels of anxiety after imagining the future, as engaging in EFT had helped them to mentally rehearse and plan for these events. Therefore, the following hypothesis was made:

> H1: instructing soon to be first time mothers to simulate detailed steps involving childbirth, first day with baby and a typical day at six weeks, would result in anxiety ratings for birth and early motherhood made after simulating (post-simulation anxiety) to be significantly lower than ratings made before simulating (pre-simulation anxiety).

The women were also asked to give subjective ratings of the phenomenological qualities of the simulations, with the expectation that simulations that were richer and more detailed would be related to lower post-simulation anxiety and lower general and pregnancy related anxiety. The following hypothesis was made:

> H2: It is predicted that simulation qualities of a] detail b] vividness c] sensory detail d] positive anticipated emotions, e] frequency of thinking about the event and f] a first-person perspective will significantly predict and negatively relate to the DVs of i] post-simulation anxiety and significantly predict and negatively relate to ii] GAD-7, ii] PRAQ. It is also predicted that negative anticipated emotions will significantly predict and positively relate to the DVS as stated above.

The simulation task asked the participants to evaluate their own subjective experience of imagining the future by rating the level of the phenomenological qualities

they experienced in the simulations. As the simulations in this phase of the study were made out loud, they could be recorded and transcribed. It was possible for the researcher to rate the simulations for the key qualities of detail, vividness, sensory detail, emotional valence, and emotional intensity to give an objective measure of these qualities that could then be examine as to whether they related to or predicted the women's mood. This would control for any variation in the participants' interpretation of the qualities.

The transcription process also allowed for further analysis of the simulations which highlighted one potentially important new characteristic: the number of specific steps. The simulation task in Study 1 uses an adapted means-end problem solving task, where the participants were provided with the beginning of the events (going into labour, arriving home with their baby, and the start of a typical day at around 6 weeks postpartum) and the end of the event (giving birth, the end of the first day/typical day at six weeks) and were asked to give a step-by-step account of what would happen in between these two points. Counting the overall number of these steps gave an indication of the level of specific, event related knowledge the simulations contained, in contrast to the rating of detail, which could be a rating of any knowledge, relevant or not. Previous research has shown that an episodic specificity induction (ESI) technique increases the level of detail in future thinking in a means-end problem solving task, which was also found to relate to improved psychological wellbeing associated with those events (Jing et al, 2016).

Transcribing and rating the simulations therefore leads to the following prediction that relate to the relationship of the researcher's observed qualities to the participants' emotional wellbeing:

> H3: It is predicted that researcher rated simulation qualities of detail, vividness, sensory detail, positive emotional valence, and specific steps will significantly predict and negatively relate to the DVs of i] post-simulation anxiety and significantly predict and negatively relate to ii] GAD-7, ii] PRAQ and iv] PRAQ subscale of fear of giving birth. The researcher rated negative emotional valence will positively relate to the DVs as stated above.

As stated in Chapter 1, there are two complementary theories relating to the role of memory in EFT; the constructive episodic simulation hypothesis (CESH) emphasises the role of the episodic memory in providing details of personal experiences to be used in EFT while the semantic scaffolding hypothesis (SSH) suggests that the semantic memory provides the more general, conceptual knowledge. This difference is apparent when the events being imagined are novel, such as the ones in the current study. The SSH suggests novel events rely on the semantic memory as there is a lack of personal memories to draw upon and therefore are lower in specificity (Irish et al., 2011, 2012; Irish & Piguet, 2013).

The level of specificity relates to the number of contextual details in the simulations and can include the time of day, the environment, sensory detail, thoughts and emotions and a sequence of events (Hallford et al., 2020). These would be drawn from the women's autobiographical memory. According to Conway the autobiographical memory is organised hierarchically and contains autobiographical knowledge, i.e., personal factual and cultural

knowledge, and episodic memories from personal experience (Conway & Pleydell-Pearce, 2000). This knowledge contains different levels of specificity, from broad lifetime periods to general events and event specific knowledge.

A simple measure of the type of memory the women drew upon was used in the current study. They were asked to state where their ideas came from when they were imagining the future. This was recorded and transcribed before the answers were rated using a scale based on Conway's hierarchical model of autobiographical memory. The answers were rated on whether they mentioned i] general conceptual knowledge acquired through sources such as books, TV programmes or birth/parenting classes, ii] general event memories or 'mini-histories' that can't be dated, and are not linked to a specific event, iii] event specific knowledge relating to their own experiences that are vivid in nature.

Given the novel nature of the events in Study 1 it is expected that the women would be more likely to mention sourcing their simulations from general conceptual knowledge rather than their own experiences of childbirth or parenthood as they have not experienced these yet. This would support the SSH, that the construction of novel future events relies on the semantic memory, and the general knowledge of the world it stores. Therefore, the following hypothesis was made:

H4: It is predicted that the sources of simulation content for the novel events of childbirth, first day at home with the baby and a typical day at six weeks will be rated as coming from general conceptual knowledge as measured by the rating scale based on Conway's hierarchical model of autobiographical memory.

This phase of Study 1 also examines the extent to which the participant and the researcher's ratings of the simulation qualities relate to each other. If the two types of ratings show a positive correlation, then we can be confident that the participant's subjective ratings are a valid measure of the phenomenological qualities. First the participant and researcher ratings will be explored across event type, to gain an understanding of how they vary, then the relationship between the two sets of ratings will be explored, with the following prediction:

H5: It is predicted that there will be a positive correlation between the participant rated simulation qualities of detail, vividness, sensory detail, positive and negative anticipated emotions with the researcher rated simulation qualities of detail, vividness, sensory detail, emotional valence, and specific steps.

The final hypothesis of Phase 1 of Study 1 is a prediction relating to the relationship between general and pregnancy related anxiety. If as stated in the methodology chapter (Chapter 2) these are two separate forms of anxiety it would be expected that while there is likely to be a positive correlation between the PRAQ-R that measures pregnancy related anxiety and the GAD-7 measuring general anxiety, the strength of these relationships will indicate the extent to which they are measuring separate and distinct forms of anxiety.

H6: It is predicted that there will be a positive correlation between the measure of general anxiety, GAD-7 and the measure of pregnancy related anxiety, PRAQ-R and its three subscales: fear of giving birth, worries about appearance and concerns for the wellbeing of the infant.

3.2 Method

3.2.1 Ethics

Prior to recruitment, ethical approval was obtained by the Goldsmiths University Psychology Department ethics committee. No other organisational ethics were required for the research. Participants gave consent for Study 1 at two timepoints, 1] before completing the mood questionnaires, and 2] at the beginning of the interview. They were informed of the aims of the study, confidentiality and privacy and were given a link to a copy of the University's GDPR policy. To enable confidentiality participants used their initials in the study and were issued with a respondent ID number which was used to link the different parts of the study together.

3.2.2 Participants

Participants who were nulliparous women (were pregnant and had not given birth previously) were recruited to the study via a link distributed through social media platforms and online platforms aimed at pregnant women. This included Facebook, Twitter, Instagram, and web groups such as Mumsnet and Netmums. A small number of participants came via Prolific, a participant recruitment site, and the rest via word of mouth, through contacts known to the researcher and to women who had taken part in the study. A total of 245 participants who met the criteria for inclusion of being over the age of 18 years, at least 3 months pregnant and not having previously given birth (nulliparous) completed the mood measures. Of those N=80 (33.56%) participants took part in the simulation phase of the study.

A comparison between those who completed both the mood measures and interview and those who only completed the mood measures on the measures of anxiety and depression revealed that those who dropped out before the interview had statistically higher levels of both general anxiety, as measured by the GAD-7 and pregnancy related anxiety, measured by the PRAQ-R. There was no difference in probable depression as measured by the EPDS. This suggests that those who withdrew from the study after completing the mood measures had higher levels of anxiety than those who continued.

Table 1

Mean (sd) for completers and non-completers for measures of anxiety and depression.

	Mood measures and interview (n=80)	Mood measures only (n=160)	
GAD-7	5.90 (4.81))	5.93(4.74)	t (238) 2.93, p = .004
PRAQ-R	27.40 (sd 8.69)	30.63 (sd 9.14)	t (238) 2.63, p = .009
EPDS	9.37 (sd 5.24)	10.60 (sd 5.11)	t (237) 1.73 p = .085

It is useful to look at the percentage of participants falling into the severe categories for the measures of anxiety and depression, see Table 2 below. A series of chi-square test for association were conducted between study completion and the levels of mood as measured by the GAD-7 and EPDS. All expected cell frequencies were greater than five. There was a statistically significant association between study completion and GAD-7 levels, $\chi2(1) = 8.01$, p = .018, with a higher frequency of severe anxiety in the mood measures only group. There was no statistically significant association for the EPDS: $\chi2(1) = 2.65$, p = .10.

Table 2

Level of severity of mood measures by completion

Measure	Mood measures and interview (n=80)	Mood measures only (n=160)
GAD-7		
Minimal 0-4	40 (50%)	51 (31.9%)
Mild 5-9	24 (30%)	54 (33.8%)
Moderate 10-14	9 (11.3%)	29 (18.1%)
Severe 15+	7 (8.8%)	26 (16.3%)
EPDS		
Low (0-12)	62 (77.5%)	114 (71.3%)
High (13+)	18 (22.5%)	46 (28.7%)

The mean scores and standard deviations for the PRAQ-R subscales of fear of childbirth, concerns about appearance and fear of having a handicapped child are given in Table 3 below. Comparing the mean scores for the subscales with independent t-tests with completer vs non-completer as the grouping variable, finding that the non-completers had statistically significantly higher levels of fear of childbirth, t (239) 2.60 P = .01, and fear of having a handicapped child, t (240) 2.05 p = .04 but not concerns about their appearance, t (239) 1.56 p = .12.

Table 3

Mean (sd) scores for PRAQ-R subscales

Subscale	Completers	Non-completers
Fear of childbirth	9.06 (sd 2.92)	9.11 (sd 2.88)
Concerns about appearance	8.29 (sd 3.62)	8.31 (sd 3.59)
Fear of having a handicapped child	10.11 (sd 4.66)	9.98 (sd 4.61)

3.2.3 Power Analysis

An a priori power analysis was conducted using G*Power version 3.1 (Faul et al, 2007) to determine the minimum sample size required to test the study hypothesis that post simulation anxiety will be lower than pre-simulation anxiety for each of the three events. Results indicated that the required sample size to achieve 80% power for detecting a medium effect at a significance criterion of α = .05 was N=71 for a repeated measures t-test. Thus, the obtained sample size of N=80 is adequate to test the study hypothesis, especially given the expected attrition rate in Study 2 due to the specialist nature of the sample, and the timing of the follow-up; 8 weeks postpartum.

3.2.4 Participant and pregnancy variables

Below in Table 4 are the characteristics of the participants who completed Study 1, phase 1. The mean age was 30.91 which is in line with the average age mothers give birth in England and Wales (ONS, 2020).

Table 4

Characteristics of the participants (n=80)

Characteristic	
Age	30.91 (sd 4.67)
Ethnicity	
White (including white British, Irish, Roma, Traveller, other white backgrounds)	67 (83.8%)
Black, Black British, Caribbean, or African	8 (10%)
Asian or Asian British	3 (3.8%)
Mixed or multiple ethnic groups	1 (1.3%)
Other	1 (1.3%)

As can be seen in Table 5 the majority of the women were between 7-9 months pregnant when they took part in the Study, and all were carrying only one infant. Over half of the women intended to give birth in hospital.

Table 5

Participant characteristics relating to pregnancy and giving birth (N-79*)

No of months pregnant at time of the study	
3-4 months	22 (27.8)
5-6 months	21 (26.6%)
7-9 months	36 (45.6%)
Where they plan to give birth	
hospital	46 (58.2%)
home	13 (16.5%)
birth centre	20 (25.3%)
Number of babies	
1	79 (100%)
2	-
3 or more	-
How they plan to give birth	
normal vaginal birth	39 (48.8%)
water birth	31 (39.2%)
planned C-section	-
undecided	9 (11.4%)

Note. *One participant did not fill out the pregnancy details.

3.2.5 Materials

Mood measures:

i)   *Self-rated anxiety for each event* - participants were asked to rate the level of

anxiety prior to simulating each event (pre-simulation anxiety) and after simulating

each event (post-simulation anxiety) on a 9-point Likert scale from 0 = not at all

anxious to 8 = extremely anxious. This gave a measure of the immediate impact of future thinking on anxiety.

ii)   *The Pregnancy-Related Anxiety Questionnaire* (PRAQ) is a 10-item questionnaire widely used to assess and identify pregnancy specific anxiety (Huiznik et al, 2004). The items are scored from 1 to 5 (1 – absolutely not relevant and 5 – very relevant) with an increase of scores indicating an increase of pregnancy related anxiety, with a maximum score of 50. The 10 items load onto 3 subs-scales: fear of giving birth (items 1 4 & 7), worries about having a handicapped child (3, 8, 9, 10) and concern about one's appearance (items 2, 5, 6).

iii)   *The GAD-7* (Löwe et al., 2008) is a brief self-report scale to identify probably cases of general anxiety disorder (GAD). It is composed of 7 items that reflect the DSM-IV symptom criteria for GAD. Cut-off scores for anxiety severity 5, 10 and 15 for mild, moderate, and severe (Spitzer et al 2006). With scores of above 10 recommended as a clinical cut-off (NHS, IAPT, 2016).

iv)   *Edinburgh Post-Natal Depression Scale* (EPDS; (Rubertsson et al., 2014) is a 10 item self-report instrument that was developed to screen for major depression in the postpartum period. Items are scored from 0 (not at all) to 3 (yes, quite a lot/often). It has a maximum score of 30, and scores of 14 or above indicate probable depression (Matthey et al., 2013, 2019).

The Simulation Task:

The simulation task was based on the Means End Problem Solving Task and its development is discussed in Chapter 2: Methodology (MEPS; Platt, Spivack & Bloom, 1971). It involved asking participants to generate a future scenario of three events: childbirth, first 24 hours with baby and a typical day with baby at approximately six weeks postpartum. The participants were given the beginning and end of the scenario and were asked to fill in the middle in as much detail as possible, from the start until the event was over.

The participants were asked to rate the level of the following phenomenological qualities of episodic future thoughts, which were scored in the following way:

· *Detail*: - the level of detail contained in each simulation as a whole rated on a 7 point Likert scale from 1 = not at all to 7 = a considerable amount.

· *Vividness*: - how clear the image is in the mind rated on a 7 point Likert scale from 1 = not at all to 7 = a considerable amount.

· *Sensory detail*: the extent to which the scenario contained the 5 senses; visual imagery, sound, smell, taste and touch or physical sensations. These were asked about separately and were rated on 7-point scales from 1 = not at all to 7 = a considerable amount. Mean scores were calculated by combining the five scales and dividing by 5 to give a mean measure of sensory detail.

· *Visual perspective:* Participants were asked if they saw the scenario through their own eyes or through someone else's - first vs 3rd person.

- *Valence expectancy*: - the extent to which positive and negative emotions were anticipated in relation to each future event rated on a 9-point Likert scale from 0 = none to 8 = a considerable amount.

- *Thought frequency*: - the frequency they had thought about the future events in a similar manner to the simulations. Four response options were scored as follows:

  - 1= I have not thought about it like that before,

  - 2 = I have thought about it at least once like that,

  - 3 = I have thought about it several times like that,

  - 4= I often/always have that scenario running through my head

- *Episodic vs semantic sources of information:* an open-ended question about where their ideas came from when they were thinking about the events. Rated for the level of episodic (internal) details and semantic (external) details.

3.2.5 Procedure

Recruitment advertisements were placed on social media, which contained a link to Qualtrics that contained questions asking about participant details and the mood questionnaires. Participants were invited to click on the link, where they were shown an information sheet giving details of the study before being asked to give consent to take part. The participant and pregnancy variables were collected followed by the mood questionnaires (PRAQ, GAD-7, and EPDS). At the end of the mood questionnaires the participants were asked to indicate whether they were happy to take part in the interview by entering their email address.

Those participants who agreed to an interview were sent an invitation to arrange a suitable time and then were sent a link for a video interview, using software such as Zoom, Skype, Facetime or WhatsApp video, depending on what the participant had access to. On the day of the interview, the researcher opened a set of interview questions on Qualtrics and called using the video software. The researcher reminded the participants of their right to withdraw from the study and took consent for an audio recording of the interview to be taken. The researcher read from their screen and recorded the participants answers. The following procedure was used for each of the three events:

i)   Participants rated their pre-simulation anxiety for the event,

ii)   They imagined out loud the event, from the beginning (i.e., going into labour, arriving at home, or starting their day) to the end (i.e., giving birth, ending 24 hours later for the first day and typical day at six weeks).

iii)   They rated the level of each simulation characteristic in turn (detail, vividness, sensory detail, positive anticipated emotions, negative anticipated emotions, visual perspective, and frequency of thinking about the event)

iv)   They rated their post-simulation anxiety.

Their simulations were recorded via the Voice Record App on an iPad or iPhone for transcription later. Completion of the interview took approximately 30 minutes. On completion of the interview, and after the debrief, participants were asked if they would be willing to take part in a follow-up to the study at approximately 8 weeks after their baby was

born. If they agreed, their contact details were checked, and a note was taken of their due date and contact details.

3.2.6 Data analysis

Screening and cleaning data

The data was cleaned, and missing data, which comprised a few randomly scattered missing data points (simulation quality variables, mood questionnaires and participant variables) that were excluded listwise. The mood measures were scored according to the criteria set out by each measure, giving a total score for each measure and the level of severity.

Content analysis of the simulation transcripts

The interviews were recorded using an app on an iPhone and iPad belonging to the researcher. The app chosen was Voice Record, which allowed for an MP3 recording of the interview to be made. This gave an accurate record of the interview, but especially the simulation sections that were transcribed. The interviews were imported as mp3 files into a web-based transcription software that could only be accessed by the research team; otter.ai. This provided a 'rough' copy of the transcription which the researcher then cleaned and corrected for errors to provide a final version for analysis. The final cleaned transcripts were exported as pdfs and stored on the researchers MacBook and backed up to an external hard drive.

A direct approach to content analysis, based on Mayring, (2000) was used to rate the transcribed simulation recordings. This method involves applying pre-defined codes to the

transcripts of the simulation sections of the interviews. The initial codes were developed based on the participant self-ratings of the simulation qualities: detail, vividness, positive and negative emotions, and sensory detail. After the researcher read the transcripts, two further codes were identified: the number of specific steps and emotional intensity. The following codes were used:

· *Detail:* The overall level of detail for the whole simulation rated on a 7 point Likert scale from 1 = not at all to 7 = a considerable amount.

· *Vividness*: How vivid the simulation was to the researcher when reading the transcript rated on a 7 point Likert scale from 1 = not at all to 7 = a considerable amount.

· *Sensory detail*: The number of references to the senses expressed in the simulation

· *Positive emotional valence*: The number of positive emotions expressed in the simulation.

· *Negative emotional valenc*e: The number of negative emotions expressed in the simulation.

The additional researcher qualities identified through the content analysis were:

· *Emotional intensity*: The researcher rated how intense the emotions expressed rated on 7-point scales from 1 = not at all to 7 = a considerable amount.

· *Number of specific steps:* the number of steps that the participants imagine taking during the event that take them from the beginning of the event to the end.

Code definitions were written alongside coding rules for how they should be applied to create the coding frame, see Appendix J. The codes were implemented in the following way:

1. 77 interviews were transcribed initially by entering the audio recording of the interview into an online transcription software (otter.ai) which provided a rough transcription of each interview. Three interviews were not recorded due to technical errors by the recording app used.

2. The researcher then went through each interview listening to the recording and correcting the errors in transcription to ensure accuracy and to allow immersion in the simulations.

3. The transcripts were entered into the coding software (MAXQDA) where the codes were generated and assigned individual colours. The simulation sections of the transcripts were read again, sections of texts relating to the codes were highlighted and the code was assigned.

4. For those codes that were a count of the number of times a characteristic was present (positive/negative emotions, sensory detail, specific steps) a score was entered into an excel sheet for each participant.

5. For the codes of emotional intensity, detail, and vividness the researcher entered a score on a scale of 1 = not very to 7 = very into the excel sheet.

The transcripts were scored by a second researcher to ensure reliability. They did not have sight of the researcher's ratings and scored a selection (80%) of the transcripts from all three events. The second researcher was provided with the transcripts of the event

simulations in an excel sheet, and a second excel sheet to record their ratings. After an

initial sample of 5 simulations were rated, a discussion was held to review the transcripts,

scoring guidelines and level of consensus. These ratings were then compared with the

researcher's ratings using an intra-classical correlation, using a two-way mixed model with

absolute agreement, which generated a Cronbach's Alpha for each pair of ratings, shown in

Table 6 below. The usual benchmark value for Cronbach's alpha is 0.7, with all but one

rating achieving this or higher, indicating a consistent rating, suggesting the ratings were

reliable. The Cronbach's Alpha for negative emotions for the first day at home was below

this level, at .62 and while this is below the usual benchmark, values of .60 to .70 are

acceptable in exploratory research such as the current study (Nunnally and Bernstein 1994).

Examples of the coding can be found in Appendix K.

Table 6

Cronbach's Alpha for inter-rater reliability for researcher-rated simulation qualities

	Childbirth	First day at home	Typical day at 6 weeks
Detail	.78	.83	.82
Vividness	.72	.80	.80
Sensory detail	.74	.85	.70
Specific steps	.79	.93	.87
Positive emotions	.80	.71	.80
Negative emotions	.76	.62	.72
Emotional intensity	.73	.72	.71

Rating the sources of information question

A rating scale based on Conway's hierarchical model of autobiographical memory was

used to assess the extent to which the women used semantic or episodic sources in their

simulations. The transcripts of the sources question for each event were transcribed as above, and rated for the number of times each of these sources were used, giving an overall score for each one:

1. Semantic –general and personal conceptual knowledge that can be acquired through sources such as books, TV programmes, pregnancy, and parenting classes.

2. General autobiographical knowledge – general event memories or 'mini-histories' that can't be dated, not linked to a specific event

3. Episodic –event specific knowledge relating to their own experiences of the events being imagined.

The transcripts were scored by both the researcher and a second researcher to ensure reliability. They did not have sight of the researcher's ratings and scored a selection (32.5%) of the transcripts from all three events. The second researcher was provided with the transcripts of the sources question in an excel sheet, and a second excel sheet to record their ratings. After an initial sample of 5 simulations were rated, a discussion was held to review the transcripts, scoring guidelines and level of consensus. These ratings were then compared with the researcher's ratings using an intra-classical correlation which generated a Cronbach's Alpha for each pair of ratings, shown in Table 7 below, with all ratings scoring above the benchmark of .70 suggesting a high inter-rater reliability. Examples of the coding can be found in appendix X.

Table 7

Cronbach's Alpha for inter-rater reliability for researcher rated sources of memory

	Childbirth (n=77)	First day (n=76)	Six weeks (n=75)
Type of knowledge (semantic, general autobiographical and episodic)	.91	.94	.81

3.3 Results

3.3.1: Does simulating childbirth and early parenthood reduce anxiety for these future events?

It was hypothesised that instructing soon to be first time mothers to simulate detailed steps involving childbirth, first day with baby and a typical day at six weeks, would result in post simulation anxiety ratings for all three events to be significantly lower than ratings made before simulating the future, and this hypothesis was met. Figure 4 shows the mean anxiety ratings for before and after simulating the event for each of the three events.
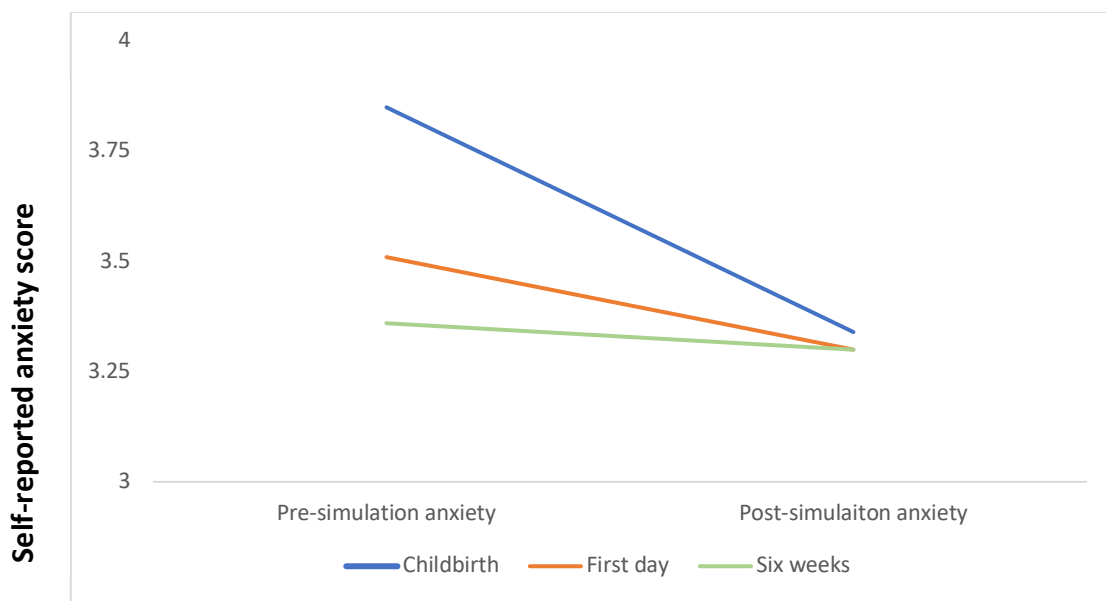
Figure 4

Soon to be first time mother's pre and post simulation anxiety ratings for each of the three events.

A 2 (Time: before vs. after) x 3 (Event: childbirth vs. 24 hours vs. 6 weeks) repeated measures ANOVA was conducted to examine the effect of time and event type on participants' self-reported anxiety. The analysis revealed a significant main effect of time, $F(1,79)=5.62$ $F(1,79)=5.62$, $p=0.02$, indicating that simulation significantly reduces anxiety levels. Specifically, post-hoc analysis with Bonferroni correction showed that anxiety scores were significantly higher before the simulation ($M=3.58$) compared to after the simulation ($M=3.31$).

The partial eta squared for the main effect of time was $\eta_p^2 = 0.066$, suggesting a medium effect size (according to Cohen 1988). This indicates that approximately 6.6% of the variance in anxiety levels can be attributed to the simulation intervention, which suggests a meaningful reduction in anxiety.

There was no significant main effect of event type, $F(2,158)=0.73$ $p=0.48$, suggesting that the type of event being simulated (childbirth, 24 hours, or 6 weeks) does not significantly influence anxiety levels. Additionally, the interaction between time and event type was not significant, $F(2,158)=2.16$, $p=0.12$.

3.3.2 Do the phenomenological qualities of the simulations predict anxiety about giving birth and early parenthood?

As stated in the introduction, there were two sets of ratings for the simulation qualities: i] the participant ratings (the subjective ratings of the qualities given by the participants at the time of simulating the events) and ii] the researcher ratings (researcher ratings of the qualities from the transcribed simulations). They were both analysed to assess the extent to

which they related to and predicted the emotional wellbeing of the participants, across the three events.

Participant simulation qualities

The second hypothesis predicted that across the three events the simulation qualities of a] detail b] vividness c] sensory detail d] positive anticipated emotions and e] first-person perspective and f] negative anticipated emotions will significantly predict and negatively relate to the DVs of i] post-simulation anxiety and significantly predict and negatively relate to ii] GAD-7, ii] PRAQ and iii] EPDS, with g] negative anticipated emotions significantly predicting and positively relating to these DVs. Before carrying out the analysis, a series of Pearson's correlational analyses were carried out for all three events to ensure the simulation qualities did not co-vary, with none of the participant rated qualities showing covariance. Therefore, all simulation qualities were entered into a series of standard multiple regression analyses to test this hypothesis. Visual perspective is a binary variable and therefore was entered into the regression analysis as a dummy variable where 0 = first person perspective and 1 = third person perspective, and for all subsequent analysis.

The regression analysis examining factors predicting post-simulation anxiety for childbirth revealed a significant model, $F(7,55)=3.35$, $p=0.005$, with an R^2 of 0.21. This indicates that 21% of the variance in post-simulation anxiety for childbirth is accounted for by the predictor variables, which according to the guidelines outlined by Cohen (1988) represents a large effect size.

Table 8 provides detailed information on the individual contributions of each predictor variable to the variance in post-simulation anxiety for childbirth. The standardized

coefficient (β= -0.451) for positive anticipated emotions was negative and significant, indicating that expecting to feel fewer positive emotions during childbirth is associated with higher levels of post-simulation anxiety. This negative β suggests a medium to large effect size, emphasizing the importance of positive anticipated emotions in predicting anxiety levels. Visualizing childbirth from an observer perspective was also significantly related to higher post-simulation anxiety levels. The standardized coefficient (β=0.242) for this variable indicates a medium effect size, suggesting that the visual perspective the women view childbirth from plays a significant role in their post-simulation anxiety. Neither GAD-7, EPDS, or PRAQ-R could be predicted by participant rated simulation qualities.

Table 8

Multiple regression for participant rated childbirth simulation qualities with Post-Simulation Anxiety as criterion variable

Variables	B	SE	Beta	t	p
Detail	.131	.212	.084	.616	.541
Vividness	.114	.207	.099	.697	.489
Sensory detail	.432	.274	.197	1.579	.120
Positive anticipated emotions	-.570	.163	-.451	-3.494	.001
Negative anticipated emotions	.011	.157	.008	.068	.946
Frequency of thought	-.422	.256	-.196	-1.649	.105
Visual perspective	1.067	.521	.242	2.046	.046
Constant	5.415	1.706		3.174	.002
R^2	.299				
Adjusted R^2	.210				

All the first day at home participant simulation qualities were entered into a series of standard multiple regression analyses. However, none of the first day at home qualities related to or predicted any of the measures of mood.

Six-week post-simulation anxiety was positively related to and significantly predicted by the participant simulation characteristic of frequency of thinking about the event ($F_{(7,55)}$ 3.30, $p = .005$) with 20.6% of the variance being accounted for by the predictor variables. This R^2 value of 0.206 once again indicates a large effect size according to Cohen's (1988) guidelines, suggesting that the model has substantial predictive power. Table 9 shows the individual contributions of each variable.

The standardized coefficient ($\beta=0.308$) for the frequency of thinking about the event was positive and significant, indicating a medium effect size. This indicates that more frequently thinking about a typical day at six weeks is associated with higher post-simulation anxiety. This medium to large effect size highlights the practical significance of the model. It suggests that any future interventions aimed at reducing the frequency of thinking about this event could potentially lower post-simulation anxiety levels.

Table 9

Multiple regression for participant rated six weeks simulation qualities with Post-Simulation Anxiety as criterion variable

Variables	B	SE	Beta	t	p
Detail	-.245	.206	-.202	-1.187	.240
Vividness	.258	.216	.207	1.196	.237
Sensory detail	.365	.233	.223	1.570	.122
Positive anticipated emotions	-.254	.177	-.182	-1.439	.156
Negative anticipated emotions	.159	.135	.148	1.176	.245
Frequency of thought	.614	.234	.308	2.620	.011
Visual perspective	-1.247	.647	-.228	-1.927	.059
Constant	3.074	1.743		1.764	.083
R^2	.296				
Adjusted R^2	.206				

In Table 10 below, it can be seen that mood as measured by the EPDS was negatively related to and significantly predicted by the participant simulation characteristic of positive anticipated emotions, (F (7,55) 3.08, p = .008) with 19% of the variance being accounted for by the predictor variables. This R^2 value of 0.19 indicates a medium effect size according to Cohen's (1988) guidelines, suggesting that the model has a moderate but meaningful predictive power. Expecting to have fewer positive emotions during a typical day at six weeks was related to higher levels of probable depression during pregnancy. The standardised coefficient (β= -0.292) for positive anticipated emotions was negative and significant. It indicates that expecting to feel fewer positive emotions when imagining this event is associated with higher levels of probable depression as measured by the EPDS.

Table 10

Multiple regression for participant rated six weeks participant simulation qualities with mood as measured by EPDS as criterion variable

Variables	B	SE	Beta	t	p
Detail	.116	.543	.037	.213	.125
Vividness	.999	.568	.308	1.757	.085
Sensory detail	.719	.613	.168	1.172	.246
Positive anticipated emotions	-1.065	.465	-.292	-2.289	.026
Negative anticipated emotions	.068	.357	.024	.191	.849
Frequency of thought	.653	.617	.126	1.058	.295
Visual perspective	-.559	1.706	-.038	-.328	.744
Constant	6.841	4.594		1.489	.142
R^2	.282				
Adjusted R^2	.190				

Researcher simulation qualities

It was predicted by the third hypothesis that the researcher rated simulation qualities for each of the three events of a] detail, b] vividness, c] sensory detail, d] positive emotional valence, and e] specific steps would significantly predict and negatively relate to the DVs of i] post-simulation anxiety and significantly predict and negatively relate to ii] GAD-7, iii] EPDS and iv] PRAQ-R, with g] negative emotions significantly predicting and positively relating to these DVs. Once again, before carrying out the analysis, a series of Pearson's correlational analyses were carried out to ensure the variables did not co-vary. Childbirth researcher ratings showed a strong positive correlation between detail and vividness (0.87), and detail and means end steps (0.79). This suggested that detail was not a unique variable and therefore it was removed from the subsequent childbirth linear regression

analysis. Furthermore, emotional intensity had a strong positive correlation with negative emotions (0.75) and was also removed from this analysis.

Childbirth post-simulation anxiety was examined in relation to researcher-rated simulation qualities, revealing significant predictors: positive emotions, specific steps, and negative emotions ($F_{(5,71)}$=4.735, p=0.001) as shown in Table 11 below. These predictors collectively accounted for 19.7% of the variance in post-simulation anxiety, indicating a medium effect size according to Cohen's (1988) guidelines. Positive emotions were negatively related to post-simulation anxiety. The standardized coefficient (β= -0.274) was negative, suggesting that higher levels of positive emotions during the simulation are associated with lower post-simulation anxiety. Specific steps were also negatively related to post-simulation anxiety, (β= -0.322) suggesting that less detailed and specific steps during the simulation are associated with higher anxiety levels post-simulation. Lastly, Negative emotions were positively related to post-simulation anxiety (β= 0.371) indicating that higher levels of negative emotions during the simulation are associated with higher post-simulation anxiety. The effect size for all three variables were medium, indicating a significant influence on anxiety outcomes.

None of the other mood measures, GAD-7, EPDS, PRAQ-R or the PRAQ sub-scales could be predicted by the childbirth researcher rated simulation qualities.

Table 11

Multiple regression for researcher rated childbirth simulation qualities with Post-Simulation Anxiety as criterion variable.

Variables	B	SE	Beta	t	p
Vividness	-.086	.215	-.062	-.398	.692
Sensory detail	.052	.213	.028	.243	.808
Positive emotions	-.281	.121	-.274	-2.328	.023
Negative emotions	.348	.107	.371	3.246	.002
Specific steps	-.070	.033	-.322	-2.092	.040
Constant	4.800	.653		7.348	.000
R^2	.250				
Adjusted R^2	.197				

For the first day at home with baby it was found that there was a strong positive correlation between detail and vividness (0.88), and therefore detail was again not entered into a series of standard multiple regression analyses. First day post-simulation anxiety was negatively related to and significantly predicted by the researcher simulation quality of vividness ($F_{(6, 70)}$ 6.742, p = .009) with 31% of the variance being accounted for by the predictor variables. Vividness was negatively related to first-day post-simulation anxiety (β= -0.364) with a large effect size (Cohen, 1988), indicating that simulations rated as lower in vividness by the researcher are associated with higher levels of post-simulation anxiety.

None of the other mood measures, GAD-7, EPDS, or PRAQ-R could be predicted by researcher rated simulation qualities.

Table 12

Multiple regression for researcher rated first day simulation qualities with post-simulation anxiety as criterion variable

Variables	B	SE	Beta	t	P
Vividness	-.568	.219	-.364	-2.677	.009
Sensory detail	.072	.390	.019	.185	.854
Positive emotions	.061	.230	.050	.264	.792
Negative emotions	.369	.219	.378	1.685	.096
Emotional intensity	-.227	.405	-.148	-.560	.577
Specific steps	-.070	.038	-.243	-1.815	.074
Constant	6.488	.845		7.675	.000
R^2	.366				
Adjusted R^2	.312				

When researcher ratings for a typical day at six weeks were correlated, once again detail showed a strong correlation with both vividness (0.91) and means end steps (0.80) leading to detail to be removed from the regression analysis. Six weeks post-simulation anxiety was negatively related to and significantly predicted by the researcher simulation quality of vividness ($F_{(6, 69)}$ 2.898, p = .011) with 13.2% of the variance being accounted for by the predictor variables. There is a negative relationship between post-simulation anxiety and vividness (β= 0.371) with lower levels of researcher rated vividness being associated with higher levels of anxiety after simulating this event. With an R^2 of 0.132, the model explains a modest but meaningful 13.2% of the variance in anxiety levels suggesting it accounts for only a moderate portion of the variability in anxiety outcomes.

None of the other mood measures, GAD-7, EPDS, or PRAQ-R could be predicted by researcher rated simulation qualities.

Table 13

Multiple regression for researcher rated six weeks simulation qualities with post-simulation anxiety as criterion variable

Variables	B	SE	Beta	t	p
Vividness	-.603	.2314	-.501	-2.610	.011
Sensory detail	.-.258	.368	-.082	-.701	.486
Positive emotions	.004	.230	.050	.264	.792
Negative emotions	.178	.262	.158	.680	.499
Emotional intensity	.404	.498	.238	.811	.420
Specific steps	.044	.040	.205	1.095	.278
Constant	4.254	.816		5.212	.000
R^2	.201				
Adjusted R^2	.132				

3.3.6 What sources of information do participants use when imagining a novel event?

It was predicted that the sources of simulation content for the novel events would show a bias towards general conceptual knowledge as measured by the rating scale based on Conway's hierarchical model of autobiographical memory. The frequency of each source of information the women stated they had used in their simulations are presented in Table 14 below. Chi-square analysis revealed that for all three events, the women were statistically significantly more likely to be coded as using general conceptual knowledge as the source of

their simulations of the future, supporting the SSH that the construction of novel future

events rely on the semantic memory and the general conceptual knowledge it contains.

Table 14

Frequencies of sources of information by event type

	Childbirth (n=77)	First day (n=76)	Six weeks (n=75)
General conceptual knowledge	47 (61%)	43 (56.6%)	50 (66.7%)
General autobiographical knowledge	16 (20.8%)	26 (34.2%)	22 (29.3%)
Episodic knowledge	14 (18.2%)	7 (9.2%)	3 (4%)
	$X2 (1)$ 26.68, p = .001	$X2 (1)$ 25.61, p = .001	$X2 (1)$ 44.72, p = .001

3.3.7: Participant and researcher ratings for simulation qualities as a function of event type

Participant rated qualities

After creating each simulations participants were asked to rate the level of the simulation qualities of a] detail, b] vividness c] sensory detail d] positive anticipated emotions e] negative anticipated emotions f] frequency of thinking about the event and g] visual perspective. Figure 5 below gives the descriptive statistics and (bars) for the ratings of each characteristic for the three simulation events.
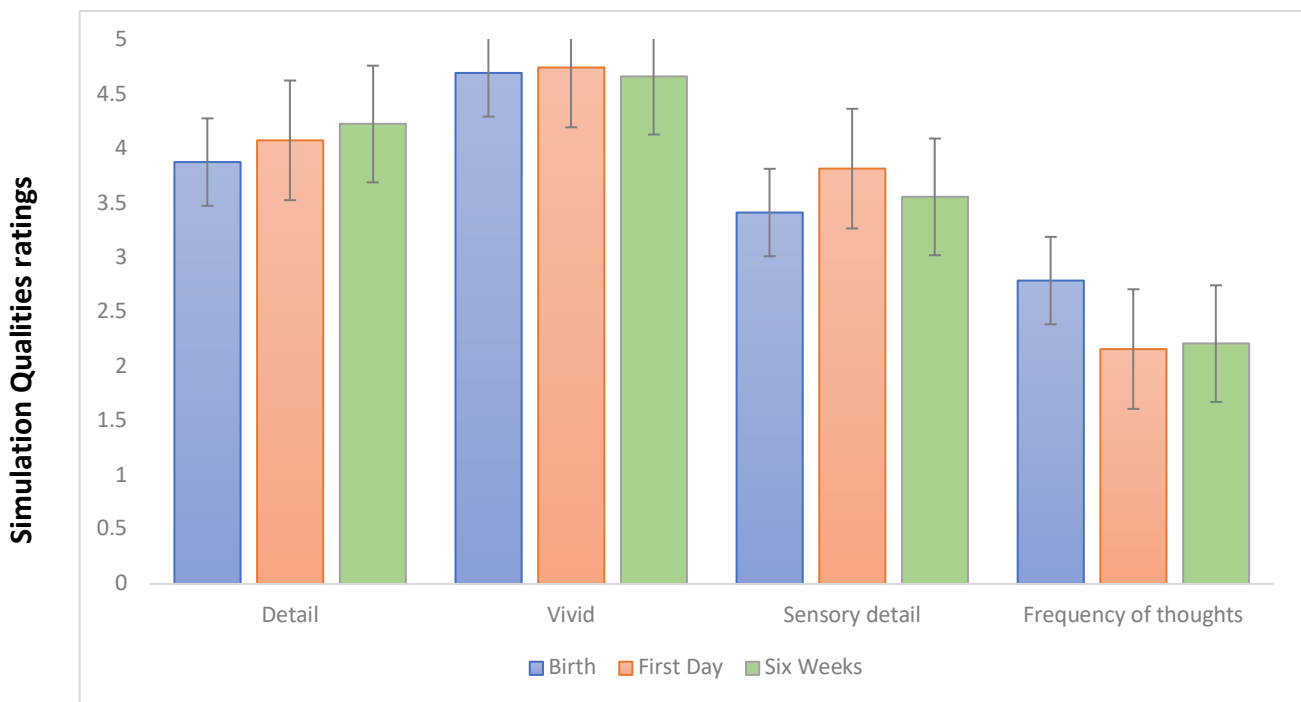
Note. Bars: standard error

Figure 5

Mean scores for participant simulation qualities as a function of event type

A series of one way ANOVAS were carried out to explore the pattern of participant simulation qualities of 1] detail, 2] vividness, 3] sensory detail and 4] frequency of thinking across the three events. There was a statistically significant effect for sensory detail $F_{(2, 124)}$ 5.11, p = .007, with first 24 hours with baby rated as having the highest level of sensory detail compared to the other two events. Analysis of frequency of thinking about the event found that childbirth was the most frequently thought about event $f_{(2,158)}$ 12.43, p = .001. There was no statistically significant difference between the three events for the level of detail or vividness.

It was predicted that anticipated emotions will vary as a function of event type, and Figure 6 shows the mean ratings for the level of anticipated emotions across the three events. The women reported expecting to have the lowest number of positive anticipated emotions (mean 5.55, sd 1.59) and the highest level of negative anticipated emotions (mean 3.34, sd 1.68) for childbirth. When it comes to the first day at home with the baby, the ratings were the other way round; the women expected to have the highest level of positive emotions (mean 6.56, sd 1.41) and the lowest negative anticipated emotions (mean 2.76, sd 1.86). A typical day at six weeks sat between the other two events for negative anticipated emotions mean 3.38, sd 1.75) were scored higher than first 24 hours with baby with baby.
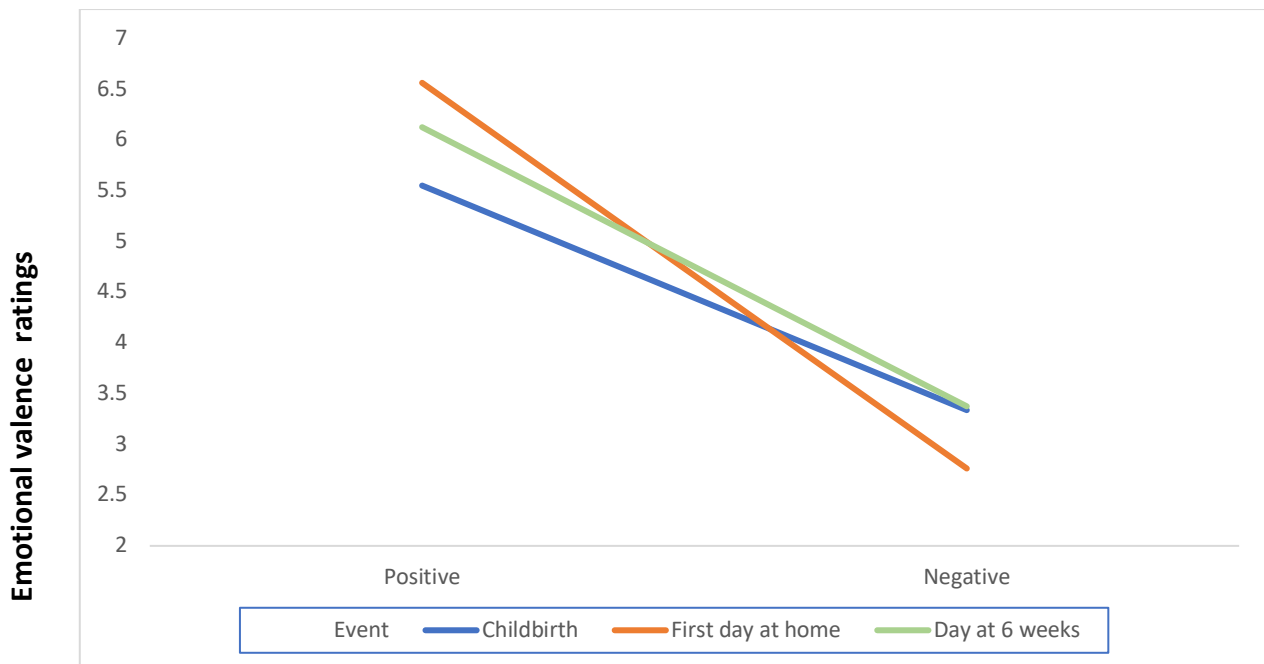
Figure 6

Positive vs Negative anticipated emotions as a function of event type

To explore this further, a 2 (emotion: positive vs negative) x 3 (event: childbirth, first day and six weeks) repeated measures ANOVA was carried out which showed that there was a statistically significant main effect for type of anticipated emotions $F_{(1,79)}$ 154.91 p = 001, η_p^2 =0.6. Additionally, there was a statistically significant main effect for event $F_{(1,79)}$ 4.59 p = .012, η_p^2 =0.06. Mauchly's test of sphericity indicated that the assumption of sphericity had been violated for the two way interaction $x2_{(2)}$ = 16.44, p = .001, therefore the Greenhouse-Geisser correction was used and yielded a statistically significant interaction of emotion*event $F_{(2, 158)}$ 11.33 p = 001, η_p^2 =0.01.

Simple main effects were run for positive*negative anticipated emotions, yielding the following results:

- Mean childbirth positive expectancies was 2.21 (95% CI, 1.611 to 2.814) higher than negative anticipated emotions, a difference that was significant, F (1,79) 53.58, p = .001, with a large effect size (η_p^2 = 0.4).

- Mean first day positive expectancies was 3.80 (95% CI, 3.16 to 4.44) higher than negative anticipated emotions, and this difference was significant F (1,79) 138.52, p = .001 again with a large effect size (η_p^2 =0.6).

- Mean six weeks positive anticipated emotions was 2.75 (2.17 to 3.33) higher than negative anticipated emotions, and again this difference was significant, F (1,79) 89.34, p = .001 and again with a large effect (η_p^2 =0.5).

Simple main effects were also run for event type, childbirth, first day and six weeks for anticipated emotions:

- Positive anticipated emotions were statistically significantly different over the three events, F (2,158) 14.29, p = .001. η_p^2 =0.2, with Bonferroni post hoc analysis revealing that first day positive anticipated emotions ratings were significantly higher than childbirth (1.012 (95% CI, 1.56 to .461) and six weeks (.44 (95% CI, .10 to .78). Six weeks anticipated emotions were also rated higher than childbirth (.58 (95% CI, 1.05 to .10).

- Negative anticipated emotions were also statistically significantly different over the three events F (2,158) 5.47, p = .005, η_p^2 = 0.06, with Bonferroni adjustments revealing that childbirth negative anticipated emotions ratings were statistically significantly

higher than first day (.58 (95% CI, .03 to 1.12) as were six weeks negative anticipated emotions (.61 (95% CI, .15 to 1.07).

In summary, the women reported anticipating statistically significantly higher levels of positive than negative emotions, and this was found across the three events with a medium to large effect size. However, the women reported the highest level of negative anticipated emotions for childbirth and the highest level of positive anticipated emotions for the first day at home. The medium to large effect sizes for all but one result indicate that anticipated emotions have a important role in anxiety related to these future events.

The frequencies for visual perception the participants stated they used in each event simulation are given in Table 15 below. An observer perspective was used predominantly when the participants were imaging the first 24 hours with baby or a typical day at six weeks with their baby, which was found to be a statistically significant difference. Interestingly childbirth showed a very different pattern. There was a more even split between the two perspectives when imagining childbirth, and a chi-square analysis revealed that whilst there was a statistically significant difference between first and third person perspective for first day and six weeks, there was not for childbirth perspective.

Table 15

Frequencies and chi-square analysis for visual perception

	Childbirth	First day	Six weeks
Field Perspective	47 (58.8%)	67 (83.8%)	66 (82.5%)
Observer perspective	33 (41.3%)	13 (16.3%)	14 (17.5%)
	X2 (1) 2.45, p = .11	X2 (1) 36.45, p = .001	X2 (1) 33.80, p = .001

Researcher rated simulation qualities:

The researcher simulation qualities for each event, those rated by the researcher from the transcripts of the simulations are given in Figure 7 below. A series of the one-way ANOVAs found that childbirth simulations were rated by researchers as having higher levels of sensory detail (F (2,150) 11.14 p= .001), and emotional intensity (F (2,150) 24.41 p= .001) compared to both of the parenthood simulations. However, when it came to detail (F (2,150) 7.15 p= .001) and vividness (F (2,150) 5.55 p= .005), a typical day at six weeks was rated statistically significantly higher than the other two events for these qualities.
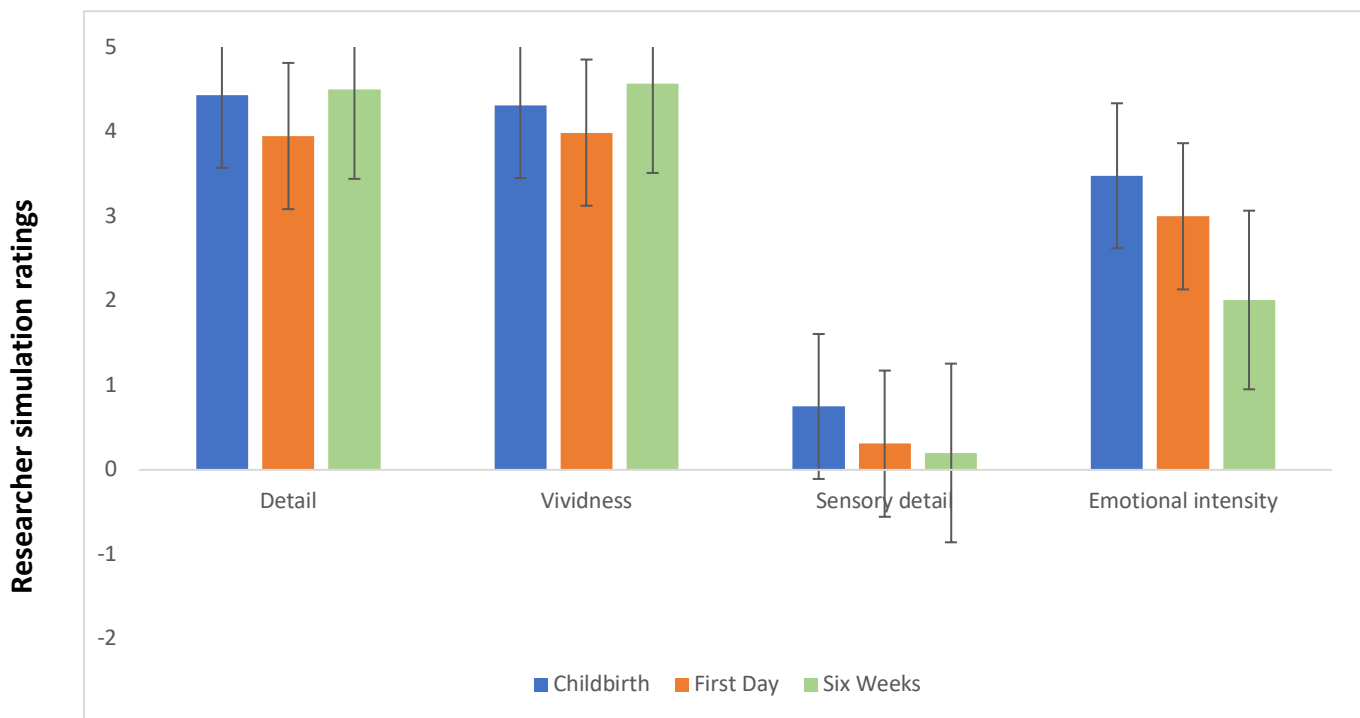
Note. Bars: standard error

Figure 7

Descriptive statistics for researcher rated simulation qualities as a function of event type

To explore whether researcher ratings of emotional valence varied as a function of event type, a 2 (emotion: positive vs negative) x 3 (event: childbirth, first day and six weeks) repeated measures ANOVA was carried out which showed the following results:

- there was a significant main effect for event F (1,79) 16.85 p = .001, η_p^2 = 0.2 suggesting a difference in the emotional valence as a function of event type.
- There was not a statistically significant main effect for event and no statistically significant interaction of emotion*event.

Simple main effects were also run for event type: childbirth, first day and six weeks for positive emotions finding that:

- positive emotions were statistically significantly different over the three events, F (2,150) 7.83, p = .001, η_p^2 = 0.01.
- Bonferroni post hoc analysis revealed that for six weeks positive emotions ratings (0.84 (95% CI, .052 to 1.16) were significantly lower than childbirth (1.76 (95% CI, 5.21 to 1.16) and first day (1.74 (95% CI, 1.30 to 2.18).

These results indicate that the type of event is important in the researchers ratings of emotional valence, with a large effect size for the main effect of event, while the simple main effects analysis shows that positive emotions vary significantly across the three events with a medium effect size.
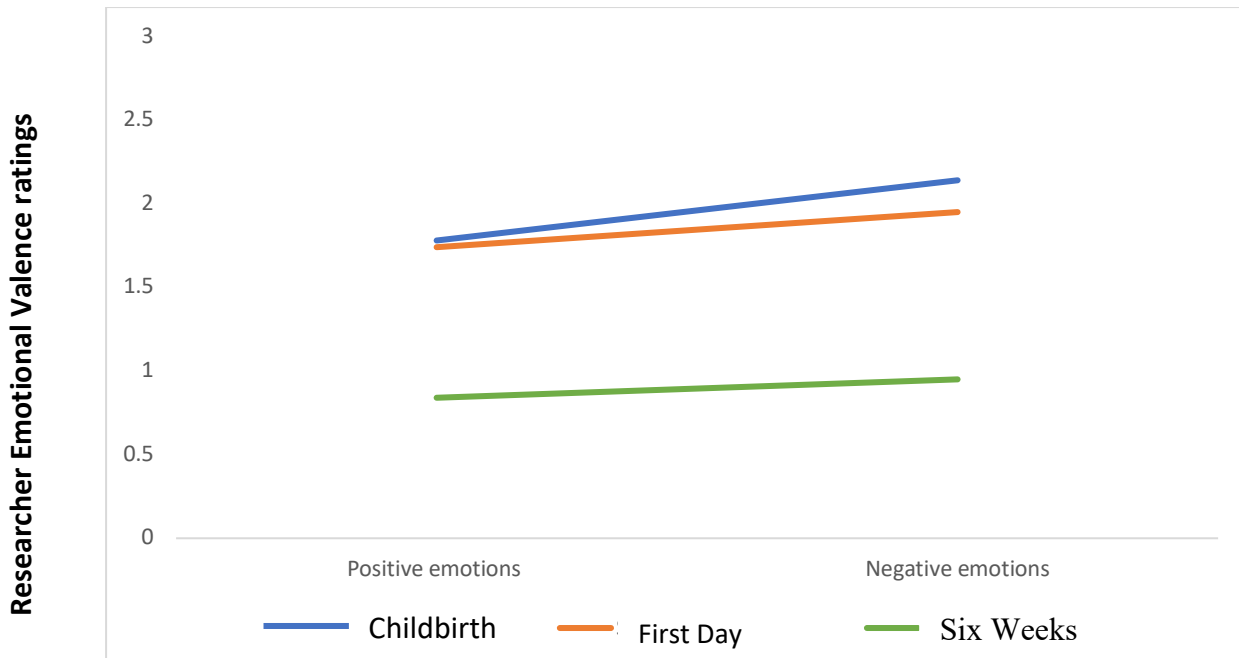
Figure 8

Positive and negative researcher rated emotions as a function of event type

When it comes to specific steps, the first 24 hours with baby was rated as having the fewest number of steps, compared to the other two events, with childbirth having the highest (F (2,150) 18.40 p= .001, η_p^2 = 0.2). This suggests a large effect size for specific steps and that the number of steps the women give may be important in their simulations.
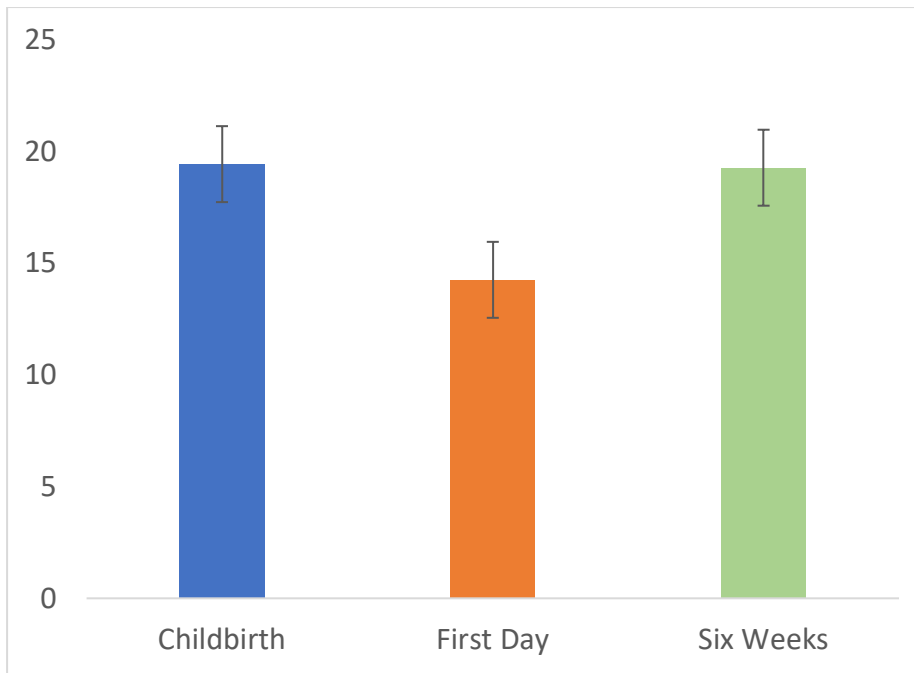
Note. Bars: error bars

Figure 9

Number of Specific steps as a function of event type.

3.3.8: A comparison of participant and researcher ratings of simulation qualities.

The final prediction of phase 1 relates to whether the participant's simulation ratings are high in internal validity, that is if there will be a positive correlation with the researcher rated qualities. This is important as simulating and rating the future events is a subjective experience, and there is a possibility that the women could interpret the simulation qualities differently. Pearson's partial correlations were run to assess the hypothesis that there will be a positive relationship between the participant rated simulation qualities of a] detail b] vividness c] sensory detail d] positive anticipated emotions and e] negative anticipated

emotions and the researcher rated simulation qualities of a] detail b] vividness c] sensory detail d] positive emotions and e] negative emotions for each of the three events.

In order to carry out the correlational analysis both the participant and researcher ratings were standardised, as they were rated on different scales. The correlations for the standardised scores are given in Table 16 below for each event. There was a low positive correlation between childbirth participant positive anticipated emotions and researcher rated positive emotions (r (80) 0.24, p=.04). There was also a low positive correlation between first day participant negative anticipated emotions and researcher rated negative emotions (r (80) 0.26, p=.03) and between six weeks participant rated negative anticipated emotions and researcher rated negative emotions (r 0.38, p=.001). There were no other statistically significant relationships between participant and researcher ratings for any of the three events.

Table 16

Pearson correlational analysis between participant rated and researcher rated qualities.

		Childbirth					First day					Six weeks				
		Researcher rated														
		Detail	vivid	Sensory detail	Positive emotion	Negative emotion	Detail	vivid	Sensory detail	Positive emotion	Negative emotion	Detail	vivid	Sensory detail	Positive emotion	Negative emotion
Participant rated	Detail	-.003					.08					-.15				
	Vivid		.13					.13					-.02			
	Sensory detail			-.20					.24					.20		
	Positive emotion				.24*					.13					.19	
	Negative emotion					.30**					.25					.38**

Note. *p<.05, **p<.001

116

3.3.9 The relationship between pregnancy and general anxiety.

The relationship between pregnancy related anxiety as measured by the PRAQ-R and general anxiety, measured using the GAD-7 was explored using a series of bivariate correlational analysis, given in Table 17. This analysis showed that there was a positive medium correlation between the PRAQ-R and GAD-7, and between two of the PRAQ-R subscales and the measure of general anxiety. However, there was only a weak statistically significant relationship between general anxiety and the subscale of Fear of Childbirth.

Table 17

Pearson correlational analysis between GAD-7 and PRAQ_R total score and subscales

		PRAQ-R Subscale		
	Total PRAQ-R score	Fear of Childbirth	Worry about infant health	Concerns about appearance
GAD-7	.50**	.25*	.47**	.41**

* p < 0.05
** p<0.01

3.4 Discussion

The first aim of this study was to investigate the role episodic future thinking has in helping soon to be first time mothers regulate their anxiety about childbirth and early parenthood. This study explored future thinking in relation to these events, and the women's anxiety before and after engaging in future thinking. It was expected that the act of imagining the future would lead to lower levels of anxiety, and that the participant and researcher rated phenomenological qualities of the simulations would relate to lower levels of post-simulation anxiety.

It was predicted that imaging the future events of childbirth, the first day at home with the baby and a typical day at six weeks would reduce anxiety for these events. It was found in line with this hypothesis that there was a significant effect for time whereby post-simulation anxiety was lower for all three events, than pre-simulation anxiety with a medium effect size. This suggests that future thinking does have an adaptive function in emotional regulation (Szpunar et al., 2014) and that asking soon to be first time mothers to imagine childbirth and early parenthood can aide them in preparing for these events.

The reduction in anxiety post-simulation could be related to the level of specificity in the imagined scenarios. Specificity in EFT refers to simulating events that are located in time or space, in contrast to imagining ones that are more abstract or general. For example, imagining giving birth in a hospital room with your partner present would be a specific EFT, whereas the abstract, general thought that childbirth is something you will experience in the future would not. Simulations that are high in specificity would therefore involve contextual

details that can include the time of day, the environment, sensory detail, thoughts and emotions and a sequence of events (Hallford et al., 2020).

The current study used an adapted means-end problem solving task (MEPS: Platt and Spivack, 1975) where participants were asked to imagine the steps involved in going from the beginning of an event to the end, and the level of specificity was analysed by counting the number of steps that the women used in the simulations. It was found for the childbirth that the number of specific steps was related to childbirth post-simulation anxiety: the lower number of individual steps given by the participants in their childbirth simulations was related to higher post-simulation anxiety for that event. This supports previous research looking at the role specificity plays in anxiety related to future events. For example, studies have that used an episodic specificity induction (ESI) to improve performance on MEPS tasks have found that the increase in means end steps generated by using the ESI was associated with lower anxiety (Jing et al., 2016; Madore et al., 2014). Brown et al., (2002) using an adaptation of a MEPS found that soon to be first time mothers who gave less coherent simulations expressed more worry about arriving at hospital in time to give birth. This suggests that specificity plays an important role emotional regulation.

However, it does contrast with findings from O'Toole and Berntsen (2020) who found that the number of specific birth-related future events imagined by soon to be first time mothers was negatively associated with positive affect, and positively associated with symptoms of psychological distress, negative effect, and worry, leading to them to suggest that specificity was detrimental for pregnancy mental wellbeing. They suggested that the pregnant women who expressed high worry also perceived the upcoming event of birth as a

stressor, leading them to create scenarios that were higher in specificity in an attempt to manage this stress by using the scenarios to mentally rehearse a potentially stressful future.

This contrast between the current study and O'Toole and Berntsen's findings could come from the type of specific details that are being measured. O'Toole and Berntsen defined specificity as an event taking place within a 24-hour time frame, which may be too narrow to capture the complexities of the relationship between what is happening in a simulation and worry or anxiety about the event. The current study explored the content of the simulations more deeply, identifying which qualities that contribute to the specificity of the simulations are important in helping women manage their pregnancy related anxiety.

It is possible that the women in the current study who produced a higher number of specific steps had received more antenatal education, where they would have had the opportunity to learn about the process of giving birth. Therefore, what was being measured was a higher level of general knowledge about childbirth, and it was this that acted to lower anxiety. When the sources of the women's simulations were rated for their level of specificity there was a statistically significantly higher level of general conceptual knowledge given as the source, which when combined with the findings relating to the number of specific steps, suggests that general conceptual knowledge is important in managing anxiety around childbirth. In fact, Serçekuş & Başkale, (2016) found that antenatal education helped to reduce fear of childbirth in a sample of pregnant women who had not received this type of birth class before, suggesting that this could be a protective factor in anxiety. However, attendance at this type of class was not recorded in this study therefore more research would be needed to explore this further.

It was expected that those who reported anticipating feeling more positive when they experienced the three events would have lower general and pregnancy related anxiety. It was found that the women who rated their post-simulation anxiety higher also reported anticipating fewer positive emotions during childbirth. This supports Favrod et al's (2018) finding that positive mental images were associated with less fear of childbirth. However, a similar finding was not found for the two parenthood events. This could be related to the relatively lower levels of pre-simulation anxiety the women experienced, they already felt less anxious about these two events and therefore the direction of their anticipated emotions had less relevance in them managing this anxiety.

There was one other important finding that related to childbirth simulations and post-simulation anxiety. Nigro and Neisser (1983) found that visual perspective in memory can be related to the emotional content of the memory and the emotional state at the time of recall. Memories with a strong emotional content were more likely to be recalled from a field perspective, and neutral or less emotional ones were more often recalled from an observer perspective. In the current study, childbirth was rated as having the highest pre-simulation anxiety of the three events, seen equally from a field perspective and observer perspective in contrast to the other two events, and this field perspective related to and predicted higher post-simulation anxiety. This suggests that a more self-immersed perspective when imagining a future event that is high in emotional content contributes to maintaining a higher level of anxiety for that event. This suggests that visual perspective has predictive validity when it comes to future thinking and anxiety and encouraging women to imagine childbirth from an observer perspective may help them to manage their anxiety.

This finding is in contrast to Finnbogadóttir & Berntsen, (2011) who found that high

worriers who took part in a memory and future thinking task based on a set of word cues

were more likely to report using an observer perspective when imagining the future than

low worriers, and that general anxiety, social anxiety and rumination were associated more

frequently with this observer perspective. The key difference between the current study and

Finnogadottir and Berntsen's is that the women in the current study imagined a novel,

highly personal event they were all going to experience, and rated their anxiety about that

event in particular, rather than their general level of anxiety. Therefore, the anxiety they

reported feeling represents how they actually feel about going into labour and giving birth,

rather than how they feel about hypothetical events that may or may not occur. There is

perhaps a need for further exploration of the difference between using hypothetical

scenarios generated from methods such as word-cues, and real-life events in future thinking

research, as well as how anxiety around imagined events are measured.

The level of specificity, the visual perspective reported and the direction of

anticipated emotions in EFT are all important and could therefore be effective in reducing

anxiety around childbirth. Interventions have been used in the prevention and treatment of

depressive symptoms and have found to be effective in increasing both the amount of

future thinking and reducing the frequency of depressive symptoms (Barry et al., 2019;

Hallford, Farrell, et al., 2022), but so far to date its use with anxiety has been minimal. Study

2 will further explore the role that specificity plays in the adaptive functions of EFT when it

comes to emotional regulation.

There is less of a clear pattern for the parenthood events with fewer of these

simulation qualities predicting post-simulation anxiety. It was found that the frequency of

thinking about a typical day at six weeks predicted higher post-simulation anxiety ratings for that event, perhaps suggestive of high worriers attempting and failing to manage their anxiety about this event by repeatedly imagining this day. Both the Avoidance Model of Worry (Behar et al., 2009) and the Intolerance of Uncertainty Model (Dugas et al., 2010) compare worry to rumination that maintains anxiety, and the women, when they did think about the future with their baby, may have been attempting to prepare for it but this may have led to them to feel more anxious. Further research could explore the role of repetition of future thinking by asking participants to keep a record of the frequency of thinking about the future, and the nature of this thinking which can then be explored in relation anxiety.

Higher levels of positive anticipated emotions for a typical day at six weeks predicted lower levels of mood as measured by the EPDS. This was the only characteristic that related to a measure of probable depression, and suggests that depression during pregnancy, while important to monitor and support those women who experience it, has less of a relationship with future thinking during pregnancy. None of the first day with baby participant rated simulation qualities were related to or predicted post simulation anxiety.

The second aim of this study was to clarify the type of memory that the participants felt they were accessing when imagining a novel event such as those in the current study. To this end the women were asked an open question about where their ideas had come from when they were imagining the future. General knowledge was the statistically significantly most frequent source of content for the simulations, unsurprising given the novel nature of the event. The Semantic Scaffolding Hypothesis states that general knowledge drawn from the semantic memory plays an essential role in future thinking, providing the schemas and meaning needed to create a plausible scenario of the future (Irish et al., 2021a., Irish &

Piguet, 2013). This is particularly relevant for novel events, as the current findings suggest, as the women relied on external details to fill in the gaps left by a lack of personal memories.

The third aim of this study was to examine the extent to which the participant and research ratings of the simulation qualities related to each other. This is a unique opportunity to explore the validity of the participant's subjective ratings of their simulations, by comparing them with objectively, by having two independent researchers rate them for the same qualities. If the participant's simulation ratings positively correlate with the researcher rated qualities, this would indicate that the women were interpreting their subjective experiences of simulating the future in a comparable way. Correlations were carried out between the participant rated simulation qualities of a] detail b] vividness c] sensory detail d] positive anticipated emotions and e] negative anticipated emotions and the researcher rated simulation qualities of a] detail b] vividness c] sensory detail d] positive emotions and e] negative emotions for each of the three events. There were only 3 weak positive correlations between childbirth participant positive anticipated emotions and researcher rated positive emotions, first day participant negative anticipated emotions and researcher rated negative emotions, and between six weeks participant rated negative anticipated emotions and researcher rated negative emotions. There were no other statistically significant relationships between participant and researcher ratings for any of the three events.

It is possible there were individual differences in the way the participants were interpreting the simulation qualities, which affects the internal validity of their ratings both within and across each of the events. The researcher ratings were also more predictive of

post-simulation anxiety than the participant ratings, suggesting that they are more useful in identifying the key simulations that relate to anxiety and ultimately will help to manage this anxiety. This needs further exploration, and one way would be to interview participants, to explore how they derived their ratings for the qualities. Based on cognitive interviewing, the women would first simulate the future, rating their simulations for the qualities and then they would be taken through each rating where they would be asked to explain the factors that led to them giving that rating. This would give a deeper understanding of how ratings are made, and potentially improve the methodology used to assess the phenomenological qualities in future thinking simulations.

The last aim of the study was an exploration of the pattern of simulation qualities across the three events, which provides a useful opportunity to examine the way the events varied in how they were simulated. Childbirth was thought about more frequently than the other events, supporting previous research that found pregnant women were more future orientated (Li & Cao, 2018; O'Toole and Berntsen, 2020). This seems to sit well with theories of anxiety that suggest that anxiety is future focused, and is characterised by chronic, excessive, and uncontrollable worry (Behar et al, 2005). The women may have been engaging in worry about childbirth in an attempt to mentally prepare for it, leading to higher levels of pre-simulation anxiety. The subscales of the PRAQ-R give some indication of where this worry lies; the women were most concerned about the wellbeing of their infant, and then about childbirth, with their own physical changes being less of a concern.

The two early parenthood events of the first day at home and a typical day at six weeks were thought about less frequently than childbirth, which may be due to their temporal distance. Spreng & Levine (2006) found that people generally tend to spend more

time thinking about past and future events that are temporally near, suggesting that expending cognitive functions on constructing mental representations of events that would not be relevant for some time would be inefficient. This is further supported by the anecdotal finding that the women talked about not having thought about their first 24 hours with baby or what life would be like when the baby was six weeks very often, with some remarking that the interview was the first time they had considered what life would be like with a newborn infant.

Childbirth had the lowest self-ratings for sensory details, and first day with baby the highest. Szpunar & McDermott, (2008) found that future events that were located in familiar contexts to prior experiences contained more sensory details. Therefore, if the women are less familiar with where they will give birth, they may experience fewer sensory details. The imagined scenario of first day at home with the baby is located in a context that is very familiar to the women, their own home, where they would have extensive prior experience to draw upon for their scenarios, and therefore sensory detail could be expected to be higher.

It could therefore be expected that childbirth would have higher levels of both detail and vividness reported by the participants, due to it being temporally nearer than the other two events, in line with previous research stated above that personal future events occurring in the near future would be rated as having more contextual detail than those in the distant future (Szpunar, 2010). However, the three events showed similar levels and this finding would require further exploration to understand why no difference was found.

The first day at home and typical day at six weeks were predominantly seen from the field perspective, that is the women reported seeing it from their own eyes, consistent with research on episodic memory (D'Argembeau & Van der Linden, 2004). This finding contradicts previous research suggesting that temporal distance in future thinking increases the likelihood of a observer perspective being taken as the events were less likely to have been imagined as frequently as those that are temporally closer (Hamilton & Cole, 2017). However, a tentative explanation is that there could be an effect of familiarity of location rather than temporal distance happening. The women may be engaging more of their episodic memories for the location of these two events that would occur in more familiar settings: their own home. If this were the case, there would be an expectation that these two events would also have higher levels of vividness, which was not found.

When it comes to the researcher rated qualities, one of the most interesting findings is that childbirth simulations had the highest level of specific steps. This means the women were able to give more steps that took them from going into labour to giving birth, compared to the other two events. This may be due to the women having thought about childbirth more frequently, so having rehearsed the steps involved previously. It may also be due to them having attended antenatal classes as mentioned above, but not having done any preparation for parenthood yet.

Study 1, Phase 1 was also an opportunity to explore the relationship between general and pregnancy related measures of anxiety. Chapter 2 (Methodology) discusses the importance of using a separate measure of pregnancy related anxiety as this form of anxiety is unique to the experience of being pregnant. It would be expected that if there was no difference between the concept of general and pregnancy related anxiety they would have a

strong positive correlation. This is not what was found. A series of Pearson's product moment correlational analyses carried out on the GAD-7 scores and the total PRAQ-R score, and two of the PRAQ-R subscales, worries about changes in appearance and concerns for the wellbeing of the infant, showed a statistically significant medium positive correlation with the GAD-7 scores. This suggests that while there is an overlap in the anxiety being measured by the two anxiety scales, it is likely they are exploring different aspects of anxiety. This becomes more apparent when considering the relationship between the GAD-7 and the subscale of fear of giving birth. There was only a weak positive correlation between the two measures, indicating that the GAD-7 may not be a suitable measure of fear of childbirth. Therefore it is important that a separate measure of pregnancy related anxiety is used when researching women's experience of anxiety during pregnancy.

3.5 Limitations

A potential limitation to be considered that can impact any episodic future thinking research is the issue of demand characteristics. Demand Characteristics are when participants' behaviour conforms to the research aims and hypotheses, as the participants become aware of what they believe is the purpose of the study (Stein et al., 2018). It can be problematic in episodic future thinking research as both the instructions relating to the events to be imagined and the questions asking participants to rate the phenomenological qualities can influence the way the future is imagined in subsequent trials. Phase 1 of Study 1 asked the women to imagine three events, in the same order each time. This means that the first simulation event, childbirth, was the least likely to be influenced by demand characteristics, however, it could have set expectations for the subsequent two events and led the women to imagine these with more of the phenomenological qualities in mind.

There are two ways this could have been controlled for: the order of the events could have been rotated, so that there was a 1 in 3 chance of each event being imagined first or the design of the study could have been changed to a between participant design, the women only imagining one of the three events. Presenting the events in differing order would help to counterbalance the effects of demand characteristics. However, it would put the events in an illogical order, where the women were imagining caring for their newborn infant before they had imagined giving birth to them. An alternative solution would be to have the women imagine only one event, but this would then require recruiting three times as many women, when recruitment of this very specific group is already difficult.

There is a third possibility, that is used when episodic future thinking is researched in relation to delay discounting. Delay discounting is when rewards are considered to lose their value if they are delayed (Stein et al., 2018), and episodic future thinking research asks participants to imagine future events in relation to delayed rewards to see the impact of this delay. This type of research is prone to demand characteristics; participants can easily work out that the research is looking at whether they will choose to delay rewards or not. One way to control for this is to include questions to check for demand characteristics. The participant is asked to state what they think the purpose of the study is and what they think the researcher is expecting to find (Stein et al., 2018). This could be included at the end of the simulation task and would help to determine whether demand characteristics played a part in the results.

A second limitation is the high attrition rates between those who completed the mood measures only and those who went on to complete the interviews. Data collection in the current study was split into two, the initial part was the completion of the mood

questionnaires, and the second part was the interview. The intention was to reduce the burden on the participants taking part in the interviews, but it had the unintended consequence of collecting data from a large number of potential participants who did not choose to continue. A comparison of the two sets of participants on the mood measures found that the nonparticipants had higher general and pregnancy related anxiety than those who carried on to the interview phase which could have led to them withdrawing from the study before the interview. This is supported by Munkhaugen et al., (2016) who reported that nonparticipants in a coronary heart disease study had higher levels of anxiety than those who participated. However, Schreyer (2017) found no significant differences in anxiety levels between participants and nonparticipants in an eating disorder treatment study, suggesting that nonparticipation may not be that straightforward.

Participation in the current research could have been influenced by a number of factors. For example, Sheridan et al., (2020) reviewed factors relating to barriers and facilitators for patients taking part in health research. The three dominant facilitators were personal benefit, altruism and trust, while the number of barriers were wider and more disparate. Practical difficulties relating to inconvenience and time constraints were seen as to affect motivation. A lack of knowledge around research had a negative effect for most nonparticipants, while distrust of research was important to participants from minority populations. Therefore, the sample in Study 1 may not be representative of the wider population of women they are being sampled from, as they have lower anxiety than the nonparticipants.

However, participation may not be due to anxiety alone. Anxiety levels could be a mediating factor that increases the impact of facilitators or barriers of participation in any

health related research, leading to issues of sample bias when recruiting participants. The current study involved taking part in interviews and this may have been seen as inconvenient, time consuming and therefore reduced motivation, particularly for those who were more anxious. The only way to be certain would be to ask nonparticipants why they chose not to take part, which would make for a very interesting follow-up study.

3.6 Conclusion

This phase of Study 1 has found that when soon to be first time mothers imagine childbirth and the first day at home with their baby, their post-simulation anxiety for these events was lower than their pre-simulation anxiety, suggesting that EFT has a role in emotional regulation. The level of specificity of the childbirth simulations was found to be important, with simulations with a higher number of specific steps relating to lower post-simulation anxiety. This suggests that an intervention that increases the level of specificity would further reduce anxiety relating to childbirth. This is explored in Study 2, where participants in an experimental group who are given prompts to increase the specificity of their simulations are compared to a control group.

The women were less anxious after imagining the first day at home with their baby, suggesting that EFT has potential to help them manage their anxiety. However, none of the participant ratings of the phenomenological qualities related to post-simulation anxiety, leaving a question about what aspects of the simulations relate to this difference. This event may be of more significance post-partum, and phase 2 of this study will explore the women's experience of bringing their baby home and whether the accuracy of the simulations was important in preparing them for this momentous event.

There was very little difference between pre and post simulation anxiety for a typical day at six weeks. This may be due to the temporal distance of the event; for some women this day was up to 8 months in the future, and their pre-simulation anxiety was very low suggesting that they were not anxious about it. Some women mentioned in the interviews that they had not thought about this day previously, stating that they did not know anything about babies at six weeks old. Therefore, this event was not carried forward to Study 2. This had the added benefit of reducing the burden to the participants in Study 2, which would help ensure they completed the study.

Chapter 4: Study 1 – Phase 2

4.1 Introduction

4.1.1 How important is simulation accuracy when imagining childbirth and early parenthood?

The first aim of following up with the women from phase 1, after they have given birth, was to increase our understanding of how the accuracy of simulating a worrisome future event might impact emotional well-being in the longer-term, that is after the events have been experienced. Imagining the future may have positive benefits if a positive expectation set by the simulation is met by a positive outcome. However, if the expectation is negative, or the outcome is not as expected there may be an increase in distress either during pregnancy as the women expect a negative outcome, or postpartum as the experience did not live up to their expectation.

This was explored in the follow-up phase (Study 1: Phase 2) of the study by asking the women whether their expectations of childbirth and early parenthood, as outlined in their simulations from Phase 1, met with the reality of their experience. To achieve this, during phase 2 the women were given a transcript of their simulations to read before rating the extent to which giving birth and experiencing those early days of parenthood met their expectations. This gave a rating of their subjective assessment of how accurate their future thinking was, rating the simulation accuracy. They were also asked about the level of valence accuracy of their simulations, whether the experience was better or worse than they imagined.

This was possible because the events that were imagined in phase 1 when the women were pregnant, were ones that they went on to actually experience. Additionally, all

the women experienced the same events, unlike studies where personally relevant plausible events are generated, but not necessarily actually experienced, or where each event simulated is individual to that participant.

Women often report feeling uncertain about what to expect when it comes to childbirth. Borrelli et al., (2018) carried out a qualitative study exploring soon to be first time mother's expectations around labour and birth using semi-structured interviews during the women's third trimester of pregnancy. They identified three themes: the unknown territory of labour and birth, waiting for the unknown and going with the flow as a coping strategy. The soon to be first time mothers viewed childbirth as a new and unknown event, and talked about waiting to give birth as a time of uncertainty that left them feeling insecure about how they would react to labour and birth. The women also anticipated there being a gap between their expectations and experiences of childbirth. The way the women expected to cope with this uncertainty was to 'go with the flow', and to adjust their expectations as the situation developed.

The Intolerance of Uncertainty model of anxiety (Dugas et al, 1995) proposes that individuals with GAD find situations that are high in uncertainty or ambiguity stressful, and this can lead to chronic worry (Behar et al, 2009). This is characterised by negative problem orientation (focusing on the negative aspects of a problem) and cognitive avoidance (thought replacement, distraction, thought suppression) which only serve to maintain worry. It seems possible therefore that removing uncertainty about childbirth will serve to reduce worry. One way that women's uncertainty can be managed is through receiving antenatal education. Cankaya and Simsek (2020) investigated the effects of antenatal education on fear of childbirth, depression, anxiety, stress, childbirth self-efficacy and mode

of delivery in soon to be first time mothers. Those who had received antenatal education reported lower fear of childbirth, depression, anxiety and stress and increased childbirth self-efficacy compared to controls who did not receive antenatal education. This difference was maintained postpartum with the antenatal group continuing to show lower symptoms of anxiety, stress and depression, and a greater likelihood of having had a vaginal birth. This points to the importance of women understanding the birth process and so going into childbirth with expectations that reflect the reality of childbirth. This is supported by Preis et al., (2019) who found that greater satisfaction with childbirth comes from congruence with women's expectations and their plans for childbirth.

When it comes to parenthood, holding unrealistic expectations can lead to parents reporting feeling shocked by the demands of parenthood, especially when they first bringing baby home (Sanders et al, 2021). Reality may not match the preconceptions that women may have, that the day will be filled with joy and happiness, especially with the reality of exhaustion, anxiety and confusion that comes with caring for a newborn (Sanders et al, 2021). Sanders et al found in a meta-synthesis of qualitative studies of childbirth and parenthood, that the origins of these unrealistic expectations often came from a lack of contact with others who had babies, and a reliance on the internet and media for information. This, coupled with an optimism bias for the future, may lead soon to be first time mothers and their partners to seek out only positive and avoid negative information about caring for a newborn (Carver et al, 2010). Optimism is the tendency to expect that there will be a positive outcome in uncertain situations (Scheier et al, 1994) and is related to improved psychological wellbeing (Carver et al, 2010).

Future thinking tends to be more optimistic and have a positivity bias (D'Argembeau & Van der Linden, 2004; De Vito et al, 2015; Rasmussen & Berntsen, 2013). In fact, Phase 1 of the current study found that women rated their simulations as higher in positive anticipated emotions and lower in negative anticipated emotions across all three events, suggesting that they anticipated feeling positive in the future. This optimism may protect against stress and anxiety during pregnancy, which can be an advantage for both the woman and the infant's health in the long term (Sanders et al, 2021). However, unrealistic optimism can also lead new parents to overly focus on the positive and view negative life events as more likely to happen to others than themselves and may lead them to not prepare adequately for parenthood (Sanders et al, 2021; Weinstein, 1980).

This leads to the following predictions being made in relation simulation accuracy. It is predicted that:

H6: Simulation accuracy for the three events (i.e. childbirth, first day at home and typical day at six weeks), will relate to and negatively predict mood post-partum as measured by the GAD-7 and EPDS.

H2: Valence accuracy for the three events (i.e. childbirth, first day at home and typical day at six weeks), will relate to and negatively predict mood post-partum as measured by the GAD-7 and EPDS.

Additionally, the follow-up attempted to assess the impact of EFT on later emotional wellbeing by asking the women to recall how often they had thought about the future in the same way as their simulations. A high frequency of thinking about the imagined scenarios can have two possible impacts on the women's later emotional wellbeing. The first is that

the simulations continue to help to reduce anxiety about the future events by helping the women to prepare for childbirth and parenthood. Phase 1 showed a reduction in anxiety about childbirth after the women had created their simulations, suggesting that EFT has an adaptive function in emotional regulation, that thinking about the future helps to prepare us for that future, with childbirth showing the highest reduction in anxiety post-simulation. Interestingly childbirth was also the most thought about of the three events, perhaps due to the fact that it is a major life event that was due to happen in the near future. Given that on average, we may experience up to 60 future orientated thoughts (D'Argembeau, Renaud and Van der Linden, 2011) and that repeated simulations of future events makes them seem more plausible (Szpunar and Schacter, 2013), coupled with the fact that women are more future orientated during pregnancy (Li & Cao, 2018; O'Toole and Berntsen, 2010) suggests that thinking about childbirth and parenthood frequently during pregnancy can help women further regulate their emotions postpartum.

Given that those with GAD find uncertain or ambiguous situations worrisome (Dugas et al., 1995) and that high worry in pregnancy is a predictor of postpartum depression (Osborne et al., 2021) it is likely that there would be a relationship between the frequency the women thought about their simulations and their emotional wellbeing. However, in phase 1 the women were more likely to feel less anxious after imagining childbirth and those early days of parenthood. In Osborne et al's study the women completed the Penn State Worry Questionnaire which is designed for the general population and not specifically for pregnancy. It is possible that such a general measure, while useful, may not tap into the women's thinking about the future directly enough. Phase 2 asks the women to recall whether they had thought about their imagined scenarios during their pregnancy, giving

them a copy of these to remind them so that they are able to make a judgement about the content of their thinking. This therefore means that phase 2 of the current study is potentially able to shed more light on women's recall about how frequent they think about their future and if this is associated with post-partum mood. It is predicted that:

H7: there will be a negative correlation between the women's recall of how often they have thought about the three events in a way that was similar to the simulations given in phase 1 and emotional wellbeing as measured by the GAD-7 and EPDS.

4.1.2 The comparison of qualities of future thinking and memory for the same events

The second aim of phase 2 was to compare the qualities of the simulations from phase 1 with those of the women's memories of the events postpartum. Remembered and imagined events are seen as both involving creating simulations which are constructed from the same pool of experiential details, relying on the episodic memory for their content (Addis, 2018). The constructive episodic simulation hypothesis proposes that it is the function of episodic memory to support the construction of imagined future events through the retrieval of information about past experiences. This information or elements are then recombined into possible future scenarios (Schacter and Addis, 2007). Research using brain imaging techniques have suggested that there is a 'core brain network' that is activated when recalling the past and imagining the future (Spreng & Grady, 2010). Similarly, patients with impaired episodic memory also have problems imagining future events (Tulving, 2005; Klein et al, 2002). This has led to the assertion that past and future events draw on similar information and rely on similar underlying processes, that episodic memory supports the

139

construction of future thinking by recombining elements from memory into simulations of novel future events and the function of the memory system is to make these elements available (Addis, Pan & Schacter, 2010).

This overlap between recalling the past and imagining the future leads to a number of commonalities in their phenomenological qualities (Tulving, 2002; Schacter and Addis, 2007). When it comes to episodic specificity, research has established that both memories and future thinking show similar declines with age, and that enhancing the level of detail generated on both a memory and imagination task elicited more episodic details for both (Levine et al., 2002; Addis et al., 2010; Madore, Gaesser and Schacter, 2014). This indicates that as the constructive simulation hypothesis suggests, both past remembering and future thinking are underpinned by the same processes in relation to detail, and therefore it is predicted that the simulations and memories of each event will show similar levels of detail.

Vividness is often used as a measure of the intensity of the visual experience of a memory or future thought (Andrade et al., 2013). According to Baddeley and Andrade's model of imagery, the level of vividness of memory is determined by the elements of stored knowledge it is based on, such as the available perceptual information, the capacity of the modality specific short-term memory systems, executive processes involved in retrieval and manipulation of information and the complexity of the stimulus being imaged. Therefore, if as the CESH predicts future simulations are constructed from elements from the episodic memory, there would be similarities in the level of vividness between past remembering and future thinking. To explore this, Thakral et al (2019) examined whether vividness of simulations can be predicted by the level of vividness of the episodic memories they were sampled from. They asked participants to recall past memories comprised of a personally

familiar location and person. These pairs were then recombined to be used in novel simulations of the future. The participants rated the level of vividness for both the memory and the simulations leading to the finding that the vividness of the memory co-varied with the vividness of the simulation, suggesting that the simulations were based on the content of the memory. Although the memories were accessed prior to the simulations in Thakral et al's study, it is still suggestive that in the current study the women will show similar levels of vividness in both their simulations of the three events and their subsequent memories of them, and this is what is predicted.

The characteristic of sensory detail however, highlights differences between past remembered and future imagined events. Sensory detail refers to the information from the five senses that is included in memories and simulations. Generally, participants are asked to rate the overall sensory content in their memories or future simulations, and it has been found that this differs according to whether they are recalling past events or imagining the future. Conway et al (2002) explored the neurophysiological correlates of two types of memory, experienced and imagined events. Their participants were instructed to construct these imagined memories to be plausible, and to contain real people, places, and goals, akin to a future thinking task. Conway et al found that the memories differed in their content, with memories of experienced events containing sensory-perceptual knowledge stored in the occipital networks and memories for imagined events containing generic imagery generated from frontal networks. This is supported by more recent research by Branch & Zickar, (2021) who found that future thoughts contained significantly fewer sensory details compared to memories. It is therefore predicted that there will be a negative correlation between ratings of sensory detail for the simulations and the memories of the events.

Emotional valence refers to the positive versus negative emotions that are associated with past or future events. Phase 1 found that the women expected to experience more positive, and fewer negative emotions in relation to all three events, with the effect strongest for childbirth. This is in line with previous studies that have found that positive future events are more frequent and imagined faster than negative ones, and contain more sensory details, and greater feelings of pre-experiencing Çankaya & Şimşek, (2021). When comparing the emotional valence of future simulations with past remembered events there tends to be a positivity bias for future relative to past events with future events being rated as more positive than past events (Newby-Clark & Ross, 2003). However, this previous research asks participants to recall the past and then imagine the future, while the current study has asked participants to do the opposite; they imagined future events then recalled their experience of them afterwards. Phase 2 is therefore an opportunity to explore the potential similarities or differences between the emotional valence of future events and the subsequent memories for those events, with the expectation that the simulations would have a positivity bias compared to the memories.

Research on autobiographical memory shows the importance of visual perspective on recall of memories, with most memories being retrieved from a field perspective; seeing the memory as if through one's own eyes and a minority of memories recalled from an observer perspective or seeing the memory through someone else's eyes (Nigro & Neisser, 1983). Memories from a field perspective tend to be more emotionally rich, more recent, and less frequently rehearsed (Berntsen & Rubin, 2006, D'Argembeau et al., 2003). McDermott et al., (2016) examined the similarities in visual perspective between past remembered and imagined future events and found that over 70% of both were rated as

having a third person perspective. D'Argembeau and Van Der Linden (2004) asked participants to report the visual perspective they used in past-remembering and future thinking and found that while there was a difference in the visual perspective reported depending on how temporally distant the event was, this was found for both past and future events. Temporally close events were more likely to be from a field perspective, and temporally distant in the observer perspective, for both memory and imagination tasks.

Phase 1 supports D'Argembeau and Van der Linden's finding in relation to temporal distance. The first day at home with the baby and a typical day at six weeks were predominantly seen from a field perspective, but childbirth showed a near even split between field and observer perspective. When it comes to recalling the events, there is less likely to be a temporal distance effect, as the follow-up will capture the women's memories only a short period after the event has occurred. What is apparent from this previous research is that episodic memory and future thinking share a range of commonalities and differences that vary according to which characteristic is being examined. Therefore, the following hypotheses are made:

H8: there will be a positive correlation between the ratings for the simulation and memory qualities for detail, vividness, and negative emotional valence, while the ratings of positive emotional valence and sensory detail will have a negative correlation.

4.2 Method

4.2.1 Ethical approval

Prior to recruitment for Phase 1, ethical approval was also obtained by the Goldsmiths University Psychology Department ethics committee for phase 2. No other organisational ethics were required for the research. Participants gave consent for Phase 2 at the beginning of the Qualtrics survey. They were informed of the aims of the study, confidentiality and privacy and were given a link to a copy of the University's GDPR policy. To continue to ensure confidentiality but also ensure the different parts of the study could be connected participants entered their initials into Qualtrics, along with their respondent number from Phase 1.

4.2.2 Participants

41 women completed the follow-up study at around 8 weeks after giving birth, this was 50.62% of the sample from phase 1. The details relating to the birth of their baby are given below.

Birth variables

Table 17 shows the details about the baby's at follow-up: the date of birth, gestational age, the type of birth, where they gave birth, how they coped with labour, the age of their baby when brought home and the age of the baby when completing the questionnaire.

Table 17

Characteristics of the baby's birth (n=41)

Gestational age at birth	
Under 40 weeks	13 (31.70%)
40-42 weeks	20 (48.78%)
Over 42 weeks	5 (12.20%
No answer	3 (7.32%)
Birth type	
Vaginal birth	23 (56.1%)
Planned C section	2 (4.88%)
Emergency C section	16 (39.02%)
Birthplace	
Hospital	37 (90.24)
Birth Centre	2 (4.88%)
Home	2 (4.88%)
Labour	
TENS machine	2 (4.88%)
Gas & air	6 (14.63%)
Pethidine (opioids)	1 (2.44%)
Epidural	17 (41.46%)
Alternative methods	15 (36.59)
Baby age home	
Same day	4 (9.76%)
1 day	13 (31.71%)
2-4 days	20 (48.78%)
5 days +	4 (9.76%)
Baby age at follow-up	
8-11 weeks	17 (41.46%)
12 weeks -6 months	18 (43.09%)
7-12 months	6 (14.63%)

Mood measures

Table 18 gives the mean scores for the measures of mood completed during pregnancy and postpartum.

Table 18

Mean scores (sd) for measures of mood postpartum

	Phase 1 (pregnancy: n=41)	Phase 2 (postpartum: n=40*)
GAD-7	7.05 (5.57)	5.68 (4.71)
EPDS	10.12 (6. 04)	19.85 (6.02)

Note. *One participant did not complete the mood measures postpartum

The severity of anxiety and depression during pregnancy and post-partum as measured by the GAD-7 and the EPDS are shown in Table 19 below.

Table 19

Frequency of the levels of severity for the GAD-7 and EPDS

Measure	Phase 1 (pregnancy: n=41)	Phase 2 (postpartum: n=40*)
GAD-7		
Minimal 0-4	19 (46.3%)	18 (45%)
Mild 5-9	11 (26.8%)	14 (35%)
Moderate 10-14	5 (12.2%)	5 (12.5%)
Severe 15+	6 (14.6%)	3 (7.3%)
EPDS		
Low (0-12)	28 (68.3%)	29 (72.5%)
High (13+)	13 (31.7%	11 (27.5%)

Note. *one participant did not complete the mood measures postpartum

4.2.3 Procedure

At around 8 weeks after the estimated due date given in phase 1, participants were emailed a link to the follow-up study. On clicking on the link, they were taken to a Qualtrics survey, where they were informed of the study purpose again and asked to give consent and given a link to the University's GDPR policy. They were asked about the details of the birth of their baby, before completing the simulation accuracy questions relating to the transcribed scenario from phase 1 for each of the three events in turn. These questions and their analysis are described below. They were also asked a series of questions relating to their memory of the actual event; this part of the study is described and discussed in detail in chapter 5. They were then asked to complete the mood measures before being shown the debrief and thanked for taking part. A small payment was made as a thank you.

4.2.4 Measures

Experience of the three events: Simulation accuracy:

After reading the transcript of their simulation, the women were asked to rate the following:

- *Simulation accuracy*: The extent to which what happened during the event matched participants' expectations, rated on a Likert scale from 1 = did not match my expectations at all to 7 = completely matched my expectations.
- *Valence accuracy*: The extent to which, on balance, the experience of the event was better or worse than the imagined scenario on a 7 point Likert scale from 1 = a lot worse than expected to 7 = a lot better than expected. A rating of 4 was neither worse or nor better.

- *Frequency:* how frequently they had imagined the event this way while they were pregnant. Four response options were given:

> I did not think about this scenario at all
>
> I thought about it only once like that
>
> I thought about is several times like that
>
> I often/always had that scenario running through my head

The memory task:

The participants were asked to recall each event in turn, and were given a box in Qualtrics to write their memory down if they wished, otherwise they just thought about it, then rated the extent to which their memory contained the following:

- *Detail*: This relates to level of detail contained in each memory as a whole. Detail was rated on a 7 point scale ranging from 1 = not at all, to 7 = very detailed

- *Vividness*: Vividness is related to how clear the image is in the mind when the event is recalled. Vividness was rated on a 7 point scale ranging from 1 = not at all, to 7 = very vivid

- *Sensory detail*: the extent to which the memory contained the 5 senses; visual imagery, sound, smell, taste and touch or physical sensations. These were asked about separately and were rated on 7-point scales from 1 = not at all to 7 = a considerable amount. Mean scores were calculated across the five scales to give a mean measure of sensory detail.

- *Visual perspective:* Participants were asked if they recalled the event through their own eyes or through someone else's - either first vs 3rd person,

- *Valence*: two 9-point scales from 0 = none to 8= a great deal measuring the extent to which positive and negative emotions were experienced during the memory of the event.

- *Frequency:* how frequently they had imagined the event this way while they were pregnant. Four response options were given:

I did not think about this scenario at all

I thought about it only once like that

I thought about is several times like that

I often/always had that scenario running through my head

Mood measures

The GAD-7 (Löwe et al., 2008) was used, having been used in Study 1. The same cut-off scores for anxiety were also used: 5 =mild, 10-=moderate and 15 = severe (Spitzer et al 2006). With scores of above 10 recommended as a clinical cut-off (NHS, IAPT, 2016).

Edinburgh Post-Natal Depression Scale (EPDS; (Rubertsson et al., 2014) scores of 14 or above indicate probable depression (Matthey et al., 2019) and was used in Study 1.

4.3 Results

4.3.1 Is simulation accuracy important for postpartum mood?

At follow-up, the women were asked to read their simulations from Study 1 then rate on a Likert scale from 1 – 7 how accurate they felt their simulations had been in predicting the future, now that they had experienced the events, with a higher score indicating higher simulation accuracy. They also rated whether the experience was better or worse, with a higher rating indicating the events were considered to be better than expected. Table 19 below gives the mean ratings (sd) for these variables.

Table 19

Mean scores (SD) for simulation accuracy and whether the event was worse than expected

	Childbirth	First day	Six weeks
Simulation accuracy	3.07 (sd= 2.02)	4.68 (sd=1.82)	5.24 (sd=1.74)
Valence accuracy	3.76 (sd=2.07)	4.10 (sd=1.86)	4.71 (sd=1.60)

One-way repeated measures ANOVAS were carried out to assess the extent to which these two variables varied across the events. The women reported statistically significant lower ratings of simulation accuracy for childbirth, F (1,40) 19.66, p=.001, η_p^2 = 0.3 and were significantly more likely to report that childbirth was worse than expected by giving it a lower rating for valence accuracy F (1,40) 4.10, p=.03, η_p^2 = 0.09. There is a medium effect size for childbirth simulation accuracy, suggesting that it is important that expectations and

reality match. However valence accuracy whilst significant only had a small effect size, indicating that other factors may be more influential.

It was hypothesised that the women's anxiety postpartum as measured by the GAD-7 would relate to and be predicted by their ratings of simulation accuracy and valence accuracy, controlling for their anxiety in pregnancy (Study 1: Phase 1) for each of the three events. A two-stage hierarchical multiple regression was performed first for childbirth, where GAD-7 scores in pregnancy was entered in the first stage, so that it was controlled for. Following this, the two childbirth accuracy variables were added at the second stage: i) simulation accuracy and ii) valence accuracy. The data met the assumptions for a hierarchical multiple regression and the results showed that at the first stage, GAD-7 in pregnancy significantly contributed to the model $F_{(1,38)}$ 4.30, $p=.05$, accounting for 10.2% of anxiety postpartum.

In stage 2 the inclusion of the two accuracy variables resulted in an additional 12.9% of the variance in anxiety postpartum, and this change was significant: $F_{(3,36)}$ 3.61, $p=.02$. Overall, only Valence accuracy was significant and uniquely predicted anxiety postpartum. Simulation accuracy was not a significant predictor of anxiety postpartum. These individual relationships are summarised in Table 20. Combined, the independent variables explained 23% of the variance in the model.

Table 20

Hierarchical multiple regression predicting postpartum GAD-7 from childbirth simulation accuracy, and valence accuracy, controlling for GAD-7 in pregnancy.

Variable	B	SE	Beta	t	p	F	R^2	ΔR^2
Step 1								
Constant	8.809	1.997		4.412	<.001			
GAD-7 pregnancy	.281	.135	.319	2.074	.045	4.30*	.102	
Step 2								
						3.03	.231	.129
Constant	10.885	2.466		4.415	<.001			
GAD-7 pregnancy	.311	.132	.353	2.353	.024			
Simulation accuracy	.272	.384	.116	.709	.483			
Valence accuracy	-.885	.363	-.393	-2.436	.020			

Note. *P > .05, **p > .001

Next, a two-stage hierarchical multiple regression was performed for the first day at home with baby, where GAD-7 scores in pregnancy was entered in the first stage, so that it was controlled for. Following this, the two first day accuracy variables were added at the second stage: i) simulation accuracy and ii) valence accuracy. The results of the hierarchical multiple regression showed that at the first stage, GAD-7 in pregnancy significantly contributed to the model: F(1,38) 4.30, p=.05, accounting for 10.2% of anxiety postpartum.

In stage 2 the inclusion of the two accuracy variables resulted in an additional 23.4% of the variance in anxiety postpartum, and this change was significant: F(3,36) 6.07, p=.002.

Overall, only simulation accuracy was significant and uniquely predicted anxiety postpartum. Valence accuracy was not a significant predictor of anxiety postpartum. These individual relationships are summarised in Table 21. Combined, the independent variables explained 33.6% of the variance in the model.

Table 21

Hierarchical multiple regression predicting postpartum GAD-7 from first day at home simulation accuracy and better or worse controlling for prepartum GAD-7.

Variable	B	SE	Beta	t	p	*F*	*R²*	*ΔR²*
Step 1								
Constant	8.809	1.997		4.412	<.001			
GAD-7 pregnancy	.281	.135	.319	2.074	.045	4.30*	.102	
Step 2								
						6.07**	.281	.234
Constant	16.264	2.765		5.883	<.001			
GAD-7 pregnancy	.205	.123	.233	1.657	.106			
Simulation accuracy	-1.096	.530	-.406	-2.068	.046			
Valence accuracy	-.285	.485	-.113	-.588	.560			

Finally, a two stage hierarchical multiple regression was performed for a typical day at six weeks, where GAD-7 scores in pregnancy was entered in the first stage, so that it was controlled for. Following this, the two typical day at six weeks accuracy variables were added at the second stage: i) simulation accuracy and ii) valence accuracy. Note that for this model, assumptions were checked. The results of the hierarchical multiple regression

showed that once again, at the first stage, GAD-7 in pregnancy significantly contributed to the model: $F_{(1,38)}$ 4.30, p=.05, accounting for 10.2% of anxiety postpartum.

In stage 2 the inclusion of the two accuracy variables resulted in an additional 11.9% of the variance in anxiety postpartum, and this change was significant: $F_{(3,36)}$ 3.39, p=.03. Overall, neither accuracy variable was significant, nor did they uniquely predict anxiety postpartum. These individual relationships are summarised in Table 22. Combined, the independent variables explained 22% of the variance in the model.

Table 22

Hierarchical multiple regression predicting postpartum GAD-7 from typical day at six weeks simulation accuracy and better or worse controlling for prepartum GAD-7.

Variable	B	SE	Beta	t	p	F	R^2	ΔR^2
Step 1								
Constant	8.809	1.997		4.412	<.001			
GAD-7 pregnancy	.281	.135	.319	2.074	.045	4.30*	.102	
Step 2						2.74	.220	.119
Constant	7.934	3.394		2.337	.025			
GAD-7 pregnancy	.343	.133	.390	2.581	.014			
Simulation accuracy	.842	.450	.303	1.874	.069			
Valence accuracy	-.938	.469	-.318	-2.001	.053			

In summary, simulation accuracy for the first day at home with baby was negatively related to postpartum GAD-7 scores, with those who rated their simulation accuracy lower more likely to report higher general anxiety, again controlling for anxiety during pregnancy. Both prepartum anxiety and childbirth valence accuracy predicted postpartum mood, with GAD-7 scores in pregnancy positively relating to postpartum scores, and valency accuracy negatively relating to GAD-7 postpartum but adding childbirth simulation accuracy and valence accuracy to the model did not lead to a statistically significant increase in R^2 for the model. Gad-7 prepartum related to and predicted postpartum anxiety but neither simulation accuracy nor valence accuracy showed a statistically significant relationship.

It was predicted that the women's probable depression postpartum as measured by the EPDS would relate to and be predicted by their ratings of simulation accuracy and valence accuracy, controlling for their EPDS scores in pregnancy (phase 1). A series of hierarchical multiple regressions were run to determine if the addition of simulation accuracy and valence accuracy improved the prediction of postpartum probable depression as measured by the EPDS over and above the women's probable depression measured at phase1 during pregnancy. There were no statistically significant models for probable depression and the predictor variables of simulation and valence accuracy for any of the three events.

4.3.2 Frequency of thinking about the events during pregnancy and mood postpartum?

After reading the simulations from phase 1, the women were asked to recall how often they had thought about the three events in this way during their pregnancy, with a higher score indicating a higher level of thinking about them. Table 23 shows the women's mean recall for thinking about the events during pregnancy, with a higher score indicating more frequent thinking about the event.

Table 23

Mean scores and standard deviations for the frequency of thinking about the events

	Childbirth	First day	Six weeks
Thinking about the event	4.78 (sd=2.53)	3.29 (sd=2.43)	3.95 (sd=2.95)

A one way repeated ANOVA found that the women showed a statistically significant higher recall of their thinking about the childbirth scenario in this way during the rest of their pregnancy compared to the other two events, $F_{(1,40)}$ 4.31, p=.017, η_p^2 = 0.097. This indicates that the frequency of thinking about the events varies across the events.

Table 24

Correlational coefficients for frequency of thinking about events and measures of mood

	Childbirth	First day	Six weeks
GAD-7 postpartum	.04	.36*	.05
EPDS Postpartum	-.03	-.01	.04

Note. * p = .02

It was predicted that there would be negative correlation between the women's recall of how often they have thought about the three events in a way that was similar to the simulations given in phase 1 and emotional wellbeing as measured by the GAD-7 and EPDS. A bivariate Pearson correlation was carried out which established there was only one weak statistically significant positive correlation, which was between the GAD-7 anxiety scores in phase 2, and the women's recall for how often they had thought about the first day simulations they created in phase 1. There were no statistically significant relationships between general anxiety and childbirth or a typical day at six weeks, and between any of the event frequencies and probable depression as measured by the EPDS. This suggests that the women's recall of how often they thought about the events during the rest of their pregnancy had no relationship with their mental health postpartum.

4.3.3: The relationship between qualities of EFT and memory for the same events

Based on prior research, it was predicted that there would be a positive correlation between the ratings for the simulation and memory qualities for detail, vividness, and negative emotional valence, while the ratings of positive emotional valence and sensory detail would be negatively correlated. As can be seen from Table 25 on the next page, there was only one statistically significant relationship found between any of the simulation qualities from phase 1 of the study and the memory qualities from phase 2. This was between sensory detail for simulation and memory for the first day at home, r (1,41) .61, p<.001.

There was a statistically significant association between simulation and memory for childbirth visual perspective, $\chi^2(1) = 7.37$, p = .007. There were fewer field perspective

ratings for the childbirth simulations than the childbirth memory. There were no statistically significant differences between simulation vs memory for first day $\chi 2(1) = 0.951$, $p = .33$, or six weeks $\chi 2(1) = 1.52$, $p = .22$.

Table 25

Field vs observer perspective frequencies for memory vs simulation by event type

	Childbirth	First day	Six weeks
Simulation			
Field	22 (53.7%)	32 (78%)	30 (73.2%)
Observer	19 (46.3%)	9 (22%)	11 (26.8%)
Memory			
Field	27 (71.1%)	25 (64.1%)	30 (76.9%)
Observer	11 (28.9%)	14 (35.9%)	9 (23.1%)

Table 26

Bivariate correlational analysis between simulation and memory qualities for each event.

		Childbirth					First day					Six weeks				
		Memory qualities														
		Detail	vivid	Sensory detail	Positive emotion	Negative emotion	Detail	vivid	Sensory detail	Positive emotion	Negative emotion	Detail	vivid	Sensory detail	Positive emotion	Negative emotion
Simulation qualities	Detail	-.03					.30					-.03				
	Vivid		.02					.09					.02			
	Sensory detail			.36					.61**					.35		
	Positive emotions				-.08					-.07					-.09	
	Negative emotions					-.14					.07					.09

Note. *p<.05, **p<.001

4.4 Discussion

This study sought to establish whether the accuracy of future thinking is related to later adjustment to the events being imagined. Specifically, Study 1: Phase 2 of this study aimed to investigate whether the potential positive benefits of imaging childbirth and parenthood during pregnancy continue into the postpartum period. It was predicted that the women's ratings for simulation accuracy and valence accuracy for the three events (i.e. childbirth, first day at home and typical day at six weeks), would negatively relate to and predict mood post-partum as measured by the GAD-7 and EPDS, when their baseline levels of anxiety and depression were controlled for.

Women's lower ratings of simulation accuracy for the first day at home were related to higher general anxiety postpartum, even when controlling for their anxiety during pregnancy. The Intolerance of Uncertainty model of anxiety (Dugas et al., 1995) proposes that heightened levels of ambiguity can lead to chronic worry, that is maintained by negative problem orientation, and cognitive avoidance. During phase 1, the simulations of the first day at home had lower pre-simulation anxiety, the fewest number of specific steps and had been thought about the least of the three events, while the women expected to feel the most positive on this day. Added to this is the anecdotal finding that the women often mentioned during their interviews that they had not thought about life with a newborn baby, had not thought past the birth.

This may have protected them against stress and anxiety during pregnancy, but ultimately being unrealistically optimistic could have led them to focus on the positive and not prepare adequately for parenthood (Sanders et al., 2022). It is also possible that the

women engaged in cognitive avoidance in relation to this event, leaving them unprepared for the reality of caring for a newborn, leading to them feeling their simulations were inaccurate and which then contributed to heightened anxiety postpartum. This can make the women vulnerable to ongoing issues such as PTSD. Ayers et al., (2016) in a meta-analysis of 50 studies from 15 countries (n-21,429) found that along with depression and poor health in pregnancy, fear of childbirth was a pre-birth vulnerability factor for PTSD, while risk factors in birth were negative subjective birth experiences, an operative birth and lack of support.

Antenatal education may prepare women not only for childbirth but also parenthood. Cankaya and Simsek (2020) found that soon to be first time mothers who had received antenatal education reported lower fear of childbirth, depression, anxiety and stress and increased childbirth self-efficacy compared to controls who did not receive antenatal education. This difference was maintained postpartum with the antenatal group continuing to show lower symptoms of anxiety, stress and depression, and a greater likelihood of having had a vaginal birth. When it comes to parenthood, Sanders et al, (2021) found in a meta-synthesis of qualitative studies of childbirth and parenthood, that unrealistic expectations relating to parenthood often came from a lack of contact with others who had babies, and a reliance on the internet and media for information. The women may have engaged in many types of antenatal education that could include classes but also books, YouTube, social media and the experiences of friends and family. These were not specifically measured in the current study and the implications of this is discussed in the limitations of this chapter below.

In contrast to the above finding, childbirth simulation and valence accuracy did not show a statistically significant relationship with postpartum wellbeing, for either anxiety or probable depression, despite this event having the highest pre-simulation anxiety and being the most thought about of the three events both at the time of the Phase 1 interview, and at the Phase 2 follow-up. Additionally, the women also had the lowest ratings of positive anticipated emotions and the highest level of negative anticipated emotions for childbirth in phase 1 and gave simulation accuracy and valence accuracy the lowest scores. This makes the findings around expectations surprising, and further research is needed to understand the contrasting way that childbirth and the first day at home are anticipated and experienced.

It was predicted that thinking about the simulations frequently during the rest of the pregnancy would help to reduce anxiety about the future events by helping the women to prepare for childbirth and parenthood. This hypothesis was not supported, with their being only a weak positive correlation between GAD-7 postpartum and the women's recall of how frequently they had thought about the first day at home. There was no relationship between GAD-7 and the other events, nor between the EPDS and thinking about any of the three events. This could reflect a weakness in the methodology, the question asks the women to reflect back over a number of months and recall if they had thought about the future in a particular way, and how often. A more valid way of measuring this would be to ask the women to keep a diary of their thinking around the events while they were pregnant, allowing an objective measure to be taken of the frequency future thinking and its relationship with mental wellbeing after the events have occurred.

The second aim of Phase 2 was to look at the relationship between the qualities of the simulations from Phase 1 and those of the women's memories from phase 2. Measuring participants subjective experience of thinking about the future is used in 60% of research into episodic future thought (Miloyan and MacFarlane, 2019). As in the current study, a mixture of common phenomenological ratings is used, alongside metacognition relating to the experience of thinking about the future, such as how frequently they are thought about. Generally, these qualities were derived from measures of similar qualities used to explore memories, using a range of methodologies, from interviews, experimental tasks, questionnaires to diary studies (Berntsen & Jacobsen, 2008). Assessment is typically via ratings on a multiple-point rating scale that allow the level of each characteristic to be evaluated.

A series of Pearson's correlation analysis were carried out to explore the relationship between the qualities of memories, and future thinking. The findings were surprising, as there were no statistically significant relationships between the two sets of qualities, with the exception of sensory detail for the first day at home with baby, in contrast to previous research which suggests that there would be a pattern of positive and negative correlations. The women appear to be assessing memories and future thinking differently across the two time points. When it comes to childbirth women frequently share their birth stories, finding they gain a sense of validation, empowerment and a normalising of birth experiences by doing so (Johnson, Scott & Brann, 2020). However, episodic memory, which is used to recall birth experiences, is reconstructive and susceptible to errors, and given that women are likely to be telling their birth story frequently this could change the way they rate their memories of it.

However, this study does not delve into the reasons behind this difference. To fully understand the difference between the subjective experience of past and future thinking, would be useful to carry out cognitive interviews where participants talk through their rationale for choosing different ratings for the qualities. This would shed light on how the ratings are made, and how any possible similarities and differences could be researched in the future.

4.5 Limitations

One limitation of this phase of Study 1 is the low response rate at follow-up. One possible explanation for this is the timing of the follow-up: all the women from Phase 1 were sent a link to the follow-up study for Phase 2 at around 8 weeks after their due date, with the aim that they would complete this when their baby was over 6 weeks old. The intention was to capture their experiences shortly after they had occurred, while the memory of them was still fresh. However, this may have been somewhat mistimed, as the response rate was very low. Later an additional payment was offered for taking part in the follow-up, which improved the response rate a little with the final return rate reaching 51%. Having a newborn baby to care for meant that taking part in Phase 2 of the research was not a priority for many of the women. They were simply too busy adjusting to parenthood. Recruitment to Study 1: Phase 1 was extended to the beginning of 2023, which increased the number of participants available to be invited to take part in the follow-up. This does however suggest that only the most motivated participants continued on to this part of the study.

It is also possible that those women who had negative birth experiences or who suffered more from anxiety or depression postpartum were less likely to complete the follow-up. During Phase 1 of this study, 260 women completed the mood questionnaires for the study, but only 80 went on to take part in the interview phase, a total of 31%. The women who completed the interview in Phase 1 had lower general anxiety as measured by the GAD-7 and scored lower for fear of childbirth as measured by the PRAQ-R subscale than those who dropped out after the mood questionnaires. There is the possibility that those who did not complete the follow-up study would show a similar pattern, meaning that the current findings are skewed towards those who are less likely to have mental health issues postpartum.

Andrighetti and Austin (2017) interviewed sixteen women who took part in a prospective longitudinal research study on postpartum depression about their decision-making about and experiences of taking part in research. Main motivators included perceived person relevance of the research, anticipated benefits, altruism and trust in the research team. Andrighetti and Austin suggest that strategies to improve participation rates and decrease attrition should ensure these factors are address at recruitment and each stage of the study. The follow-up was carried out via email and an online study. . A more individualised approach to recruitment at follow-up may have increased the participation rate, such as taking participant's phone numbers and calling them in person. The researcher may have been able to reiterate the relevance and benefits of the research and rebuild trust, thus increasing the response rate to the follow-up.

A second limitation relates to the level of antenatal and/or parenting education the women engaged in during pregnancy, and the fact that this was not recorded in Phase 1 nor

Phase 2 in any detail. Study 1: Phase 1 recruitment began in February 2020 and was intended to be in person face to face interviews with soon to be first time mothers. Within 6 weeks of recruitment beginning the Covid-19 global pandemic had begun and the UK, like many other countries were in lockdown. All pregnant women were told to stay home, and the interviews moved from face to face to online. Restrictions impacted on the availability of antenatal and other pregnancy support groups for an extended period of time, with restrictions only lessening in the summer of 2021. Pregnant women also had to contend with being unable to bring partners to antenatal appointments, and at some points during the pandemic, to the labour ward until they were in active labour. This was a very difficult time to be pregnant or have a newborn baby.

It is possible that barriers to accessing antenatal and/or parenting education could have influenced the way the women imagined the events in this research, and the extent to which the women's expectations met reality. However, there are other, less formal means of antenatal education such as the experiences of friends or family, books, videos on the internet and social media. These may have improved the women's knowledge about pregnancy, childbirth and life postpartum, but may also have unintentionally increased fear of negative birth stories were shared, as these can have a significant impact on a pregnant woman's outcomes.

The National Maternity Review reported that women want to be able to access high quality information about risks related to pregnancy and birth, to help empower them in their decision making. Cross, Krahe, Spiby and Slade (2023) examined the relationship between the content of antenatal preparation and birth experience, to assess the impact this had on women's postnatal well-being. They found that receiving a greater quantity of

information, whatever the content, had a more positive general birth experience. Additionally, receiving more broader focused information that included possible obstetric complications and procedures, was linked to more positive birth experience and lower likelihood of experiencing the birth as traumatic. Cross et al., suggest that receiving information about obstetric complications and procedures during antenatal preparation was associated with more positive outcomes.

There was a question on types of antenatal education in the study, but it lacked the necessary detail to fully encompass the breadth of the possible types of content. Having more in depth questions relating to antenatal preparation during pregnancy may have helped clarify the extent to which this affected the women's expectations and subsequent mood postpartum and its link to future thinking.

4.5 Conclusion

When women in Phase 2 of Study 1 considered their experience of childbirth they reported that it did not match their expectations, with valence accuracy predicting mood postpartum. Lower valence accuracy, that is finding the experience of childbirth to be worse than expected, was related to higher general anxiety, suggesting that having an experience that did not match prior thinking was not anxious making, but that experience being worse than expected was. However, it was simulation accuracy that was important when imagining early parenthood, with lower ratings being related to higher general anxiety, suggesting having a realistic expectation of parenthood during pregnancy is important for mood postpartum.

Chapter 5: Study 2

5.1 Introduction.

The findings from Study 1, as outlined in Chapter 3, indicated that the level of specificity in simulations of future events were negatively related to the self-reported post-simulation anxiety women experienced about childbirth. The simulations of going into labour and giving birth, that were rated as containing more specific steps, were also found to have lower post-simulation anxiety. This finding supports previous research looking at the role of specificity of future thinking in relation to psychological wellbeing (Jing et al., 2016, Hallford et al., 2022). This chapter will begin by explaining what is meant by specificity, how research into specificity grew out of autobiographical memory research, before outlining recent research that focuses on episodic future thinking that has shown a link between specificity and psychological wellbeing, particularly anxiety. It will then discuss the effectiveness of previous interventions based on increasing specificity (Raes et al., 2009; Hallford et al., 2020, Hallford et al., 2022) and give the rationale for this study that sets out to test the efficacy of a brief intervention for perinatal anxiety, with a focus on increasing specificity in future thinking.

Autobiographical memory refers to our ability to recall personal experiences from our past that, when combined, create a coherent story of our selves. These autobiographical memories are a synthesis of episodic and semantic memories. Episodic memory comprises specific events and experiences and provide a chronological record of our lives. It involves details such as time, place, emotions, and sensory perceptions, which in turn contribute to vivid and context-rich memories. Episodic memory allows the recall of specific memories that relate to events that have been experienced at a particular time or place, for example "I went for a coffee with my friend last Tuesday". On the other hand, semantic memory

contributes general knowledge and facts about the world to our autobiographical memory. It provides a broader framework of non-personal memories which are non-specific to us as a person and relate to general knowledge and concepts concerning the wider world. For example, when we go for coffee we recall that "*coffee shops sell cappuccinos*". Autobiographical memory, therefore, is a synthesis of episodic and semantic components with episodic memories conveying the personal while semantic memory anchors these experiences in a broader context (Barry et al., 2022).

In relation to specificity, according to Conway & Pleydell-Pearce (2000) the autobiographical memory is organised hierarchically, from broad, general summarised information drawn from the semantic memory to event specific detail from the episodic memory. The lowest level of specificity refers to semantic generalisation, or memories that are more general and abstract that lack the detailed features of specific memories. These involve general knowledge and concepts of others and the self, including locations, actions, plans, goals that have distinct time periods with beginnings and endings. An example may be general knowledge about how elections work in the United Kingdom. The second level of Conway's model relates to general events that can be single or repeated events that may include a series of memories linked together by a theme, and these could be referred to as 'mini-histories'. For example, the memory that an election occurs every four years and that you go to the local school to vote. The third and highest level of specificity, episodic specificity, comprises of memories that contain event-specific knowledge such as personal details, that are vivid in nature and contain a rich array of contextual information such as time, place, emotions, and sensory perceptions. An example may be going to vote on a

Thursday afternoon, and the experience of going into the booth and finding it difficult to choose who to vote for before placing the slip in the box and leaving.

The interest in the role autobiographical memory specificity in the development and maintenance of mood disorders stems from the vast body of research that has suggested that those with depression tend to recall autobiographical memories in a less specific, detailed way. They generate more general and abstract memories which in turn impact the richness and vividness of their memories (for a review see Van Vreeswijk & De Wilde, 2004; Barry et al., 2023; Williams et al., 2007). Baddeley's Working Memory Model (Baddeley, 2001)emphasises the role of the working memory's four components; the visio-spatial sketch pad, phonological loop, central executive, and episodic buffer, in the encoding, storage and retrieval of memories (Baddeley, 2000). The central executive is believed to be the core component that acts as a supervisory system; it manages attention, decision making and cognitive resources to enable the encoding, storage, and retrieval of autobiographical memories (Baddeley, 2000).

The central executive integrates various details and events into meaningful structures to represent our own life stories, by determining the relevance and significance of different memories (Baddeley, 2000). It does this by allocating attentional resources to relevant aspects of memories that are needed for retrieval, and for those with depression this is towards negative emotional material, leading to a circular relationship that is developed between negative emotional responses and depressive mood, where the negative emotional response fosters a depressed mood, which in turn exacerbates negative emotional responses (Chen et al., 2023). Positive or neutral emotional material are not attended to, and the inability to inhibit or shift from this cycle leads to overthinking and

rumination (Chen et al., 2023). This over focus on negative aspects of autobiographical memories leads to the retrieval of memories that are lower in specificity, that do not contain vivid, rich, and detailed event-specific knowledge and are not associated with one specific time period (Conway & Pleydell-Pearce, 2000; Raes, Williams and Hermans, 2009). Cognitive mechanisms that are associated with depression, such as rumination and negative cognitive styles lead to a reduction in the retrieval of specific positive or neutral memories, further reinforcing negative bias. This may hinder the ability to use specific, positive memories to regulate emotions effectively leading to the maintenance of depressive symptoms (Dalgleish & Werner-Seidler, 2014).

The vast body of literature that demonstrates the importance of over general memory in the development and maintenance of depression has led to interventions such as the Memory Specificity Training (MeST) that aim to increasing the recall of specific rather than general memories to improve memory specificity and reduce symptoms. Raes, Williams and Hermans (2009) developed the MeST as a group-based training programme delivered on a weekly basis over 4 weeks. The 10 participants were in patients experiencing moderate to severe levels of depressive symptoms. In session 1, the participants were trained to generate memories of a particular occasion or event that happened on a particular day at least 1 week before the test in response to 1 positive and 1 negative cue word. They were instructed to include spatio-temporal, contextual and sensory-perceptual details, as a way of increasing specificity. Homework was given, to do the same exercise with 10 further cue words and to write down a specific memory of the day every evening for the week between sessions.

In the second and third sessions, participants recalled two specific memories for the same cue, with the aim to reduce overgeneralisation. The focus for session 2 was positive or neutral cues, and for session 3 it was negative cues. Homework for these two sessions was to again generate specific memories (positive, neutral, or negative) to 10 word cues. The final session focused on how to combat the over general thinking that can occur by recalling a single experience, for example 'whenever I cook, things go wrong' can lead to 'whatever I do, things go wrong', 'I'm a complete failure'. The intention being to help the participant to recognise when they start to experience unspecific thinking.

Raes, Williams and Hermans found there was an increase in specificity of memories along with a reduction in rumination, experiential avoidance and greater increases in problem solving skills, that were still consistent when changes in depressive symptoms were controlled for, suggesting that they were not simply due to changes in these symptoms over the 4 week period of the programme. These effects were seen over a longer period when Hallford et al., (2020) adapted the MeST to be offered as an online computerised version. They delivered it to participants with a current major depressive episode, who were assigned to either the MeST group or a wait-list control. They found that significantly fewer participants in the MeST group vs the control group met the criteria for a major depressive episode at the one month follow-up. They also scored higher on memory specificity, and lower on depressive symptoms at the three month follow-up. This suggests that increasing memory specificity can improve depressive symptoms in those with a major depressive episode.

The constructive episodic simulation hypothesis states that past remembering, and future thinking draw on shared adaptive cognitive processes that allow future scenarios to

be constructed using elements from the episodic memory. It would therefore be expected that if lower specificity in memory is related to the development and maintenance of depression, a similar relationship would be found with future thinking. Specific future thinking involves simulating events that contain contextual details such as spatial environments, temporal details, sequences of events, sensory details and thought or emotions that might be experienced during the event (Hallford et al., 2020).

One study that supports this was carried out by Hallford et al (2022) who adapted the MeST to use with future thinking, with the intention of reducing anhedonia in participants who were experiencing a major depressive disorder. Hallford and his colleagues refer to this adaptation as 'Future Event Specificity Training' or FEST. Its purpose was to train those with depression to increase the frequency they use future thinking in everyday life and to increase the level of specificity in their simulations, with the intention of reducing the experience of depressive symptoms.

In a procedure that mirrored the Memory Specificity Training, participants took part in group-based training over two sessions where they were educated about future thinking, the difference between general as specific future thinking and its role in maintaining depressive symptomology. Hallford and his colleagues utilised an episodic specificity induction. This is where word cues are given to participants to elicit details of memories of recent past experiences from the episodic memory, these are then available for subsequent use in simulations of similar future events, and act to increase the specificity of those simulations. In the first session participants imagined future events based on positive and neutral word cues and were encouraged to make them rich in sensorial and scene details, actions, people, thoughts, and feelings related to the event. A series of prompts in the form

of open questions were used to increase the level of these details. The participants were given practice cue words to take away with them and instructed to generate daily future thoughts about something that could or would happen the following day. In the second session the focus was on anticipating positive emotions in the future, with participants generating two distinct future thoughts for each cue word, one positive and one neutral, with a focus on emotions for the positive scenarios. Once again, they were set the task of practicing this between sessions. The effectiveness of the FEST as an intervention was compared with a waitlist control group who completed the same set of mood questionnaires as the intervention group, over the same timeframe.

Hallford et al followed up the participants immediately after the training had occurred and again two weeks later. They found that the participants in the FEST group, relative to the control group, reported higher specificity, detail, and mental imagery in their future thinking, and had a higher sense of perceived control and likelihood of occurrence for future events and improved fluency in future thinking. Critically, they were less likely to meet the anhedonia criterion at follow up, with these effects also seen at the three month follow up where fewer people in the FEST group met criteria for a depressive episode, lower symptom severity, increased behavioural activation and improved global functioning.

The research discussed so far supports the role of specificity plays in memory, future thinking, and the maintenance of depression. The focus of Study 2 is to examine the role specificity may have in managing anxiety. Prior research such as the study carried out by Jing, Madore and Schacter (2016) described below, suggests that specificity has implications for wider psychological wellbeing. They increased episodic detail in future thinking via an episodic specificity induction, examining its impact on problem solving, cognitive reappraisal

and psychological wellbeing relating to worrisome future events. Undergraduate students provided 30 worrisome, anxiety provoking problems or events that might occur in the future (next 3-5 years) that were specific, concrete and highly familiar and had tangible outcomes. They also answered a series of questions that related to what worried them about the event, possible positive and negative outcomes, their event related anxiety and the perceived likelihood of a good or bad outcome and how difficult it would be to cope with a bad outcome.

Following this, the participants watched a video of two adults performing routine activities in a kitchen followed by either a specificity induction task (experimental condition) or a maths filler (control condition). In the specificity induction condition, they were then given mental imagery probes to help them recall specific details about the video, with the intention of training them to increase the specificity in their future thinking. The experimental and control group were then compared on two subsequent future thinking tasks. The first task was a means end problem solving task where they were given the beginning and end of a future problem based on the list of worrisome events given by the participants at the beginning of the study. The task was to give the steps needed to get from the beginning to the end of the problem. The second task was an episodic reappraisal task where they focused on the reappraisal of an imagined negative outcome of a future event to a positive one, again based on the worrisome events they had identified earlier. They also rated the simulations on the same rating scales used when they recalled their memories relating to what worries they had and the likely positive and negative outcomes and so on.

Jing, Madore and Schacter's key finding was that increasing the specificity of simulated constructive behaviours for worrisome future events using a specificity induction was

positively related to psychological wellbeing towards those events. They concluded that an increase in the specific steps and internal details produced by the specificity induction was related to larger decreases in anxiety towards worrisome events, across both a MEPS and reappraisal task, as well as larger decreases in the perceived likelihood of a bad outcome, increases in perceived likelihood of a good outcome (MEPS only) and larger decreases in the perceived difficulty to cope with a bad outcome (reappraisal only). They suggest this is possible as the specificity induction increases the episodic details relating to people, objects, places, and actions that are then made available when constructing further mental scenes of the future, as it increases the concreteness of visual imagery and minimising the effects of worry, making an event seem more real, more achievable, and more likely to lead to a positive outcome.

Research focusing on future thinking and pregnancy adds weight to the proposal that specificity is important in emotional regulation. Brown et al.'s study (2002) using a means end problem solving task found that soon to be first time mothers who created simulations of arriving at the hospital in time to give birth that were less coherent expressed more worry and had lower subjective probabilities for a successful outcome. Coherence was operationalised as high goodness of simulation derived from rating simulations based on 7 factors that included whether the simulation flowed smoothly, with each step following on logically from the last and whether they were in the correct temporal order. This suggests that specificity may have played a role in Brown et al's findings.

However, there is contradictory evidence that should be noted here. O'Toole & Berntsen, (2020) in a simulation task involving nulliparous pregnant women compared to non-pregnant controls found that the pregnant women were more likely to imagine birth as

a future event, and when imagining it their simulations were more specific than non-birth related events. Where O'Toole and Berntsen's research differs from Jing and her colleagues and the work of Brown et al is the finding that the number of specific birth related events was negatively associated with positive affect, and was positively associated with symptoms of psychological distress, negative affect, and worry. It is possible that while there is evidence that specificity of simulations may play a role in regulating affect, the difference in the methodology used to measure this may bring about differing results. In the current research the women are given the beginning and end of a scenario to simulate and told to imagine all the steps needed to get between the two. This mirrors the work outlined above by Jing, Madore and Schacter and Hallford et al. It gives the women a framework for their simulations that O'Toole and Berntsen's study did not and may lead the women to be more constructive in their thinking. O'Toole and Berntsen looked at spontaneous future thinking in response to neutral word-cues which may have allowed the women to focus on the negative aspects of childbirth leading to a positive correlation between specificity and worry.

Study 2 is an opportunity to add clarity to the role specificity plays in regulating anxiety. Much of the research above apart from O'Toole and Berntsen's, points towards there being a positive impact from increasing specificity in future thinking and suggests that doing so holds much promise in helping soon to be first time mothers manage the anxiety they experience in relation to childbirth and becoming a parent for the first time. If, as predicted, there is a negative association between specificity and self-reported anxiety after creating simulations, it will suggest that a simple intervention that increases the level of specificity in

future thinking has great potential for pregnant women to utilise as part of a wider antenatal training programme, or as a simple technique that can be used independently.

Nevertheless, simply using an episodic specificity induction where word cues are given to draw on past experiences may not be appropriate here; the women lack the prior memories of these events to draw upon as they are yet to experience them. Consequently, the approach taken in study 2 focuses on a different aspect of Hallford et al (2022) Future Episodic Simulation Training programme, the open ended questions used as prompts to increase the level of sensorial and scene details, actions, people, thoughts, and feelings associated with the events.

These prompts are ideal for use in relation to the current study; their format, predominantly as a series of open questions, can be used for any event and they are flexible enough to cope with the continually changing aspects of pregnancy. While pregnant women all have the shared experience of pregnancy, this experience will be highly individual and will change as the pregnancy progresses and they move on to being a mother. The open questions allow the women to interpret the prompts in a way that is relevant to them, they can be used at any point throughout the pregnancy, and they can be equally applied to childbirth or parenthood. The intervention in the current study embeds the prompts from the FEST study in the adapted means-end problem solving simulation task from Study 1 and compares the participants anxiety post-simulation with those in the control condition, who do not receive the prompts.

This leads to the following research question for Study 2; Does increasing the level of specificity in the simulation of childbirth and the first day at home with their baby lead to

lower post-simulation anxiety compared to the pre-simulation ratings, reported by soon to be first time mothers, more than imagining these events without manipulating the level of specificity. Based on this aim, the following predictions were made:

H1: There will be a statistically significant interaction for group (intervention x control) and time (pre x post simulation) for self-reported anxiety. It is predicted that 1] post-simulation anxiety will be statistically significantly lower than pre-simulation anxiety for both events, and 2] this effect will be greater for the intervention group than the control group.

5.2 Method

5.2.1 Ethics

Prior to recruitment, ethical approval was obtained by the Goldsmiths University Psychology Department ethics committee. No other organisational ethics were required for the research. Participants were informed of the aims of the study, confidentiality, and privacy at the beginning of the study, and were given a link to a copy of the University's GDPR policy. To enable confidentiality participants used their initials in the study along with the month of their birth, e.g. LM08. They were debriefed as to the purpose of the study once they had completed it.

5.2.2 Participants

A total of 176 nulliparous women (were pregnant and had not given birth previously) were recruited to the study via Prolific, a participant recruitment site. They initially completed a screening questionnaire which established that they we met the inclusion criteria: aged over 18, at least 12 weeks pregnant and had not given birth previously. Table 27 gives the mean scores for general anxiety, pregnancy related anxiety and probable depression by condition (control vs intervention). A series of independent samples t-test were carried out showing that the participants in each condition did not vary in their scores for the mood measures.

Table 27

Mean (sd) scores for the mood measures: GAD-7, PRAQ and EPDS

	Control	Intervention	
Gad-7	7.50 (4.83)	7.46 (5.64)	t (1,172) .06, p=.48
PRAQ	29.65 (7.17)	30.03 (8.35)	t (1,171) .060, p=.37
EPDS	10.41 93.92)	10.86 (4.37)	t (1,167) .698, p=.24

The level of severity of general and pregnancy related anxiety and probable depression are given by condition (control vs intervention) in Table 28 below. Chi-square analysis was carried out to explore whether the severity of mood varied between the two conditions.

Table 28

Level of severity of mood measures

Measure	Control Group	Intervention group	
GAD-7			
Minimal 0-4	27 (31.4%)	28 (31.8%)	X^2 (3) .48, p=.92
Mild 5-9	36 (41.9%)	35 (39.8%)	
Moderate 10-14	14 (16.3%)	13 (14.8%)	
Severe 15+	9 (10.5%)	12 (13.6%)	
EPDS			
Low (0-12)	67 (78.8%)	62 (70.5%)	X^2 (1) .29, p=.59
High (13+)	18 (21.2)	26 (29.5%)	

The mean scores and standard deviations for the PRAQ-R subscales of fear of childbirth, concerns about appearance and fear of having a handicapped child are given in Table 29 below. Independent samples t-tests show that there is no difference between the control and intervention groups for the PRAQ subscales.

Table 29

Mean (sd) scores for PRAQ-R subscales

	Control Group	Intervention group	
Fear of childbirth	10.48 (2.52)	11.01 (2.77)	t (1,171) 1.31, p = .10
Concerns about appearance	7.48 (4.48)	7.98 (3.33)	t (1,172) 1.04, p = .15
Fear of having a handicapped child	11.76 (2.92)	11.05 (4.51)	t (1,172) 1.10, p = .15

5.2.3 Power Analysis

An a priori power analysis was conducted using G*Power version 3.1 (Faul et al, 2007) to determine the minimum sample size required to test the study hypothesis that post simulation anxiety will be lower than pre-simulation anxiety for each of the three events. Results indicated that the required sample size to achieve 80% power for detecting a medium effect at a significance criterion of α = .05 was N=176 for an independent t-test. Thus, the obtained sample size of N=174 is adequate to test the study hypothesis, with N= 88 in the intervention condition, and N=86 in the control condition. The study materials were presented on Qualtrics, which uses a randomiser to present each condition of the study a roughly equal number of times across all respondents which led to a small difference in the number of participants in each group.

5.2.4 Participant and pregnancy variables

Below in Table 30 are the characteristics of the participants who completed Study 2. The mean age was 30.16 which is in line with the average age mothers give birth in the United Kingdom, which is 30.9 (ONS, 2021).

Table 30

Characteristics of the participants (N=174)

Age	30.16 (sd 4.29)
Ethnicity	
White (including white British, Irish, Roma, Traveller, other white backgrounds)	140 (81%)
Black, Black British, Caribbean, or African	7 (4%)
Asian or Asian British	14 (8%)
Mixed or multiple ethnic groups	11 (6%)
Other	2 (1%)

Table 31 below gives details in relation to the women's pregnancy, including how many months pregnant they were and whether they were pregnant with multiple babies. 2.9% of women expressed an intention to give birth at home, in line with the number of home births recorded in 2020 by the Office for National Statistics, at 2.4% (ONS, 2020).

Table 31

Participant characteristics relating to pregnancy and giving birth (N=174)

No of months pregnant at time of the study (n=169)	
3-4 months	22 (13%)
5-6 months	70 (41.4%)
7-9 months	77 (45.6%)
Where they plan to give birth	
hospital	148 (85%)
home	5 (2.9%)
birth centre	21 (12.1%)
Number of babies	
1	171 (98.3%)
2	3 (1.7%)
3 or more	-
How they plan to give birth	
vaginal birth	144 (82.8%)
planned C-section	8 (4.6%)
undecided	22 (12.6%)

5.2.5 Materials

Mood measures:

The dependent variable is the participant's self-rated anxiety, which the participants rated before (pre-simulation) and after (post-simulation) imagining the two events. Additional mood measures were included to ensure that any variation in the post-simulation anxiety ratings between the two groups was due to the manipulation of the instructions given in the simulation task, and not due to variations in existing levels of anxiety (general or pregnancy) or depression. A description of the mood measures is given below, and a

comparison of the participant's mood between the intervention and control conditions is given in the participant section of this chapter, above.

i) *Self-rated anxiety for each event* - participants were asked to rate the level of anxiety prior to simulating each event (pre-simulation anxiety) and after simulating each event (post-simulation anxiety) on a 9-point Likert scale with a higher rating indicating higher levels of anxiety. This gave a measure of the immediate impact of future thinking on anxiety.

ii) *The Pregnancy-Related Anxiety Questionnaire* (PRAQ) is a 10-item questionnaire widely used to assess and identify pregnancy specific anxiety (Huiznik et al, 2004). The items are scored from 1 to 5 (1 – absolutely not relevant and 5 – very relevant) with an increase of scores indicating an increase of pregnancy related anxiety, with a maximum score of 50. Naja et al., (2020) used a cut-off of scores above the 75th percentile to indicate high pregnancy related anxiety, which will be used in this study. The 10 items load onto 3 subs-scales: fear of giving birth (items 1 4 & 7), worries about having a handicapped child (3, 8, 9, 10) and concern about one's appearance (items 2, 5, 6).

iii) *The GAD-7* (Löwe et al., 2008) is a brief self-report scale to identify probably cases of general anxiety disorder (GAD). It is composed of 7 items that reflect the DSM-IV symptom criteria for GAD. Cut-off scores for anxiety severity 5, 10 and 15 for mild, moderate, and severe (Spitzer et al 2006). With scores of above 10 recommended as a clinical cut-off (NHS, IAPT, 2016).

iv)   *Edinburgh Post-Natal Depression Scale* (EPDS; (Rubertsson et al., 2014) is a 10

item self-report instrument that was developed to screen for major

depression in the postpartum period. Items are scored from 0 (not at all) to 3

(yes, quite a lot/often). It has a maximum score of 30, and scores of 14 or

above indicate probable depression (Matthey et al., 2019).

The simulation task: intervention vs control

Once again, the simulation task utilised an adaptation of a Means End Problem Solving

Task (MEPS; Platt, Spivack & Bloom, 1971). It involved asking participants to generate a

future scenario of two events: childbirth and first 24 hours with baby. The participants were

given the beginning and end of the scenario and were asked to fill in the middle in as much

detail as possible, from the start until the event was over.

The third event from Study 1, a typical day with baby at approximately six weeks

postpartum was not included in Study 2 as the participants in Study 1 had reported the

lowest level pre-simulation anxiety about this event of all three imagined and simulating this

event did not impact on their anxiety, with there being almost no difference between pre-

and post-simulation anxiety. Removing this event was intended to reduce the burden placed

on participants and to increase the likelihood of them completing the whole Study, including

the mood questionnaires that were given after the simulation task.

The intervention and control group differed on one aspect of the simulation task. Those

in the intervention group were given a series of prompts to use when imagining the events.

These were the same prompts used by Hallford et al (2020) in their FEST training

programme as described in the introduction, and the instructions given are outlined below.

5.2.6 Procedure

The participants who met the inclusion criteria were invited to take part in the study through a notification sent out via Prolific. The notification included a link to Qualtrics where they were given the study information and gave consent to take part in the study. Qualtrics randomly assigned them to either the control or the intervention group. Participant and pregnancy variables were collected then they completed the simulation tasks as outlined below.

The following procedure was used for the simulation task, for both of the events:

1. Participants rated their pre-simulation anxiety for the event.
2. Participants received the following instructions, depending on whether they were in the intervention or control group:

A. Intervention group

Childbirth

> Now take a couple of minutes to imagine yourself going into labour and
> giving birth. Please imagine the individual steps involved in as much detail
> as possible, from the moment you go into labour, and end when your baby
> is born. Below are some questions to help you to do this, please use as
> many as possible when imagining going into labour and giving birth:

First day at home with baby

Once again, we are going to ask you to imagine the future. Please take a

couple of minutes to imagine, in as much detail as possible, the moment

you arrive at home with your baby (or if home birth, the moment you are

alone with your baby for the first time) to 24 hours later. Please imagine

the individual steps involved in as much detail as possible.

The prompts:

- Where will it happen?
- When will it happen?
- Try and describe the setting, and the environment in which this event might happen.
- How long will it last?
- Who else will be there?
- Can you think of particular thoughts you will have?
- Are there particular objects there you might name?
- What could you hear, smell, and taste?
- Can you name some interesting details of the physical place where this might happen?
- What type of day will it be?
- What would be the most memorable part of this experience?
- Can you describe another part of this experience?

B. Control Group

Childbirth:

> Now take a couple of minutes to imagine yourself going into labour and
> giving birth. Please imagine the individual steps involved in as much detail
> as possible, from the moment you go into labour, and end when your baby
> is born.

The first day at home with baby:

> Once again, we are going to ask you to imagine the future. Please take a couple
> of minutes to imagine, in as much detail as possible, the moment you arrive at
> home with your baby (or if home birth, the moment you are alone with your
> baby for the first time) to 24 hours later. Please imagine the individual steps
> involved in as much detail as possible.

3. Both groups rated the level of each simulation characteristic in turn (detail, vividness, sensory detail, positive anticipated emotions, negative anticipated emotions, visual perspective, and frequency of thinking about the event).

4. Both groups rated their post-simulation anxiety.

5. Participants from both groups then completed the mood questionnaires, before being presented with the study debrief at the end.

5.2.7 Data analysis

Screening and cleaning data

The data was cleaned, and missing data, which comprised a few randomly scattered missing data points (mood questionnaires and participant variables) that were excluded using listwise deletion. The mood measures were scored according to the criteria set out by each measure, giving a total score for each measure and the level of severity as stated above.

5.3 Results

5.3.1 Do the prompts in the simulation task decrease anxiety?

It was predicted that using the prompts during the simulation task would lead to statistically significantly lower levels of post-simulation anxiety compared to the control group who did not receive the prompts. Table 32 below shows the mean pre- and post-simulation anxiety ratings for the two groups for childbirth and first day at home with baby.

Table 32

Mean (sd) pre- and post-simulation anxiety ratings for childbirth and first day by condition (control vs intervention).

	Childbirth		First day at home	
	Pre-simulation anxiety	Post-simulation anxiety	Pre-simulation anxiety	Post-simulation anxiety
Control	4.60 (2.04)	4.90 (1.91)	3.91 (2.13)	3.74 (2.10)
Intervention	4.80 (2.17)	4.73 (2.07)	3.94 (2.36)	3.59 (2.32)

A 2 (condition: intervention x control) x 2 (time: pre vs post simulation anxiety) x 2 (event: childbirth vs first day) repeated measures ANOVA was carried out to explore the hypothesis that the intervention group who used the prompts to help simulate the two events will have lower post-simulation anxiety than the control group. There was a statistically significant effect for event, $F_{(1,172)}$ 31.33, $p < .001$, $\eta_p^2 = 0.15$, with Bonferroni adjustments revealing that childbirth anxiety ratings were statistically significantly higher than first day across the two time points and conditions (.96 (95% CI, .621 to 1.30).

There were statistically significant interactions of time*condition, $F_{(1,172)}$ 4.32, p = .04 and event*time, $F_{(1,172)}$ 8.90, p = .003, η_p^2 = 0.024 suggesting a medium effect size. Simple main effects were run for time*condition for pre- and post-simulation anxiety, yielding the following results: mean intervention pre-simulation anxiety was .210 (95% CI, .03 to .39) higher than intervention post-simulation anxiety, a difference that was significant, $F_{(1,172)}$ 5.14, p=03 η_p^2 = 0.047, with a medium effect size. There was no statistically significant difference between pre- and post-simulation anxiety for the control condition.

Simple main effects were also run for event*time yielding the following results: mean pre-simulation anxiety for childbirth was .76 (95% CI, .40 to 1.15) higher than pre-simulation anxiety for first day at home with the baby. Likewise, childbirth post-simulation anxiety was 1.14 (95% CI, .80 to 1.49) higher than first day post-simulation anxiety. There was no statistically significant interaction for event*condition, $F_{(1,172)}$ .042, p=.84; and no statistically significant three way interaction for event*time*condition, $F_{(1,172)}$ .47, p= .49.

The above analysis suggests that there is a statistically significant difference between the control and intervention group for pre- and post-simulation anxiety across the two events, supporting the hypothesis that there will be a statistically significant interaction for group (intervention x control) and time (pre x post simulation) for self-reported anxiety. It also supports the prediction that 1] post-simulation anxiety would be statistically significantly lower than pre-simulation anxiety for both events, and 2] this effect would be greater for the intervention group than the control group.

5.4 Discussion

The study in this chapter investigated the impact of increasing specificity in the simulation of childbirth and the first day at home with a baby on post-simulation anxiety compared to imagining these events without manipulating specificity. It was predicted that there would be a statistically significant interaction for group (intervention x control) and time (pre x post simulation) for self-reported anxiety, with post-simulation anxiety statistically significantly lower than pre-simulation anxiety for both events, and this effect being greater for the intervention group than the control group.

The results for this study support the hypothesis: those in the intervention group had statistically significantly lower post-simulation anxiety ratings than those in the control group for both events. This suggests that the prompts in the intervention group were effective in increasing specificity in the simulations, which reduced anxiety post-simulation, supporting the work of Jing, Madore and Schacter (2016) and Hallford et al (2020) who all found that increasing the level of specificity in their participant's future thinking simulations had an impact on their emotional wellbeing.

The Medical Research Council (Skivington et al., 2021) guidance on developing and evaluating complex interventions suggests that research such as Study 2 should take an efficacy, effectiveness, theory based and systems perspective when evaluating an intervention. Efficacy is intended to assess the extent to which the intervention produces the intended outcomes in an ideal setting, which was found for the intervention group. The findings from the intervention group suggest that the intervention was effective in reducing anxiety, for this group, as their anxiety was lower after engaging in the simulation task with the prompts than before. This has positive implications for the use of the intervention in

reducing anxiety for pregnant women when thinking about childbirth and their first day at home with the baby.

However, for the control group there was an unintended and unexpected consequence; they rated their post-simulation anxiety as higher than their pre-simulation anxiety, a result which is inconsistent with previous findings in this thesis. Study 1 found that there was a reduction in anxiety after imagining the future, and in the current study all other post-simulation ratings were lower than the pre-simulation ratings. One possible explanation is that the control group had higher anxiety before they imagined childbirth, but analysis of the GAD-7, PRAQ and pre-simulation anxiety ratings shows that there was no statistically significant difference between the two groups. This is particularly concerning as this control group were acting as a 'treatment as usual' group to assess the effectiveness of the intervention and this leads to concerns about the ethics of asking women to imagine childbirth without support, whether that is given individually or as part of a group, or without additional training in future thinking, either in person or online.

In Study 1 the participants shared their simulations with the researcher, imagining out loud, perhaps with a sense of a shared experience that may have made them less anxious. Jing, Madore and Schacter also carried out in person research where the participants generated simulations of the future out loud to the researchers. Whilst Hallford et al, (2020) found that an online version of the Memory Specificity Training was effective in reducing depression, it did still include training about future thinking and its importance in maintaining depression. It is possible that asking the women in the control group to simply thinking about childbirth without further perceived support, training or intervention is not sufficient to reduce anxiety for a highly personal, potentially anxious making future event

that has not been experienced previously, and may have led them to feel more anxious. The inclusion of the prompts for childbirth in the intervention condition acted as a buffer to a potential increase in anxiety, and lead to a reduction in post-simulation anxiety, supporting the prediction that increasing specificity in future simulations can regulate the emotions experienced about those simulations. Increasing specificity has potential to help women manage their childbirth related anxiety through simulating the future, and the effect may be increased if it is included in a wider programme of training and support.

The Intolerance of Uncertainty model of anxiety (Dugas et al, 1995) suggest that experiencing high levels of uncertainty or ambiguity in a stressful situation can lead to chronic worry, a focus on the negative aspects of a problem and cognitive avoidance which acts to maintain worry. Increasing specificity in future thinking may reduce this uncertainty as the simulations become richer and more detailed. It is possible that the women in the control group experienced an increase in uncertainty when imagining childbirth rather than a reduction, leaving them feeling worse than before they took part in the research and without any immediate support from the researcher. This suggests that we should be cautious about using a future thinking task as a control task to compare with an intervention, as there is a risk that it could increase anxiety. Any further research to explore why such an increase in anxiety occurred would involve replicating the methodology used in Study 2, delivering the simulation task online, but it would need an immediate follow-up with anyone that experienced an increase in anxiety. This may not be possible, and the use of the simulation task in this way would need serious consideration of the ethical implications.

One way to address these implications is to embed the intervention in an already existing antenatal education programme. This would mean there would be a comparison of two types of support, one with and one without a future thinking intervention, rather than two types of future thinking task. In fact, antenatal education may be an important mediator for both maternal and infant outcomes with studies showing that it can reduce maternal stress, improve self-efficacy and lower the rate of caesarean births (Hong et al., (2020). Cankaya and Simsek (2020) found that taking part in antenatal education helped to reduce soon to be first time mother's fear of childbirth, depression, anxiety, and stress while increasing childbirth self-efficacy compared to controls who did not receive antenatal education. This difference was maintained postpartum with the antenatal group continuing to show lower symptoms of anxiety, stress and depression, and a greater likelihood of having had a vaginal birth. A potential future area of research therefore would be to look at the impact of embedding a future thinking based intervention that increases specificity in simulations of the future into an antenatal education programme would have on childbirth anxiety, and mental wellbeing postpartum. This would also meet the Medical Research Council's perspectives relating to understand how the intervention would work in different contexts and how these contexts adapt and influence the feasibility and acceptability of the intervention.

However, it is important that there is a balance when it comes to the type of information that is shared during any antenatal education, whether it is classes, books, social media or individuals sharing their experiences. Serçekuş and Mete (2010) emphasised that the content and methodology of antenatal education should not increase fear of childbirth. Additionally, Munro

The findings for the first day at home with their baby followed the expected pattern. Both the control and intervention groups showed similar levels of pre-simulation anxiety for the first day at home with baby, and both showed a reduction in anxiety post-simulation, with the intervention group ratings lower than the control group. This suggests that increasing the level of specificity when imagining the first day at home with the baby further reduces anxiety for that event. Compared to the childbirth simulations, the women felt less anxious about this event before they imagined it, giving it lower pre-simulation anxiety ratings. It is therefore possible that the intervention is more effective when the event is perceived as less threatening and causes less stress. This does support the previous findings of Jing, Madore and Schacter (2016) suggesting that the women in the intervention group found the addition of the prompts a useful tool in managing their anxiety when it comes to events that elicit lower anxiety such as the first day at home with the baby.

5.5 Limitations

The simulation task in Study 1, Phase 1 was delivered online, during a semi-structured interview which was recorded and transcribed. This allowed the content of the simulations to be examined in detail. It is clear from the findings of Study 2 that adding the prompts to the simulation task reduced the anxiety the women reported post-simulation compared to pre-simulation. What is less clear is exactly which qualities of future thinking were being manipulated. The assumption is that the level of specificity in the simulations was increased but it is possible that the women felt less anxious because the prompts encouraged them to engage more in the task, or because of the increase the level of detail in their simulations.

In Hallford et al's study that utilised the prompts in a group setting the participants were encouraged to make their future thinking rich in sensorial and scene details, actions, people, thoughts, and feelings related to the events before they shared their thinking with the group. The level of specificity in this thinking was then discussed and ideas were shared on how it could be improved. Study 1 and Hallford et al's research contrast with the methodology used in the current study, which was delivered online, meaning that there was not the same opportunity to explore the process of the women's thinking. Embedding the Study 2 simulation task in a semi-structured interview would have allowed a like for like comparison to be made with Study 1 and would have given the opportunity to examine the process of thinking brought about by adding the prompts to the task. In particular it would have enabled the analysis of the transcripts of the simulations by the researcher to see if the number of specific steps in the simulations were still as important as they had been in Study 1.

The participants chosen for this thesis were a very specialised group. Not only did they need to be pregnancy, they needed this to be the first time they had given birth. Recruitment for Study 1, Phase 1 was slow and took almost 2 years to reach the target of 80 interviews. The decision was made to administer Study 2 as an online study via Qualtrics, and the target number of participants was achieved in just a few days. This enabled the testing of the intervention, giving a proof of concept, but at the cost of a more in depth understanding of how the intervention works. Future research could address this limitation by including semi-structured interviews into the design, where the qualities of future thinking could be explored in detail, and the women could explain their thought processes.

5.6 Conclusion

To conclude, in Study 2 the key simulation characteristic of specificity was developed and investigated further through an experimental study. A series of prompts in the form of open ended questions were used to increase specificity when thinking about childbirth and the first day at home with their baby, with the prediction that those in this intervention group would have lower post-simulation anxiety compared to a control group who imagined the same events without the prompts. It was found that increasing specificity did support this hypothesis, with those in the intervention condition having post-simulation anxiety ratings that were lower than those of the control group. Further research is suggested that would help to gain a greater understanding of how this effect could be maximised, especially for events that are seen by participants as being more anxious making, such as childbirth. Antenatal education has been found to lower fear of childbirth, depression, and stress during pregnancy and postpartum (Cankaya and Simsek, 2020) and it is possible that embedding a simulation task in an antenatal programme would increase the impact of the intervention explored in this study.

Chapter 6: General Discussion

6.1 Summary of Empirical Studies

The current research tested the hypothesis that episodic future thinking has a role in the regulation of emotions associated with childbirth and early parenthood for soon to be first time mothers. To achieve this, two studies were carried out, Study 1 (Phase 1 & 2) and Study 2 both investigated the relationship between episodic future thinking and pregnancy-related anxiety. Study 1: Phase 1 found that thinking about the three events of childbirth, the first day at home with their baby and a typical day at six weeks led to lower anxiety post-simulation compared to pre-simulation ratings, across the three events but most markedly for childbirth. Study 1: Phase 1 also identified the key participant-rated phenomenological qualities of the simulations that were associated with anxiety. Both expecting to feel fewer positive emotions during childbirth and visualising childbirth from a first-person perspective were associated with higher levels of post-simulation anxiety. Additionally, the researcher rating of the number of specific steps that took the women from the beginning of the event to the end, and positive emotions were both negatively related to childbirth post-simulation anxiety. This indicates that the way that soon to be first time mothers think about their personal future helps them to regulate their anxiety associated with that future. This suggests that episodic future thinking has an adaptive function in emotional regulation (Szpunar et al., 2014), and shows great potential as a suitable intervention to help soon to be first time mothers prepare for childbirth and parenthood.

Study 1: Phase 2 aimed to investigate the importance of simulation accuracy (whether the women's experience of the events matched their simulation from Phase 1) and valence accuracy (whether their experience was better or worse than they had

expected) on longer-term emotional wellbeing by following up the women after they had given birth. The women reported lower ratings of simulation and valence accuracy for childbirth compared to the other two events, suggesting that not only was childbirth different to what they expected, they rated it as worse than they had anticipated. Conversely, simulation accuracy for the first day at home was a predictor of postpartum anxiety, an important finding given that during Study 1: Phase 1 the women had lower pre-simulation anxiety for this event, along with the fewest number of specific steps in their simulations and had thought about the first day the least of the three events but had expected to feel the most positive on this day. This supports the Intolerance of Uncertainty model of anxiety (Dugas et al., 1995) which suggests that cognitive avoidance could have been used to avoid thinking about this event, which ultimately left the women unprepared for the reality of caring for a newborn and having unrealistic expectations and heightened anxiety postpartum.

Having established that episodic future thinking was important in regulating not only pregnancy-related anxiety, but potentially postpartum mood, a brief intervention was developed to increase the level of specificity in simulations through the addition of prompts, to further reduce anxiety post-simulation. It was found that the intervention group showed a statistically significant greater reduction in anxiety after imagining the events compared to a control group, extending the findings of Hallford et al., (2022) who found that using such prompts improved the well-being of individuals with depression.

6.2 Do the qualities of future thinking predict perinatal anxiety?

Understanding the thought processes of women during pregnancy, especially when expecting to give birth for the first time is important in developing effective, evidence-based interventions to help improve the experience of pregnancy, childbirth and parenthood. The studies in this thesis asked women to think about how they imagined childbirth and parenting and how they thought they would feel during and after these life changing events. The findings from this research indicate that the qualities of the women's thinking, that is how they thought and felt about these future events, were important in their experience of anxiety during both pregnancy and postpartum and that modifying these qualities could help women to manage their anxiety.

6.2.1 How does the process of thinking during pregnancy and postpartum relate to anxiety?

During Study 1, Phase 1 the women not only simulated the three pregnancy and parenthood events, but also reflected on the quality of these simulations. This gave a measure of the women's subjective experience of thinking about the future that could be analysed in relation their event related anxiety. Additionally, the transcription of the simulations afforded further consideration of qualities that were important in the way the women were thinking about the event. Below is a discussion of these qualities, and what they have informed us about the function of episodic future thinking during pregnancy and postpartum.

Szpunar et al (2014) suggests that episodic future thinking is an adaptive process consisting of four modes: simulation, prediction, intention and planning. Study 1 and 2 have shown that the modes of planning and prediction are of importance in women's thinking during and after pregnancy. Planning will be considered first; this is the ability to construct a mental representation of the future that has a high number of specific steps concerned with achieving the intended goals. Planning in the current research was operationalised as the number of specific steps, the women were able to give to arrive at the desired outcome: giving birth, reaching the end of the first day at home with their baby or the end of a typical day at six weeks. This quality of future thinking was derived from analysing the transcripts of the simulations, when it became apparent that some women imagined the events with a logical sequence that took them from the beginning of the event to the end, while others gave simulations that were vague and lacked this level of organisation.

Study 1: Phase 1 showed that the number of specific steps given in childbirth simulations were related to the level of post-simulation anxiety, with a higher number of steps being related to lower post-simulation anxiety reported for childbirth. This suggested that being able to plan, in detail, the specific steps involved in achieving a successful outcome may reduce pregnancy related anxiety. Planning ranges from the specific to the more general and can involve defining goals, setting priorities, monitoring progress and re-evaluating the plan through simulating the future event being planned (Szpunar 2010). Study 1 showed that being able to simulate future events that engage planning at a more specific level has implications for managing anxiety. Those simulations that were specific, where the women were able to consider the steps needed to get them from the beginning to the end of the event helped the women to feel less anxious.

Study 2 set out to test the importance that planning during future thinking plays in reducing anxiety, by increasing this level of specificity in simulations. In Study 2 the level of specificity was operationalised as the level of contextual details in the simulations that can include the time of day, the environment, sensory detail, thoughts and emotions and a sequence of events (Hallford et al., 2020). This was manipulated by adding a series of prompts into the simulation task that related to the setting, timescale, sensory detail, who would be with them, and what they might be thinking during the events. Those in the intervention group, who had the prompts in their simulation task, had significantly lower post-simulation anxiety ratings compared to those in the control group for both events. As they were able to increase in the number of specific steps in the simulations to achieve a successful outcome This suggests that changing the way the women thought about the future by increasing the level of specificity in this way has great potential in reducing anxiety.

However, what is not known from Study 2 is whether this reduction in anxiety is due to an increase in specificity or to another quality of future thinking, detail. Detail refers to the number of contextual details relating to a future event. Theories of anxiety suggest individuals with general anxiety disorder create simulations of the future with less detail as a way to avoid thinking concretely about future events that are negatively-valanced (Macleod & Byrne, 1996, Wu et al., 2015, Du et al., 2022). Likewise increasing the level of detail in simulations has been found to be associated with improved psychological wellbeing related to the events being imagined (Jing et al., 2016).

It was predicted in Study 1, Phase 1 that there would be a negative relationship between women's post-simulation anxiety and the level of detail women report in their

simulations. However, this prediction was not supported, and there was no relationship between these qualities and post-simulation anxiety levels for any of the three events imagined. It could be that the question the women were asked when rating the level of detail in their scenarios, 'overall how detailed you think your imagined scenario was?', was too simplistic and did not tap into the different types of detail that the simulations contained. As can be seen from Study 1, the specific steps included in the childbirth simulations were related to anxiety, and perhaps the women did not feel these were what was meant as 'detail'. This could be clarified in future research by asking an additional question, perhaps about how organised their simulations were, or how well planned.

When adding the prompts to the simulation task, it is possible that it increased detail, that is the contextual details in the simulations, which in turn increased the specific steps imagined. However, Study 2, delivered online, did not afford the opportunity to examine the content of the women's simulations. Whilst the prompts produced a positive outcome of a reduction in anxiety, there is uncertainty about which precise aspects of the women's thinking were influenced by them. This has implications for the application of this finding. It may be important that any intervention that focuses on how women engage in future thinking around childbirth and parenthood increases both the number of specific steps and the level of contextual details in those simulations. What is known is that when thinking about childbirth, the content of simulations are important. The number of specific steps in a simulation relates to the level of anxiety experienced about childbirth, and increasing the level textual detail in order to increase the specificity of simulations reduces anxiety.

6.2.2 **How do anticipated emotions associated with episodic future thinking relate to anxiety**

Study 1, Phase 1 found there was a relationship between the direction of anticipated emotional valence and anxiety. Anticipated emotions are the emotions we expect or anticipate experiencing in the future and contrast with anticipatory emotions which are the emotions we experience in the present in response to the prospect of a future event (Barsics et al., 2016). Barsics et al found a positivity bias in anticipated but not anticipatory emotions, making this an important distinction. In the current thesis the women were asked to what extent they expected to feel positive and negative emotions in the future when experiencing the three events. The women expected to feel more negative and fewer positive anticipated emotions for childbirth compared to the other two events, and post-simulation anxiety for childbirth was related to anticipating fewer positive emotions. This suggests that the predictive nature of future thinking is important in managing affective responses, especially for an event that is more anxiety inducing. Szpunar et al., (2016) describes prediction as encompassing not only the likelihood of a particular outcome of a future event, but also our emotional reaction to it. In the context of this thesis, that is the level of positive and/or negative anticipated emotions related to the events.

For soon to be first time mothers, childbirth is a novel event that elicits a high level of anxiety. The Intolerance of Uncertainty Model of anxiety (IUM: Dugas et al., 2010) states that anxiety develops and is maintained when we find uncertain or ambiguous situations upsetting or stressful. This leads to chronic worry, negative problem orientation and cognitive avoidance, the purpose of which is to help us cope with this uncertainty or prevent

the situation from happening. Bayrampour et al (2016) suggests fear of childbirth is linked to a fear of the unknown, which they suggest is the most pronounced emotion in pregnancy-related anxiety, and it may be this that is the driving force behind the women's prediction that they will feel fewer positive, and more negative emotions and its association with higher post-simulation anxiety.

The importance of prediction can also be seen in a study by Goddard, Crawley, and Ayers (in prep) who asked 108 soon to be first-time mothers to imagine their labour and the first 24 hours at home with their baby, with half of the women being instructed to conclude each simulation with a positive outcome, and half with no such instruction. As with Study 1: Phase 1 higher post-simulation anxiety was related to more negative anticipated emotions. Also, those in the positive outcome condition reported a significant decrease in their post-simulation anxiety ratings compared to those with neutral instructions. The findings from the current research and that of Goddard, Crawley and Ayers suggest that when simulating the future, being able to predict how they will feel, and what the outcome of the simulation will be, helps women to manage their anxiety at the time of creating the simulation. Study 1, Phase 2 looked at the longer term predictive value of simulating the future.

Study 1: Phase 2 set out to explore both simulation and valence accuracy and its role in postpartum mood by following the women up after they had experienced the events from Study 1, Phase 1. Simulation accuracy (the extent to which the simulations from Phase 1 matched the reality of their experiences of the events) and valence accuracy (whether their experiences of the events were better or worse than they expected) allowed for a measure of the predictive value of future thinking in pregnancy and on into the postpartum period.

The first finding from Phase 2 was contrary to expectation, for childbirth simulation accuracy did not predicted postpartum anxiety, despite being rated the lowest of the three events. It is possible that the way the women imagined the future changed between taking part in the study and giving birth. They may have become better informed about childbirth, taking part in antenatal classes, reading books, watching YouTube videos, or talking to others who have been through childbirth. Engaging in these activities could have led them to make more realistic predictions of what childbirth would be like. This could have given some protection from the effects of anxiety post-partum; as even though they felt their simulation and valence accuracy did not match the reality of their experience, this did not lead to anxiety as they had not expected it to match.

Simulation accuracy for the first day at home with a baby was associated with the women's reported levels of general anxiety postpartum, beyond prepartum anxiety alone. Lower simulation accuracy, that is the less the simulation from Study 1: Phase 1 related to the women's experience of the first day at home with the baby, was related to higher anxiety postpartum. There was no relationship between valence accuracy and general anxiety postpartum. This suggests that the way the women imagined the first day of parenthood was predictive of their general anxiety levels postpartum, but whether it was better or worse was not as important, just that it was different.

This finding is particularly informative as the simulations of the first day at home at phase 1 had lower pre-simulation anxiety, the fewest number of specific steps, was thought about the least of the three events, and the women anticipated feeling the most positive on this day compared to the other two events, suggesting that they would feel less anxious postpartum. This suggests that the way women think during pregnancy has an important

function in not only how they manage their anxiety during pregnancy, but also postpartum, particularly for parenthood. Anticipatory emotions predict how anxious women feel when thinking about childbirth and parenthood when pregnant, and the accuracy of their thinking about parenthood during pregnancy is related to their mood postpartum.

6.2.3 What role does visual perspective play in perinatal anxiety and future thinking?

There are two interesting things to note about visual perspective in the current research. The first was that in Study 1 phase 1 the women had a near 50:50 split between seeing their childbirth simulation in an observer and field perspective, unlike the other two events where an observer perspective was dominant. The second was that a field perspective was associated with higher childbirth post-simulation anxiety, again unlike the other two events.

The importance of visual perspective and mood came from research looking at autobiographical memory. Nigro and Neisser (1983) found that visual perspective in memory can be related to the emotional content of the memory and the emotional state at the time of recall. Memories with a strong emotional content were more likely to be recalled from a field perspective, and neutral or less emotional ones were more often recalled from an observer perspective. Childbirth, being rated as having the highest pre-simulation anxiety could be viewed by the women as having the strongest emotional content of the three events. This suggests that being less immersed in the simulation by taking a field perspective adds to the women's anxiety as it is used as an avoidance tactic creating a distance between 'seeing' the event to avoid experiencing emotions relating to it. Favrod et al's (2018) study supports the current finding. They found that spontaneous birth

related positive images were more likely to be seen from an observer perspective, with negative mental images seen from a field perspective and scoring lower for many of the visual characteristics (sharpness, colour, brightness, more often in two dimensions and still) than positive mental images. It is possible that the emotional valence of the simulation influenced the visual perspective used.

However, O'Toole & Berntsen, (2020) found that birth-related future events that were generated in response to the neutral word cues were more specific, came to mind more involuntarily, were associated with a stronger physical reaction and were more likely to be seen from an observer perspective than non-birth related events. It is not clear what the 'birth-related' events were that were being brought to mind, and whether they were positive or negative. They may not have been specifically about giving birth as in the current research, but other associated events, and they may have been positive in nature, leading to the women feeling less anxious and therefore seeing them from an observer viewpoint.

Similarly, Finnbogadóttir & Berntsen, (2011) found an observer perspective was associated with general anxiety, social anxiety and rumination in a future thinking word cue task. The current study measured event specific anxiety for novel, highly personal events that were going to experience, rather than their general level of anxiety. In fact, none of the simulation qualities measured in the current research related to general anxiety. It is possible that the pre- and post-simulation anxiety reported in the current research was a more accurate measure of how the women feel about going into labour and giving birth, while Finnbogadóttir & Berntsen were measuring how their participants feel about hypothetical events that may or may not occur.

The first day at home and typical day at six weeks were predominantly seen from the observer perspective, that is the women reported seeing it from a third person perspective, consistent with research on episodic memory (D'Argembeau & Van der Linden, 2004). It is likely that there is an effect of familiarity with the setting of the simulations occurring for these two events. The women may be engaging more of their episodic memories for the location of these events as they would occur in more familiar settings, their own home or familiar locations they may visit during a typical day at six weeks.

6.2.4 Does imagining the future more frequently make you more anxious?

Having considered the content of women's thinking during pregnancy and its importance for their mental wellbeing, we now turn towards how often women think about the future and its relationship with anxiety. Research exploring the relationship between the frequency of future thinking and depression suggest that future thinking is less likely to be engaged in by those experiencing depression. Hallford et al., (2022) adapted a memory intervention that was developed to reduce symptoms of depression by increasing specificity in memories recalled by those with depression to use with future thinking. The intention was to reduce anhedonia in participants who were experiencing a major depressive disorder and to increase the frequency that future thinking is engaged in. They found that the participants in the intervention group, relative to the control group, reported higher specificity, detail, and mental imagery in their future thinking, and had a higher sense of perceived control and likelihood of occurrence for future events and improved fluency in future thinking. They also reported an increase in future thinking and a reduction in their depressive symptoms and their experience of anhedonia.

Behar et al., (2012) suggest that repetitively thinking about a potential future event leads to thinking that is abstract and associated with less imagery during negative, but not positive thinking. This could be due to thinking becoming more verbal linguistic and less imagery-based as a response to a potentially anxiety inducing event. This acts to inhibit both vivid mental imagery as well as the somatic and emotional activation that fear elicits which is needed for habituation (Behar et al., 2005; Behar et al., 2009; Borkovec 1994; Borkovec et al 2004). Essentially, by suppressing mental imagery the individual is unable to process the anxiety that the future event is eliciting, and they experience higher levels of fear than if they could call on vivid mental imagery and process the somatic and emotional response these produced. It would therefore be expected that thinking about the events less frequently would be associated with higher levels of anxiety as the women are less likely to be habituating to the anxiety associated with the events.

Childbirth was the most thought about of the three events in Study 1, but frequency of thinking about the future only predicted post-simulation anxiety for a typical day at six weeks, the event that was the least thought about. This only partially supports the hypothesis that more frequent thinking about the events would relate to higher levels of post-simulation anxiety. It is possible that this finding may be due to the way the frequency data was collected. The question asked the women how often they had thought about the event in this way before. This required them to make a number of decisions about the simulation they had just made, had they thought about the future at all and if so did this thinking include this event, had they thought about the event in this way and finally how often had this occurred. They were not given a time period for when this thinking was supposed to have happened, meaning they could have thought back over the last week,

months or even years. It also required them to compare voluntary future thinking, that required deliberate, controlled and slow cognitive processing, with involuntary spontaneous thinking that is automatic and comes to mind freely (Cole and Kvavilashvili, 2021). In other words, they were not comparing like with like.

Experience sampling is one way to measure future thinking in daily life. In a typical study using this methodology, Grant and Walsh (2016) sent text messages to participants over 1 or two days, asking them to record their episodic thinking. They were able to establish the frequency of future thinking in this period as the participants recorded it as it was occurring. This method could be adapted to prompt pregnant women to record the content and frequency of their future thinking to establish how often they are engaging in involuntary future thinking about giving birth and/or parenthood, and what this thinking consists of. This would give a clearer picture of the relationship between how women think during pregnancy and their mental wellbeing.

6.2.5 Applications of future thinking to prevent anxiety during pregnancy and postpartum.

Looking towards future applications of the findings from this thesis, one of the strengths of the current research is that we are tapping into something that women naturally do during pregnancy as they are already more future orientated (Li & Cao, 2018; O'Toole and Berntsen, 2020). The findings from Study 1 and 2 suggest that intentionally considering the future can be used to reduce anxiety and potentially prevent the long-term effects this can have on both the woman and the infant. The content of the simulations, how the women anticipate how they will feel, how realistic the simulations are, and the

visual perspective used when imagining the future have all been shown to relate to how anxious the women report feeling, both during pregnancy and postpartum.

An intervention based on future thinking has great potential because of its naturalness, it is asking women to engage in an activity they are already doing spontaneously. Before it can be developed further there are a number of questions that need to be addressed in the next stage of research to ensure the effectiveness of it is maximised. The first of these relates to the content of the simulations. The simulation task instructions asked the women to imagine the event in as much detail as possible, and to imagine the individual steps involved. The prompts in the intervention condition of Study 2 were effective in reducing anxiety but it is unclear whether this was because they increased the detail, the number of steps, both or neither. It is important to clarify this and one way to do so would be to carry out cognitive interviews, where the women perform the simulation task then talk through their thought processes. The simulation task instructions and/or prompts could then be refined to ensure they are as effective as possible in reducing anxiety.

Adding instructions relating to emotional valence and visual perspective could also further improve the efficacy of the intervention. Study 1 suggested that a lack of positive anticipated emotions and an expectation to feel negative emotions was related to anxiety. Goddard, Crawley and Ayers (in prep) found that expecting a positive outcome from childbirth and the first day at home with baby was associated with lowering of anxiety post-simulation. It would also be helpful to find out if there is a need to instruct the women to view the future events from an observer perspective, and if so what combination of other instructions facilitate this best. The women could be told to think positively, from a field

perspective, in as much detail as possible and including the individual steps, but this could

become an overload of instructions and it may be unclear which elements are having a

positive impact. A multi-condition study where each quality is tested against the others and

in combination with each other would narrow down whether it is more effective to focus on

one or two elements of future thinking or to have the women attempt to combine the

prompts, detail, individual steps, visual perspective and emotional valence.

Study 2 showed that the method of delivering the intervention could have an impact

on its efficacy. The intervention was delivered online, with no training or support and the

control group rated their anxiety higher after imagining the future than before. Hallford et

al., (2022) delivered their intervention targeting depression in a group-based training

programme over two sessions that included education around future thinking and

instructed them to engage in daily future thinking. It would be useful to explore a similar

programme for pregnancy anxiety, comparing a group-based programme with an online

one, and also looking at how frequently the women need to engage in future thinking

between sessions.

The final area for future research relating to developing an intervention concerns

simulation accuracy. Study 1, Phase 2 pointed towards the importance of accuracy of

simulations on longer term mental health. Pregnancy, childbirth and parenting share many

common features, but women also vary greatly in their experience of them. As stated

above, it would be useful to develop a training programme based around future thinking,

but with antenatal and parenting education embedded within it. The first stage of creating

this programme would be to run a series of focus groups that ask women about their

experience of childbirth and parenting for the first time, and the ways that they met or did

not meet their expectations. It would also be helpful to ask midwives for their experiences of helping soon to be first time mothers through the process of giving birth and becoming a parent. An antenatal training programme could be built around this, that includes a future thinking intervention within it.

However, any intervention that aims to reduce anxiety in pregnancy needs to go beyond the immediate effect and have a positive impact on both the women's and the infants long term outcomes. A longitudinal study that followed women through pregnancy, childbirth and parenthood would help to see whether changing the way women think during pregnancy really has any long term benefit. Additionally, following the development of the infants as they move from being babies into children would allow us to establish whether reducing pregnancy related anxiety would improve the cognitive and behavioural outcomes for children over their childhood.

A new but growing area of research concerns how soon to be first time fathers think about childbirth and parenthood. It has become usual for fathers to accompany their partners when giving birth to share the experience. This offers an important level of social support to the women, especially for those who have not experienced it before. However, the expectations around and impact of this experience on fathers is an area of research that has been widely neglected. There is some evidence that fathers who witness a traumatic birth can suffer from birth-related PTSD. Women may experience PTSD due to prepartum vulnerability factors that interact with other risk factors such as previous pregnancy loss, medical complications, childhood abuse, intimate partner violence, coping styles, social support, personality traits, and previous history of mental health problems that affect the way birth is thought about (Ayers et al., 2016). Kress et al., (2021) found that these risk

factors also played a role in fathers birth-related PTSD, along with, importantly for the current research, being a first-time father.

Fathers with existing anxiety are more likely to report low positive affect and increased depressive symptoms during their partner's pregnancy which further impacts on maternal anxiety and depression during this time (Biehle and Mickelson, 2011, Koh et al., 2015). A systematic review of quantitative and qualitative studies of paternal pregnancy related anxiety by Dabb et al., (2023) has found that men are concerned with how they will cope with childbirth and worry about the health of their baby, they report having mixed emotions relating to their partners pregnancy which are often related to anxiety, a sense of inadequacy and powerlessness and the impact their own unmet needs were having on being able to support their partner.

It is important to recognise that women's thinking about pregnancy and birth does not happen in a vacuum, and their pregnancy, childbirth and parenthood experience along with any engagement in antenatal education is likely to include their partner. Embedding a future thinking intervention in an antenatal programme therefore should be approached from two angles, building on what we know from the current research it should address women's thought processes relating to pregnancy, birth and parenthood. Additionally, it should also look at the father's thinking, which may vary from their partners, as they experience both pregnancy and childbirth differently and have different concerns and stressors.

One way to approach this is to carry out a similar set of studies with soon to be first time fathers as the participants. Taking what we have learned from carrying out the research in this thesis, they could be asked to take part in a future thinking task during their

partner's pregnancy and followed up afterwards. It would then be possible to see if they are generating simulations of childbirth and parenthood in the same way as their partners, or if they imagine them differently, and which aspects of their thinking relate to their anxieties. The hope would be that there could be a parallel intervention for soon to be first time fathers that not only met their emotional and practical needs during pregnancy and into parenthood, but also helped them to support their partners as they experience these events.

6.3 How has our understanding of episodic and semantic memory in future thinking been extended?

Both Phase 1 and 2 of Study 1 explored the role of memory in future thinking of a novel and highly personal event. Phase 1 asked the women to explain where their ideas came from when they were imagining the 3 events, and Phase 2 asked the women to rate their memories of the events according to the same phenomenological qualities as the simulations in Phase 1. This gave the opportunity to explore two research questions: to what extent do the women use episodic vs semantic memory when generating their simulations, and how do the qualities of the memory of the events compare to the simulations.

Taking the first question, according to Szpunar et al's taxonomy the highest level of specificity comes from future thinking that contains high levels of event specific autobiographical content, drawn from the episodic memory, as opposed to abstract concepts about the world in general. The level of specificity in the simulations was found to be important in managing childbirth anxiety. Yet the women in Study 1: Phase 1 reported

relying on more general concepts around childbirth and parenthood to inform their simulations. This supports the Semantic Scaffolding Hypothesis (Irish et al., 2021a., Irish & Piguet, 2013) which states that general knowledge drawn from semantic memory provides the schemas and meanings needed to create a plausible scenario of the future of novel events as they rely on the semantic memory due to a lack of episodic memories to draw upon.

A possible explanation is that they used personal semantic knowledge of how they had coped with previous stressful events to construct these future scenarios. Personal semantic knowledge is facts about ourselves and how we act in situations, as well as things we have experienced, our social roles and self-knowledge, and autobiographically significant concepts (Renoult et al., 2012). Whilst semantic knowledge is atemporal and lacks an observer perspective, personal semantic knowledge includes facts about our goals, plans and future activities (Addis and Tanguay, 2022).

Addis and Tanguay (2022) suggest that our future selves co-exist with our past and present selves. For example, we would use the way we have coped with stressful situations in the past when imagining a future novel, stressful event, creating continuity with who we will be in the future, in relation to how we have been in the past (Addis & Tanguay, 2022). It is possible that along with general semantic knowledge the women used this self-knowledge, their understanding of their own traits, preferences, and beliefs about how they act in given situations to inform the planning aspects of their future thinking (Renoult et al., 2012). Our self-concept could include information such as 'listening to music helps me calm down when I get stressed' that can inform our future plans. It is possible that the personal semantic knowledge informed their choice of steps that were given in the simulations, but

were not necessarily verbalised, for example, saying 'when in labour I will listen to music' without saying why.

Consequently, in the absence of autobiographical memories to draw upon the women may have generated scenarios based on general knowledge of childbirth, to create the steps needed to achieve the outcome, along with their self-concept of how they manage novel and stressful situations. The more they were able to do this, the lower their anxiety in relation to childbirth. Further research would be useful to explore this further, perhaps asking the women to explain in detail their thinking around the construction of the simulations, shedding light on the balance between these two modes of semantic memory and their relative importance in imagining novel future events.

The second question is concerned with how the qualities of the memory of the events compare to those of the simulations. Previous research generally asks participants to recall the past and then imagine the future. Unless simulations are comprised of entirely novel events there will always be the possibility that asking participants to recall memories before simulating the future may act to prime the participants to create simulations with details and qualities that overlap with these memories. Study 1 was an opportunity to approach this topic from a different angle: the women in the current research imagined their future in Phase 1, then went on to experience it before returning to recall their experiences in Phase 2.

In Study 2: Phase 2 the women were followed up after they had given birth and were asked to recall the three events they had now experienced. Both their future thinking and their remembered past were rated by the women for the same set of phenomenological qualities: detail, vividness, sensory detail, positive emotions, negative emotions, and visual

perspective. Based on prior research it was expected that there would be a pattern of positive and negative correlations between the two sets of ratings. However, and unexpectedly, no statistically significant relationships between the two sets of qualities were found, with the exception of sensory detail for the first day at home with baby. The findings in the current research may reflect a difference between generating simulations of the future based on a schema of what that future may be like based on their general and personal semantic memory, and recalling an important life event that has been experienced, based on episodic memories. It is possible therefore that the women were not comparing like for like. This method does not shed any more light on the relationship between episodic memory and episodic future thinking, but it does open up more questions relating to the value of asking participants to compare simulations and memories for the same events.

6.4. Methodological considerations

There are three key methodological issues arising from the current research. The first that needs to be discussed relates to the rating of the phenomenological qualities by both the participants and the researcher, the second concerns the differences in the way the simulation task was implemented in Study 1 and Study 2, and the impact this may have had on the way the women engaged with the task. The final methodological issue is the way pregnancy related anxiety was measured during the study, and the need for a postpartum anxiety measure at follow-up. The participant vs researcher ratings will be discussed first, considering how methodological differences could have resulted in the lack of any relationship between the two sets of ratings.

The women in Study 1: Phase 1 were asked to imagine their scenarios out loud, to allow them to be recorded and transcribed. The researcher then rated the simulation qualities which allowed a comparison between the participant subjective ratings of the qualities and the researcher's objective ratings. A series of correlational analyses showed that the majority of the qualities did not show a statistically significant relationship, and the correlations that were found to be significant were weak (See Table 16, page 97). This suggests that the participants subjective experience of their own simulations did not relate to the way the researcher's rated them.

It is possible that asking the women to verbalise their responses may have meant that they presented their simulations focusing on their verbal rather than visual nature, meaning that they were not describing their mental images as they had experienced them. When the researcher rated the transcribed simulations, they were rating these verbalisations, and not the internal experience of the participants, so therefore there would be little relationship between the two as they were measuring different things. This suggests that this type of comparison provides little towards our understanding of how the women make their subjective ratings, though it is possible that further research into whether there is a division into how the simulations are experienced and how they are verbalised could clarify this.

There is one unexpected finding that needs to be considered. The control group in Study 2 showed an increase in their childbirth post-simulation anxiety ratings, an outcome that was inconsistent with previous findings in this thesis. As outlined in Study 2 (Chapter 5) there was no difference in general or pregnancy related anxiety between the control and intervention condition, and no difference in their pre-simulation anxiety. Therefore, other

explanations need to be considered for why this group of participants became more anxious after imagining childbirth.

A possible explanation of this increase is that the reduction in anxiety in Study 1 Phase 1 was due to the way the simulation task was carried out. It is possible that when a future event such as childbirth is novel, and potentially stressful, creating simulations in their heads as in Study 2 acts to increase and not decrease anxiety. This is in contrast to Study 1 where the participants created their simulations out loud, which may have produced a sense of a shared experience that may have made them less anxious. The women in Study 2 may or may not have imagined the events out loud, they could have thought about them in their head, they may have spoken to others about it, or not. All that can be said with certainty is that in Study 2 the task was delivered online while in Study 1, Phase 1 it was in person via a video interview.

Jing, Madore and Schacter also carried out in person research where the participants generated simulations of the future out loud to the researchers and found that those in their intervention group had lower anxiety after doing so. Whilst Hallford et al, (2020) found that an online version of the Memory Specificity Training was effective in reducing depression, it did however still include training about future thinking and its importance in maintaining depression. Imagining the first day at home with the baby, for which the women had lower pre-simulation anxiety in both the control and intervention condition, did not increase the control group's anxiety. It is possible that asking the women in the Study 2 control group to simply thinking about childbirth without further perceived support, training or intervention was not sufficient to reduce anxiety for such a highly personal, potentially anxiety making future event that has not been experienced previously. This further

strengthens the need to have a greater understanding of how an intervention based on future thinking would be effective if it was to be embedded in a wider antenatal education programme.

Pregnancy related anxiety was measured in two ways, the Pregnancy-Related Anxiety Questionnair*e* (PRAQ) a 10-item questionnaire used to assess and identify pregnancy specific anxiety (Huiznik et al, 2004). The 10 items in the PRAQ load onto 3 subs-scales: fear of giving birth, worries about having a handicapped child, and concern about one's appearance. This measure was chosen as it is able to pick up the range of specific pregnancy fears such as fears about pain and losing control during labour, feeling incompetent, worrying about their own and their infant's lives and the upcoming changes to their lives. The version of the PRAQ chosen specifically asks women a question related to the novelty of childbirth "I am worried about the delivery because I have not done it before".

A series of Pearson's product moment correlational analyses were carried out on the relationship between the GAD-7 scores for Study 1, Phase 1 and the total PRAQ-R score, and each of the PRAQ-R subscales: fear of giving birth, worries about changes in appearance and concerns for the wellbeing of the infant. The PRAQ-R total score and worries about appearance and infant wellbeing all showed a statistically significant medium positive correlation with the GAD-7 scores, suggesting that there is an overlap in the anxiety being measured by the two measures, it is likely they are exploring different aspects of anxiety. This is more apparent when considering the relationship between the GAD-7 and the subscale of fear of giving birth. There was only a weak positive correlation between the two measures, indicating that the GAD-7 may not be a suitable measure of fear of childbirth.

However, neither the PRAQ-R, its subscales or the GAD-7 related to or were predicted by the simulation qualities in Study 1, Phase 1. In fact, only the self-rated anxiety for each event, post-simulation anxiety, was related to the qualities explored in this study. The women were asked to rate their anxiety prior to simulating each event and again afterwards to give a measure of the impact of future thinking on anxiety. Asking women how anxious they feel in the moment of thinking about the future is simple, direct and immediate, and perhaps it is this immediacy that is important when exploring the relationship between mood and future thinking, as it is highly specific to the event being imagined, and measured in the moment, which then led to this association with the qualities.

In the follow-up study in Phase 2 only GAD-7 was used to measure anxiety, which may have been a limitation of this study. Whilst the GAD-7 did relate to the variables of simulation and valence accuracy, depending on the event being analysed, it is possible that a measure of postpartum anxiety may have given a more accurate picture of the women's wellbeing at this time. There is currently such a scale in development, the Postpartum Specific Anxiety Scale which at the time of designing the follow-up study was only available as a 51 item scale (Fallon et al., 2016). This was considered to be too long to be included in the follow-up study due to its length, and the impact this might have on participant retention at this stage of the research. A shortened version of the scale has now been developed consisting of only 12 items and is being trialled to assess its efficacy (Silverio et al., 2021).

It appears therefore, that the simplest way of measuring anxiety relating to future events seems to be effective. Asking women in the moment of imagining the future how

anxious they are about that future provides an immediate measure that relates to their thinking at that time. It is possible that a different measure of pregnancy related anxiety would have elicited a different result by exploring a different range of issues and concerns related to pregnancy and birth, and it would certainly be important to explore the use of a postpartum scale in any future follow-up study. However, in the context of the current thesis the simplest question appears to be the best.

6.5 Limitations

The empirical research carried out in the current thesis has made significant theoretical and methodological contributions to our understanding of the nature of episodic future thinking and its relationship to perinatal mental health. Nevertheless, there are several key limitations that should be noted. The first concerns the risk factors for pregnancy related anxiety that were not recorded during the two studies, the second relates to the lack of a control group in Study 1 and the implications both of these have for the current research findings.

There are a number of risk factors for anxiety amongst pregnant women that include previous pregnancy loss, medical complications, childhood abuse, intimate partner violence, coping styles, social support, personality traits, and previous history of mental health problems (Bayrampour et al., 2018). Many of these risk factors are screened for during routine antenatal care, while others relate to factors that could potentially mediators of anxiety. The current thesis was focused on the process of thinking during pregnancy and its relation to pregnancy related anxiety and did not collect data on these other potential risk factors. It is likely that the overall anxiety the women experienced could be influenced by

the risk factors outlined above and not collecting them was an error on the part of the researcher.

Collecting data on risk factors could highlight moderating variables that could increase or decrease the effect of future thinking on pregnancy related anxiety. In the context of the current study, experiencing previous pregnancy loss or medical complications for example could shape the way the women imagined their future experiences in both studies, and may have reduced the efficacy of the intervention in Study 2. Any future research, especially relating to embedding a future thinking based intervention into antenatal care, should consider which variables could be measured along with future thinking to assess the impact it has on anxiety. It is possible that such an intervention would need to be modified according to the findings of this type of research, allowing any accompanying antenatal education to address such issues as previous loss or lack of social support.

The second limitation relates to the use of control groups in the thesis. The purpose of a control group in psychological studies is to address any issues of internal validity that relates to the participants recruited or the tasks being carried out. It serves as a baseline that enables the researcher to measure the impact that changes to the independent variable produces and allows conclusions to be drawn from the study relating to these (Kazdin, 2021). Study 1, phase 1 asked soon to be first time mothers to imagine events relating to childbirth and parenthood, potentially anxious making events that were novel to them. This gave a measure of the effect of future thinking on anxiety relating to these events and the qualities of the simulations that were specific to them.

However, we cannot be certain that the impact of imagining these events is unique to these events and are not common to any novel event not experienced previously. The

addition of a second experimental group that imagine a novel event of similar personal importance that was also going to be experienced would allow a meaningful comparison of both the impact and qualities of simulating novel and highly personal events and would establish whether the findings of Study 1 were unique to the events being imagined or were common to any event of this type. The difficulty is finding an event that is as novel as childbirth and parenthood is for those who have never experienced it. One possibility would be to ask participants due to undergo surgery for the first time to simulate arriving at the hospital through to waking up on the ward after the operation. Such an event would involve attending a hospital, interacting with medical and nursing staff and is likely to produce anxiety. There could even be a second simulation relating to the recovery period. Both of these groups could be compared to an alternative, less anxious making event such as imagining having an X-ray for the first time, which also involves attending a hospital and interacting with staff there, but with a lower level of anxiety.

Study 2 did include a no-treatment control group who did not receive the intervention but were assessed pre- and post-simulation. This allowed for the base rate of improvement in anxiety to be measured and means that we are able to make a decision on whether the intervention was effective in bringing about change. The women in Study 2 were assigned to the intervention and control groups randomly by Qualtrics, with the researcher having no influence over who received the intervention and who did not. There are always ethical challenges when using a no-treatment control group, as a potentially effective intervention is being withheld from half of the participants. However, the women who took part in Study 2 were not seeking treatment when they signed up to take part but were looking to contribute to a research study. The information given at the beginning of the study deliberately did not include details of the intervention to prevent the effects of

demand characteristics. The debrief explained the full purpose of the study and that the women could have been assigned to either of the two groups. This ensured that the ethical challenges of a non-treatment group were addressed as far as possible within the demands of the study.

In the next stage of research exploring the development of a future thinking intervention for anxiety, an additional control group may need to be added. This could be a wait-list control group who sign up for treatment but are not assigned to a treatment group. They would provide the same information as the treatment group and complete the mood assessments at the same intervals. This group contrasts with the control group in Study 2 who still took part in the study but did not receive the additional part of the task that was considered to be the intervention. It could be argued that they had still received a level of 'intervention' as the simulation task directed them to think about the events in a way that could have influenced their future thinking and their post-simulation anxiety.

It is the intention of any research to be generalisable to the wider population that the sample has been drawn from. The current research has two issues with generalisability. The first is that the participants in all three parts of the thesis were drawn from the general population rather than from a clinical sample presenting with anxiety disorders. This restricts the extent to which the findings can be generalised beyond a nonclinical sample. Previous research has suggested that whose who have general anxiety disorder create simulations with less detail and vividness compared to healthy controls (Wu et al., 2015). Halford et al., (2018) in a meta-analysis of 19 studies which indicated that psychopathology is significantly related to the specificity and detail with which individuals can mentally simulate possible future events. It would also be important to establish whether thinking

about childbirth in a clinical sample would be an effective intervention or if it would increase anxiety further in this sample.

The second issue relating to generalisation that should be considered it the timing of both phases of Study 1: during the global pandemic of 2020-2022. This particular cohort of pregnant women may have had different access to maternal health services, social support and antenatal classes compared to those that came before them, or subsequently. Added to the pressures that were placed on them by the events of the global pandemic and the concerns over the wellbeing for themselves and their infant, may have meant the women may have been a unique cohort of participants. It may also have meant that their expectations around childbirth and parenthood were shaped by these unique events and this is reflected in the findings in Study 1.

It is unlikely that future research would ever be impacted again by the global events seen from 2020 to 2022, and it is possible that should the current research be replicated a different outcome may be achieved, as the women who are pregnant now do not have the cycle of lockdowns and ever changing guidelines from the pandemic to contend with. The current research, more than ever, presents a snapshot of a very unique period in time

6.7 Conclusion

This thesis set out to answer the research question: what qualities of future thinking relate to and potentially modify soon to be first time mothers anxiety during pregnancy and postpartum. Evidence was found that suggests the process of thinking during pregnancy is important for mental wellbeing both during pregnancy and postpartum. The participant

simulation qualities of anticipated emotional valence and visual perspective predicted childbirth post-simulation, while the researcher ratings of specific steps were also important in women's thinking. Simulation and valence accuracy were important for mood postpartum, suggesting that the way that childbirth and parenthood are thought about in pregnancy affects wellbeing postpartum.

The findings of this thesis have important implications for theory, practical implications and future research in future thinking. The Constructive Episodic Simulation Hypothesis states that future thinking draws on our past experiences to create our simulations of the future. However, the current research with its focus on a novel and highly personal event, has provided support for the Semantic Scaffolding Hypothesis, finding that for such a simulation, elements from the semantic memory, and potentially the personal semantic memory, are more likely to be used when imaging an event that has not been experienced before. Further research into the process of thinking in relation to novel events would help to clarify the way that the semantic memory is utilised. The Taxonomy of Prospective Cognition (Szpunar et al., 2016) provides a useful framework for explaining the current research, with its focus on planning and prediction, and the importance of the interaction of episodic and semantic memory in future thinking. The qualities of future thinking identified in the current research sit within this framework, with the specific steps in the simulations, and the anticipated emotions showing that planning and prediction have an important role to play in managing pregnancy related anxiety.

Regarding practical implications, it is likely that modifying simulation qualities by increasing specificity when imagining childbirth and the first day at home with their baby reduces anxiety for these events, showing great potential as an intervention that can be embedded in a broader antenatal programme. Additionally, encouraging women to

anticipate positive emotions when thinking about the future, and doing so from an observer perspective could amplify the effects of this intervention. When it comes to future research, there are two potential areas of focus. The first relates to the theoretical, exploring the process of thinking around the future, the role of episodic and semantic memory and how they interact. Gaining a deeper understanding of the way episodic and semantic memory are engaged during imagining a novel and highly personal even may shed light on the interaction of these two memory systems, and where they overlap but also how they differ in future thinking. The second is to develop a longitudinal study that measured the efficacy of an intervention during pregnancy and on through the perinatal period. This could produce useful insights into how the long-term negative effects of anxiety on both the mother and the infant could be prevented by helping women to adapt their thought processes in such a way to reduce the impact of uncertainty about and help them to adapt to such a major life changing event.

Overall, future thinking is a natural and frequently occurring thought process that has great potential in the prevention of anxiety during pregnancy and beyond. The current thesis suggests that modifying the qualities of future thinking could play an important role in preventing perinatal anxiety especially when embedded in an intervention as part of a full antenatal programme decreasing the harmful effects of anxiety for both soon to be first time mothers and their infants.

Appendices

Appendix A

Study 1: Phase 1 - Ethics Documentation 1

Questionnaire Section - Participant Information Sheet

Thinking about the future during pregnancy and early motherhood

This study forms part of a PhD project, carried out by myself, Linda Mortimer and supervised by Dr Lorna Goddard at Goldsmiths, University of London. Before you decide on whether you would like to participate, please read the following information which will tell you more about the project and what is involved.

What is the research about?
I am investigating how women who are having their first child imagine the future, and how this is related to their well being. Mental well being during pregnancy is becoming an important area for research, as rates of mental health issues during pregnancy have increased in recent years.

Why have I been asked to take part?
You have been asked to take part because you are at least 3 months pregnant and aged over 18. However if you are not 3 months pregnant yet, this study will be ongoing, so please feel free to contact me to participate once you are 3 months pregnant or beyond.

What is involved?
In this first part of the study you will be asked to fill out some demographic information on an online survey, followed by questionnaires about your mood. This will take approximately 20-30 minutes.

In the second part of the study you will be asked to take part in a face to face or video call where you will be asked to describe out loud how you imagine future events will unfold - in relation to the birth process, your first day as a mother and the first 6 weeks. These will be recorded to allow them to be analysed at a later date. You will be asked to give your email address at the end of the online survey so you can be contacted to arrange this interview.

What will happen to my data?
Your data will be kept secured and all data collected will be kept confidential and anonymous. Please note that you can withdraw at any point during the study.

Who do I contact if I have questions?
If you have any further questions, then please do not hesitate in contacting myself or Dr Goddard, our details are below.

Contact details of Researchers:

Linda Mortimer– L.Mortimer@gold.ac.uk
Lorna Goddard – L.Goddard@gold.ac.uk (supervisor)

Questionnaire Section - Consent Form

By reading the Participant Information Sheet and signing this consent form, you agree to be part of this research.

Please read each of the following statements carefully, and tick those you agree with. If you have ticked all of these and would like to take part, please type your initials in the text box entry below.

☐   I have read the participant information sheet provided and I am happy to participate in this research. I understand that by taking part in this research that I am consenting to be part of the study and for my data to be used.

☐   I understand that will be issued a Unique Identity Number (UIN) which will be used to keep all my information confidential and should be quoted in any correspondence with the researcher.

☐   I understand that I have the right to withdraw from the study at any time without a reason, and I only need to state my Unique Identity Number (UIN).

☐   I am over 18 years of age

Having read and agreed to the above statements, I give full informed consent to my participation in this study.

Please write your initials in the text box below:

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┌─────────────────────────────────────────────────────────┐
│                                                           │
│                                                           │
│                                                           │
│                                                           │
└─────────────────────────────────────────────────────────┘
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Goldsmiths

UNIVERSITY OF LONDON

The General Data Protection Regulation [GDPR] and Goldsmiths Research: guidelines for participants

Please note that this document does not constitute, and should not be construed as, legal advice. These guidelines are designed to help participants understand their rights under GDPR which came into force on 25 May 2018.

Your rights as a participant (data subject) in this study

The updated data protection regulation is a series of conditions designed to protect an individual's personal data. Not all data collected for research is personal data.

Personal data is data such that a living individual can be identified; collection of personal data is sometimes essential in conducting research and GDPR sets out that data subjects should be treated in a lawful and fair manner and that information about the data processing should be explained clearly and transparently. Some data we might ask to collect falls under the heading of **special categories data**. This type of information includes data about an individual's race; ethnic origin; politics; religion; trade union membership; genetics; biometrics (where used for ID purposes); health; sex life; or sexual orientation. This data requires particular care.

Under GDPR you have the following rights over your personal data[1]:

- *The right to be informed*. You must be informed if your personal data is being used.
- *The right of access*. You can ask for a copy of your data by making a 'subject access request'.
- *The right to rectification.* You can ask for your data held to be corrected.
- *The right to erasure*. You can ask for your data to be deleted.
- *The right to restrict processing*. You
- *The right to data portability*. You have the right to get your personal data from an organisation in a way that is accessible and machine-readable. You also have the right to ask an organisation to transfer your data to another organisation.
- *The right to object*. You have the right to object to the use of your personal data in some circumstances. You have an absolute right to object to an organisation using your data for direct marketing.
- *How your data is processed using automated decision making and profiling*. You have the right not to be subject to a decision that is based solely on automated

processing if the decision affects your legal rights or other equally important matters; to understand the reasons behind decisions made about you by automated processing and the possible consequences of the decisions, and to object to profiling in certain situations, including for direct marketing purposes.

Please note that these rights are not absolute and only apply in certain circumstances. You should also be informed how long your data will be retained and who it might be shared with.

How does Goldsmiths treat my contribution to this study? [1]

Your participation in this research is very valuable and any personal data you provide will be treated in confidence using the best technical means available to us. The university's legal basis for processing your data[2] as part of our research findings is a "task carried out in the public interest". This means that our research is designed to improve the health, happiness and well-being of society and to help us better understand the world we live in. It is not going to be used for marketing or commercial purposes.

In addition to our legal basis under Article 6 (as described above), for **special categories data** as defined under Article 9 of GDPR, our condition for processing is that it is "necessary for archiving purposes in the public interest, scientific or historical research purposes or statistical purposes". [3] If your data contributes to data from a group then your ability to remove data may be limited as the project progresses, when removal of your data may cause damage to the dataset.

You should also know that you may contact any of the following people if you are unhappy about the way your data or your participation in this study are being treated:

- Goldsmiths Data Protection Officer – dp@gold.ac.uk (concerning your rights to control personal data).
- Chair, Goldsmiths Research Ethics and Integrity Sub-Committee - via reisc@gold.ac.uk, REISC Secretary (for any other element of the study).
- You also have the right to lodge a complaint with the Information Commissioner's Office at https://ico.org.uk/make-a-complaint/

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[1] https://ico.org.uk/your-data-matters/

[2] GDPR Article 6; the six lawful bases for processing data are explained here: https://ico.org.uk/for-organisations/guide-tothe-general-data- protection-regulation-gdpr/lawful-basis-for-processing/

[3] Article 9 of the GDPR requires this type of data to be treated with great care because of the more significant risks to a person's fundamental rights and freedoms that mishandling might cause, eg, by putting them at risk of unlawful discrimination.

Questionnaire Section - Debrief form

Thank you for participating in this first part of our research.

The second part will take place via a face to face interview or video call (skype/facetime etc) lasting about 30 minutes, after which a payment of £10 will be made as a thank you for taking part. Please enter your email in the box below and I will contact you to arrange a suitable time for the interview

Linda - mlind002@gold.ac.uk

Please enter your email address here:

If you have any further questions about the present research or would like to receive a copy of your results then feel free to contact the researchers on their contact information at the bottom of this page.

If you feel distressed by any of the topics that this research has touched on then please contact your GP or Midwife, alternatively you can contact the National Childbirth Trust (NCT) and/or The Samaritans helpline below for further support.

www.nct.org.uk/about-us/contact-us or call 0300 330 0700

http://www.samaritans.org/how-we-can-help-you/contact-us   or call 116 123

A full explanation of the purpose of the study will be given after the interview stage of the study or if you do not wish to continue please feel free to email Linda on the address below

Contact details of Researchers:

Linda Mortimer– L.Mortimer@gold.ac.uk

Lorna Goddard – L.Goddard@gold.ac.uk (supervisor)

Participant and pregnancy questions

(used in Study 1: Phase 1 and Study 2)

Please answer the following questions about yourself and your pregnancy

How old are you?

_____

What is your ethnicity group?

○ White British (1)

○ Irish (2)

○ Other White background (3)

_____

○ White and Black Caribbean (4)

○ White and Black African (5)

○ White and Asian (6)

○ Other mixed background (7)

_____

○ Indian/Indian British (8)

○ Pakistani/Pakistani British (9)

○ Bangladeshi/Bangladeshi British (10)

○ Other Asian background (11)

_____

○ Caribbean/Caribbean British (12)

○ African/African British (13)

○ Other Black background (14)

_____

○ Chinese (15)

○ Other ethnic group (16)

_____

How many months pregnant are you?

○ 3 - 4 months (1)

○ 5 -6 months (2)

○ 7-9 months (3)

When is your due date?

_____

Where are you planning to give birth?

○ Hospital (1)

○ Home (2)

○ Birth Centre (3)

What type of birth are you planning on having?

○ Normal vaginal birth (1)

○ Water birth (2)

○ Planned C - Section (3)

○ Haven't decided (4)

How many babies are you expecting?

○ 1 (1)

○ 2 (2)

○ 3 or more (3)

How do you plan to cope with labour?

- ☐ TENS Machine (1)

- ☐ Gas and air (2)

- ☐ Pethidine (3)

- ☐ Epidural (4)

- ☐ Natural Methods (E.g. aromatherapy and hypnotherapy/hypnobirthing) (5)

- ☐ Other (6) _____

- ☐ I don't know (7)

Questionnaire Section - Mood questionnaires

(Used in Study 1: Phase 1 & 2, Study 2)

1. PRAQ-R

We would like to know about any pregnancy specific worries you may have. Please read each statement and circle each answer that applies most accurately to your situation.

	Absolutely not specific (1)	Hardly ever specific (2)	Sometimes specific (3)	Reasonably specific (4)	Very specific (5)
I am worried about the pain of contractions and the pain during delivery (8)	○	○	○	○	○
I am worried about the fact that I shall not regain my figure after delivery (9)	○	○	○	○	○
I sometimes think that our child will be in poor health or will be prone to illness (10)	○	○	○	○	○
I am worried about not being able to control myself during labour and fear that I will scream (5)	○	○	○	○	○
I am concerned about my unattractive appearance (6)	○	○	○	○	○
I am worried about my enormous weight gain (11)	○	○	○	○	○
I am anxious about the delivery because I have never experienced one before (12)	○	○	○	○	○
I am afraid the baby will be mentally	○	○	○	○	○

handicapped or will suffer from brain damage (13)

I am afraid our baby will be still born or will die during or immediately after delivery (14)

○　　　　　○　　　　　○　　　　　○　　　　　○

I am afraid that our baby will suffer from a physical defect or worry that something will be physically wrong with the baby (7)

○　　　　　○　　　　　○　　　　　○　　　　　○

2. GAD-7

Over the last 2 weeks, on *how many days* have you been bothered by any of the following problems?

	Not at all (1)	Several days (2)	More than half the days (3)	Nearly every day (4)
Feeling nervous, anxious, or on edge (1)	○	○	○	○
Not being able to stop or control worrying (2)	○	○	○	○
Worrying too much about different things (3)	○	○	○	○
Trouble relaxing (4)	○	○	○	○
Being so restless that it's hard to sit still (5)	○	○	○	○
Becoming easily annoyed or irritable (6)	○	○	○	○
Feeling afraid as if something awful might happen (7)	○	○	○	○

3. EPDS

We would like to know how you are currently feeling. Please check the answer that comes closest to how you have felt IN THE PAST 7 DAYS, not just how you feel today. Here is an example, already completed.

    I have felt happy:
    Yes, all the time
X   Yes, most of the time
    No, not very often
    No, not at all

This would mean: "I have felt happy most of the time" during the past week.

Please complete the other questions in the same way.

I have been able to laugh and see the funny side of things

   ○ A much as I always could (0)

   ○ Not quite so much now (1)

   ○ Definitely not so much now (2)

   ○ Not at all (3)

I have looked forward with enjoyment to things

   ○ As Much as I ever did (0)

   ○ Rather less than I used to (1)

   ○ Definitely less than I used to (2)

   ○ Hardly at all (3)

I have blamed myself unnecessarily when things went wrong

○ Yes, most of the time (3)

○ Yes, some of the time (2)

○ Not very often (1)

○ No, never (0)

I have been anxious or worried for no good reason

○ No, not at all (0)

○ Hardly ever (1)

○ Yes, sometimes (2)

○ Yes, very often (3)

I have felt scared or panicky for no very good reason

○ Yes, quite a lot (3)

○ Yes, sometimes (2)

○ no, not much (1)

○ No, not at all (0)

Things have been getting on top of me

○ Yes, most of the time I haven't been able to cope at all (3)

○ Yes, sometimes I haven't been coping as well as usual (2)

○ No, most of the time I have coped quite well (1)

○ No, I have been coping as well as ever (0)

I have been so unhappy that I have had difficulty sleeping

○ Yes, most of the time (3)

○ yes, sometimes (2)

○ not very often (1)

○ No, not at all (0)

I have felt sad or miserable

○ Yes, most of the time (3)

○ Yes, quite often (2)

○ Not very often (1)

○ No, not at all (0)

I have been so unhappy that I have been crying

○ Yes, most of the time (3)

○ Yes, quite often (2)

○ Only occasionally (1)

○ No, never (0)

The thought of harming myself has occurred to me

○ Yes, quite often (3)

○ Sometimes (1)

○ Hardly ever (1)

○ Never (0)

Appendix D

Study 1: Phase 1 - Ethics Documentation 1

Simulation Section – Participation Information Sheet

This research forms the second part of a project run by Goldsmiths College, University of London.

Title of Project:

Pregnant women's simulations of childbirth and postpartum experience I am a researcher at Goldsmiths College, investigating how women who are having their first child imagine the future. The project is supervised by Dr Lorna Goddard.

Before you decide on whether you would like to participate, please read the following information. If you have any further questions, then please do not hesitate in contacting myself or Dr Goddard, our details are at the bottom of this page.

If you wish to participate in this study then you will be asked to give your consent on a form that follows this information sheet.

You have already been asked to fill out some demographic information and questionnaires on your well-being. In this part, you will be asked to describe out loud how you imagine future events will unfold - in relation to the birth process, your first day as a mother and the first 6 weeks. These will be recorded to allow them to be analysed at a later date. You will then be asked to complete questionnaires about your mood. The whole process will take approximately 30-40 minutes.

Your data will be kept secured and all data collected will be kept confidential and anonymous. Please note that you can withdraw at any point during the study.

This research requires you to be over 3 months pregnant in order to participate. However, if you are not 3 months pregnant yet, this study will be ongoing, so please feel free to contact me to participate once you are 3 months pregnant or beyond.

Contact details of Researchers:

Linda Mortimer– L.Mortimer@gold.ac.uk
Lorna Goddard – L.Goddard@gold.ac.uk (supervisor)

Simulation Section – Consent Form

By reading the Participant Information Sheet and signing this consent form in the first part of this study, you have agreed to be part of this research. I will ask you to consent to the following that are specific to this part of the study:

☐   I continue to be happy to participate in this research. I understand that by taking part in this research that I am consenting to be part of the study and for my data to be used, and for the online interview to be recorded

☐   I understand that my Unique Identity Number (UIN) which will be used to identify my participation in this part of the study, including the recording of the online video.

☐   I understand that I have the right to withdraw from the study at any time without a reason, and I only need to state my Unique Identity Number (UIN).

Having read and agreed to the consent statements in the first part of the study I understand that I have the , I give full informed consent to my participation in this part of the study.

Please write your initials in the text box below:

_____

My initials and Unique Identification Number (UNI) is:
_____

Simulation section – Debrief Form

Thank you for participating in our research. The data that you have provided will be analysed to give further insight into how people simulate new experiences for the first time, for example childbirth and the first 6 weeks of having your newborn baby. Therefore, we are looking to see whether mood and autobiographical memories play a particular role in your answers to the simulation tasks and questionnaires that you were given.

If you have any further questions about the present research or would like to receive a copy of your results then feel free to contact the researchers on their contact information at the bottom of this page.

If you feel distressed by any of the topics that this research has touched on then please contact:

The National Childbirth Trust (NCT) www.nct.org.uk/about-us/contact-us or 0300 330 0700
The Samaritans helpline http://www.samaritans.org/how-we-can-help-you/contact-us and or 116 123

We are conducting a follow up study and would be very pleased if you felt able to participate. It will involve a brief (10 minute) survey where we will present you with the simulations that you have provided today. We will then ask you to rate the extent to which your imagined future matched your actual experience and to make some ratings on your mood.

If you are interested in taking part, please give your email address in the box below and we will contact you approximately 8 weeks after your due date

Thank you for your participation, it is highly valued.

Please write your email in the box below, to participate in the follow up study

_____

_____

Contact details of Researchers:
Linda Mortimer– L.Mortimer@gold.ac.uk
Lorna Goddard – L.Goddard@gold.ac.uk (supervisor)

Appendix E

Study 1: Phase 1 – Simulation section

Simulation task (repeated for each event)

We are interested in how people imagine important future life events that they have not experienced before. Having a first baby is, of course a very novel experience and we are interested in understanding how you imagine your future will be and how this relates to any anxieties that you have about giving birth and having a child.

First, how anxious you are about [the process of giving birth/the first day at home with your baby/a typical day with your baby at six weeks]

○ Not at all anxious 0

○ 1

○ A little anxious 2

○ 3

○ Moderately anxious 4

○ 5

○ Very anxious 6

○ 7

○ Extremely anxious 8

Simulation 1: Childbirth

The first thing we are going to do is to get an idea of how you imagine the future, specifically going into labour and giving birth. To do this I am going to ask you to imagine, out loud, giving birth, from the moment you go into labour, all the possible individual steps involved, until your baby is born. Please try do this is as much detail as possible. There is no right or wrong way to imagine this. So to begin with, why not take a few minutes to have a think about it. You might want to close your eyes if it helps. Just start talking when you are ready:

Simulation 2: First day at home with baby

Once again, I'm going to ask you to imagine something out loud, in as much detail as possible. This time I'd like you to imagine arriving home with your baby (or if home birth, those first few moments when you are alone with your baby for the first time) up to about 24 hours later. Remember there is no right or wrong way to imagine this.

Once again, take some time to think about it, and close your eyes if it helps. Just start talking when you are ready.

Simulation 3: A typical day at six weeks

Ok, for the last time, I'm going to ask you to imagine the future. This time I would like you to imagine, in as much detail as possible, what a typical day would involve at about 6 weeks after your baby's birth, starting with the moment you wake up and ending 24 hours later. Remember there is no right or wrong way to imagine this

If you wish, close your eyes and take some time to think about it, then begin talking when you are ready.

Prompts:

What else might you experience?
Is there anything that may come before or after that?
Is there anything else?

Overall how detailed do you think your imagined scenario was?

○ Not very detailed   1 (1)

○   2 (2)

○   3 (3)

○   4 (4)

○   5 (5)

○   6 (6)

○ Very detailed   7 (7)

Overall how vivid do you think your imagined scenario was?

○ Not very vivid   1 (1)

○   2 (2)

○   3 (3)

○   4 (4)

○   5 (5)

○   6 (6)

○ Very Vivid   7 (7)

When you were imagining [your labour and giving birth/the first day at home with your baby/a typical day with your baby at six weeks], to what extent did your imagined scenario involve the following?

	Not at all 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	A considerable amount 7 (7)
Involves visual detail (9)	○	○	○	○	○	○	○
Sound (5)	○	○	○	○	○	○	○
Smell (6)	○	○	○	○	○	○	○
Taste (8)	○	○	○	○	○	○	○
Touch/Physical Sensations (12)	○	○	○	○	○	○	○

When you were imagining [going into labour and giving birth/the first day at home with your baby/a typical day with your baby at six weeks], did you imagine it from your own perspective, or as if you were looking from someone else's perspective?

○ First person perspective (1)

○ Third person perspective (2)

To what extent do you think you will feel positive emotions during [labour and giving birth/the first day at home with your baby/a typical day with your baby at six weeks]?

○ None 0

○ 1

○ A little 2

○ 3

○ Some 4

○ 5

○ A lot 6

○ 7

○ A great deal 8

To what extent do you think you will feel negative emotions during [going into labour and giving birth/the first day at home with your baby/a typical day with your baby at six weeks]?

○ None 0

○ 1

○ A little 2

○ 3

○ Some 4

○ 5

○ A lot 6

○ 7

○ A great deal 8

Have you ever imagined [going into labour and giving birth/the first day at home with your baby/a typical day with your baby at six weeks] like this before?

○ That is the first time I've thought about it like that

○ I have thought about it at least once like that

○ I have thought about it several times like that

○ I am often/always running through that scenario in my head

Q15 Having imagined the future, how anxious do you feel right now about giving birth?

○ Not anxious at all 0

○ 1

○ A little anxious 2

○ 3

○ Moderately anxious 4

○ 5

○ Very anxious 6

○ 7

○ Extremely anxious 8

I am interested in where the thoughts and images that may have come from when you were imagining [your labour and giving birth/the first day at home with your baby/a typical day with your baby at six weeks]. When you were imagining, where did your ideas come from?

Possible prompts
    Did you think about something you had read about or seen on TV?
    Did you think about someone else's experiences, such as a friend or family member?

Appendix F

Ethics Documentation for Study 1: Phase 2

Participant Information Sheet (2)

Title of Project: Phase 2 Thinking about the future in pregnancy and early motherhood

Welcome back to the research study

During the first phase of this study you kindly agreed to be contacted once more after your baby was born to take part in the follow-up phase of the study. It has now been 8-10 weeks since your baby was born, and we wish to ask you a further set of questions, this time on how your imagined future events compared to the reality of your experiences.

What is involved?

In this last part of the study you will be asked to fill out some information regarding your child's birth such as method of delivery and date of birth. Then you will be asked to rate how your expectations of birth and motherhood related to your actual experience of childbirth and early motherhood, followed by questions relating to how you are feeling at the moment. You may miss out any questions you do not wish to answer. This will take approximately 10 minutes.

What will happen to my data?

Your data will be kept secured and all data collected will be kept confidential and anonymous. Please note that you can withdraw at any point during the study.

Who do I contact if I have questions?

If you have any further questions, then please do not hesitate in contacting myself or Dr Goddard, our details are below.

Contact details of Researchers:

Linda Mortimer– L.Mortimer@gold.ac.uk

Lorna Goddard – L.Goddard@gold.ac.uk (supervisor)

Consent Form (2)

 By reading the Participant Information Sheet and signing this consent form, you agree to be part of this research.   Please read each of the following statements carefully, and tick those you agree with. If you have ticked all of these and would like to take part, please type your initials in the text box entry below.

☐   I have read the participant information sheet provided and I am happy to participate in this research. I understand that by taking part in this research that I am consenting to be part of the study and for my data to be used.

☐   I understand that I have the right to withdraw from the study at any time without a reason

☐   I am over 18 years of age

Having read and agreed to the above statements, I give full informed consent to my participation in this study. Please write your initials in the text box below

_____

Your initials and unique identity number from phase 1:

_____

Debrief (Phase 2)

Thank you for participating in our research.

The main aim of this research is to examine how imagining future events relates to mood and whether accuracy of simulations of future events is important in adapting to major life changes such as giving birth for the first time, and early parenthood.

We are also looking at how qualities of memory relate to qualities of the simulations you gave in the earlier part of the study.

If you have any further questions about the present research or would like to receive a copy of your results then feel free to contact the researchers on their contact information at the bottom of this page.

If you feel distressed by any of the topics that this research has touched on then please contact:

The National Childbirth Trust (NCT),
www.nct.org.uk/about-us/contact-us
0300 330700

The Birth Trauma Association(BTA)
http://www.birthtraumaassociation.org.uk
https://www.facebook.com/groups/TheBTA/   ·

The Samaritans helpline
http://www.samaritans.org/how-we-can-help-you/contact-us or 116 123

Thank you for your participation, it is highly valued.

Contact details of Researchers:
 Lorna Goddard (supervisor) – L.Goddard@gold.ac.uk
 Linda Mortimer - L.Mortimer@gold.ac.uk

Birth questions

Could you please complete the following questions about the birth of your child.

Date of birth of baby

_____

Gestational age of baby at birth

_____

Type of birth

○ Normal vaginal birth (1)

○ Water birth (2)

○ Planned C - Section (3)

○ Unplanned C-section (4)

Where did you give birth

○ Hospital (1)

○ Home (2)

○ Birth Centre (3)

How did you cope with the labour

☐ TENS Machine (1)

☐ Gas and air (2)

☐ Pethidine (3)

☐ Epidural (4)

☐ Natural Methods (E.g. aromatherapy and hypnobirthing) (5)

☐ Other (6)

How did you cope with the labour

☐ TENS Machine (1)

☐ Gas and air (2)

☐ Pethidine (3)

☐ Epidural (4)

☐ Natural Methods (E.g. aromatherapy and hypnobirthing) (5)

☐ Other (6)

If you chose 'other', please describe in the box below:

_____

Age of your baby (in days) when brought home

_____

Q13 Age of your baby at the time of completing this questionnaire

_____

Appendix H

Simulation Accuracy questions – used for all three events

We are first going to ask you to think back to the interview you took part in, before you had your baby, and ask you about how those imagined scenarios you gave compare with the reality of your experience.

Below is a transcript of the scenario of [going into labour and giving birth/the first day at home with your baby/a typical day at six weeks] that you gave in phase 1. Please read it before answering the next set of questions.

 Each participant was given a copy of their simulations for each event

Having read the scenario from phase 1, please rate the extent to which what happened during [each event] matched your expectations

○ Did not match my expectations at all 1   (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 (5)

○ 6 (6)

○ Completely matched my expectations 7   (7)

Having read the scenario from phase 1, please rate the extent to which, on balance, the experience was better or worse than the imagined scenario

○ A lot worse than imagined 1 (1)

○ 2 (2)

○ Somewhat worse than imagined 3 (3)

○ 4 (4)

○ Somewhat better than imagined 5 (5)

○ 6 (6)

○ A lot better than imagined 7 (7)

How often did you imagine [each event] this way while you were pregnant?

○ I did not think about this scenario at all (9)

○ I thought about it only once like that (1)

○ I thought about it several times like that (3)

○ I often/always had that scenario running through my head (5)

Appendix I

Memory questions – used for all three events

Now take a couple of minutes to recall giving birth, and the individual steps involved in as much detail as possible. Recall from the moment you went into labour, and end when your baby is born.

You might want to write things down in the box below to help you recall but this isn't essential, you can just recall it in your head.

_____

_____

_____

_____

_____

- -

Overall how detailed is your memory of [each event]?

○ My memory is not very detailed (1)

○ 1 (2)

○ 2 (3)

○ 3 (4)

○ 4 (5)

○ 5 (6)

○ 6 (7)

○ My memory is very detailed 7 (8)

Overall how vivid is your memory of [each event]?

○ My memory is not very vivid 1 (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 (5)

○ 6 (6)

○ My memory is very vivid 7 (7)

When you recall [each event], to what extent does your memory involve the following?

	1 not at all (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 A considerable amount (7)
Involves visual detail (1)	○	○	○	○	○	○	○
Sound (2)	○	○	○	○	○	○	○
Smell (3)	○	○	○	○	○	○	○
Taste (4)	○	○	○	○	○	○	○
Touch/physical sensations (5)	○	○	○	○	○	○	○

When you recall [each event], which of the following statements is best applied?

○ I remember it from my own perspective, as if I am an actor in the scene (1)

○ I remember it from an outside observer's perspective, as if I am watching myself in a film (2)

Thinking now of when you [experienced each event], to what extent did you feel positive emotions during the [event]?

○ None 0 (1)

○ 1 (2)

○ A Little 2 (3)

○ 3 (4)

○ Some 4 (5)

○ 5 (6)

○ A lot 6 (7)

○ 7 (8)

○ A great deal 8 (9)

Thinking again about when you [experienced each event], to what extent did you feel negative emotions during the [event]?

○ None 0 (1)

○ 1 (2)

○ A Little 2 (3)

○ 3 (4)

○ Some 4 (5)

○ 5 (6)

○ A lot 6 (7)

○ 7 (8)

○ A great deal 8 (9)

Study 2 - Ethics Documentation

<u>**Participant Information Sheet**</u>

This research forms part of a project run by Goldsmiths College as part of a student PhD project.

Title of Project: Pregnant women's simulations of childbirth and postpartum experience

I am a PhD research student at Goldsmiths College, carrying out an investigation into how women who are having their first child imagine the future. Before you decide on whether you would like to participate, please read the following information. If you have any further questions, then please do not hesitate to contact myself or Dr Goddard (project supervisor), our details are at the bottom of this page.

Why have you been asked to take part?

You have been asked to take part because we are only recruiting women who are expecting to give birth to their first child, as we are interested in how soon to be first time mothers think about the future. You should be at least 12 weeks pregnant, aged over 18 and be expecting to give birth to your first child.

What are the possible advantages to taking part?

You will be helping us to understand how thinking about childbirth and early parenthood is related to our mental health, and how we can help women feel less worried during pregnancy.

What are the possible disadvantages to taking part?

As well as imagining childbirth and early parenthood you will be asked about your current mental health. There is a possibility that you might find such questions distressing. You can choose not to answer any individual questions, and you may withdraw from the study at any point. You will be provided details of support organisations at the end of the survey.

Who has reviewed this study?

This study has been reviewed by Goldsmiths Psychology Department's Research Ethics Committee. Goldsmiths University of London is committed to compliance with the Universities UK Research Integrity Concordat. You are entitled to expect the highest level of integrity from our researchers during the course of their research.

Who to contact if something goes wrong
Please contact the Chair of the Ethics Committee, Professor Daniel Mullensiefen,

D.Mullensiefen@gold.ac.uk if you are concerned about this research and wish to discuss your concerns further.

What study involves:

You will be asked to give your consent to take part in this study and then you will complete a series of questions relating to yourself and your pregnancy.   Next you will be asked to imagine how future events will unfold - in relation to childbirth, and your first day as a mother, before being asked some questions about how you have imagined these events.
You will then be asked to complete questionnaires about your mood.

The whole process will take approximately 30 minutes.

What will happen to your data?

Your data will be kept secured and all data collected will be kept confidential and anonymous. Please note that you can withdraw at any point during the study, even if you have completed it. All you need to do is contact the researchers on the email addresses below, with the respondent ID you will generate in a moment, and they will remove you. You do not have to give a reason for withdrawing.

Contact details of Researchers:

Linda Mortimer– mlind002@gold.ac.uk

Lorna Goddard – L.Goddard@gold.ac.uk (supervisor)

Consent Form

By reading the Participant Information Sheet and signing this consent form, you agree to be part of this research.   Please read each of the following statements carefully, and tick those you agree with.

☐   I have read the participant information sheet provided and I am happy to participate in this research.

☐   I understand that by taking part in this research that I am consenting to be part of the study and for my data to be used.

☐   I understand that I have the right to withdraw from the study at any time without a reason

☐   I am over 18 years of age

☐   I am at least 12 weeks pregnant

☐   I am expecting to give birth for the first time

Please enter your Prolific ID here

_____

Debrief Form

We would like to take this opportunity to say **Thank You** for taking the time to take part in our research study.

Please be assured, all data collected will be treated in the strictest confidence. You are free to withdraw your data from the research at any time by contacting Linda Mortimer mlind002@gold.ac.uk or Dr L Goddard L.goddard@gold.ac.uk

The aim of the study was to see if increasing the amount of detail in your imagined future events will help reduce the anxiety you feel for that event. In this study you were asked to imagine how two events would unfold; childbirth, and first day at home with baby. You were randomly allocated to one of two groups:

Group 1: You were asked to imagine how future events will unfold in as much detail as possible without any guidance on how to do this. This was our control group

Group 2: You were given specific instructions for how to imagine the future, focusing on increasing the detail that you included in your scenarios through a series of prompts. This was our experimental group.

We will be able to see how well our prompts help to reduce anxiety, and whether they can be used to help other soon to be first time mothers prepare for childbirth and early parenthood.

If you have any further questions about the present research or would like to receive a copy of your results then feel free to contact the researchers on their contact information at the bottom of this page. You may also contact us should you wish to withdraw from the study at any time.

If you feel distressed by any of the topics that this research has touched on then please contact your GP or Midwife, alternatively you can contact the National Childbirth Trust (NCT) Mind, and/or The Samaritans helpline for further support.

www.nct.org.uk/about-us/contact-us or call 0300 330 0700

https://www.mind.org.uk/information-support/helplines/ or call 0300 123 3393

http://www.samaritans.org/how-we-can-help-you/contact-us   or call 116 123

Click here to let Prolific know you have completed the study

Study 2 Simulation task

We are interested in how people imagine important future life events that they have not experienced before. Having a first baby is, of course a very novel experience and we are interested in understanding how you imagine your future will be and how this relates to any anxieties that you have about giving birth and having a child.

First, please rate how anxious you are right now about going into labour and giving birth?

○ Not at all anxious 0

○ 1

○ A little anxious 2

○ 3

○ Moderately anxious 4

○ 5

○ Very anxious 6

○ 7

○ Extremely anxious 8

Intervention condition Instructions

Now take a couple of minutes to imagine yourself going into labour and giving birth. Please imagine the individual steps involved in as much detail as possible, from the moment you go in to labour, and end when your baby is born. Below are some questions to help you to do this, please use as many as possible when imagining going into labour and giving birth:

- When will it happen?
- What time of day will it be?
- Where will you be?
- How long will it last?
- Who else will be there?
- Can you think of particular thoughts you will have?
- Are there particular objects there you might name?
- What could you hear, smell, touch, see and taste?
- Can you name some interesting details of the physical place where this might happen?
- What type of day will it be?
- What would be the most memorable part of this experience?
- Can you describe another part of this experience?

Control Condition instructions

Now take a couple of minutes to imagine yourself going into labour and giving birth. Please imagine the individual steps involved in as much detail as possible, from the moment you go in to labour, and end when your baby is born.

Thinking about the scenario you created, overall how detailed was your imagined scenario of going into labour and giving birth?

○ Very little detail 1 (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 (5)

○ 6 (6)

○ Very detailed 7 (7)

Thinking about the scenario you created, overall how vivid was your imagined scenario of going into labour and giving birth?

○ Very vague 1 (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 (5)

○ 6 (8)

○ Very vivid 7 (9)

Thinking about the scenario you created, overall how coherent was your imagined scenario of going into labour and giving birth?

○ Very vague 1 (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 (5)

○ 6 (8)

○ Very vivid 7 (9)

When you were imagining your labour and the birth of your baby, to what extent did your imagined scenario involve the following?

	Not at all 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	A considerable amount 7 (7)
Involves visual detail (1)	○	○	○	○	○	○	○
Sound (2)	○	○	○	○	○	○	○
Smell/Taste (3)	○	○	○	○	○	○	○
Touch/Physical sensations (4)	○	○	○	○	○	○	○

When you were imagining your labour and the birth of your baby, which of the following statements best applied?

○ I imagined it from my own perspective, as if I was an actor in the scene

○ I imagined if from an outside observer's perspective, as if I was watching myself in a film

We are interested in the thoughts and images that may have come to mind when you were imagining your labour and baby's birth. We would like you choose which the following sources of information you used. Please select all that apply:

- ☐ I just used my imagination (1)

- ☐ I thought about a friend or family member's experience (2)

- ☐ TV/film and online videos (3)

- ☐ books/websites (4)

- ☐ courses (NCT/Hypnobirthing/mindful birthing classes) (5)

- ☐ Other, please write below (6)

_____

How often have you imagined going into labour and giving birth in that way? Please choose one of the four following statements

- ○ This is the first time I've thought about it like that

- ○ I have thought about it at least once in detail like that

- ○ I have thought about it several times like that

- ○ I am often/always running through that scenario in my head

To what extent do you think you will feel positive emotions during labour and birth?

○ None 0 (0)

○ 1 (1)

○ A little 2 (2)

○ 3 (3)

○ Some 4 (4)

○ 5 (5)

○ A lot 6 (6)

○ 7 (7)

○ A great deal 8 (8)

To what extent do you think you will feel negative emotions during labour and birth?

○ None 0

○ 1

○ A little 2

○ 3

○ Some 4

○ 5

○ A lot 6

○ 7

○ A great deal 8

Having imagined the future, how anxious do you feel right now about going into labour and giving birth

○ Not anxious at all 0

○ 1

○ A little anxious 2

○ 3

○ Moderately anxious 4

○ 5

○ Very anxious 6

○ 7

○ Extremely anxious 8

We are now going to ask you about the first day that you will spend with your baby at home but first, please rate how anxious you are about spending the first day at home with your baby

○ Not anxious at all 0

○ 1

○ A little anxious 2

○ 3

○ Moderately 4

○ 5

○ Very anxious 6

○ 7

○ Extremely 8

First day at home with your baby

Intervention condition instructions

Once again, we are going to ask you to imagine the future. Please take a couple of minutes to imagine, in as much detail as possible, the moment you arrive at home with your baby (or if home birth, the moment you are alone with your baby for the first time) to 24 hours later. Please imagine the individual steps involved in as much detail as possible.

Below are some questions to help you to do this, please use as many as possible when creating your imagined scenario of arriving home and the first 24 hours with your baby

- When will it happen?
- What time of day will it be?
- Where will you be?
- How long will it last?
- Who else will be there?
- Can you think of particular thoughts you will have?
- Are there particular objects there you might name?
- What could you hear, smell, touch, see and taste?
- Can you name some interesting details of the physical place where this might happen?
- What type of day will it be?
- What would be the most memorable part of this experience?
- Can you describe another part of this experience?

Control Condition instructions

Once again, we are going to ask you to imagine the future. Please take a couple of minutes to imagine, in as much detail as possible, the moment you arrive at home with your baby (or if home birth, the moment you are alone with your baby for the first time) to 24 hours later.

Please imagine the individual steps involved in as much detail as possible.

Thinking about the scenario you created, overall how detailed was your imagined scenario of the first day at home with your baby?

○ Very little detail 1 (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 (5)

○ 6 (6)

○ Very detailed 7 (7)

Thinking about the scenario you created, overall how vivid was your imagined scenario of the first day at home with your baby?

○ Very vague 1 (1)

○ 2 (2)

○ 3 (3)

○ 4 (4)

○ 5 (5)

○ 6 (6)

○ Very Vivid 7 (7)

Thinking about the scenario you created, overall how coherent was your imagined scenario of the first day at home with your baby?

○ Fragmented 1 (1)

○ 2 (2)

○ 3 (3)

○ 4 (5)

○ 5 (6)

○ 6 (7)

○ Coherent 7 (8)

When you were imagining the first day with your baby, to what extent did your imagined scenario involve the following?

	Not at all 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	A considerable amount 7 (7)
Involves visual detail (1)	○	○	○	○	○	○	○
Sound (2)	○	○	○	○	○	○	○
Smell/Taste (3)	○	○	○	○	○	○	○
Touch/Physical sensations (4)	○	○	○	○	○	○	○

When you were imagining the first day with your baby, which of the following statements best applied?

○ I imagined it from my own perspective, as if I was an actor in the scene (1)

○ I imagined if from an outside observer's perspective, as if I was watching myself in a film (2)

○ I switched between my own and someone else's perspective (3)

We are interested in the thoughts and images that may have come to mind when you were imagining the first day at home with your baby. We would like you choose which of the following sources of information you used. Please select all that apply:

☐   I just used my imagination (1)

☐   I thought about a friend or family member's experience (2)

☐   TV/film and online videos (3)

☐   books/websites (4)

☐   courses (NCT/Hypnobirthing/mindful birthing classes) (5)

☐   Other, please write below (6)

_____

How often have you imagined the first 24 hours in that way? Please rate on the following scale

○ That is the first time I've thought about it like that (1)

○ I have thought about it at least once in detail like that (2)

○ I have thought about it several times like that (3)

○ I am often/always running through that scenario in my head (4)

To what extent do you think you will feel positive emotions during your first day with your baby?

○ None 0 (0)

○ 1 (1)

○ A little 2 (2)

○ 3 (3)

○ Some 4 (4)

○ 5 (5)

○ A lot 6 (6)

○ 7 (7)

○ A great deal 8 (8)

To what extent do you think you will feel negative emotions during your first day with your baby?

○ None 0 (0)

○ 1 (1)

○ A little 2 (2)

○ 3 (3)

○ Some 4 (4)

○ 5 (5)

○ A lot 6 (6)

○ 7 (7)

○ A great deal 8 (8)

Having imagined the future, how anxious do you feel right now about the first day at home with your baby?

○ Not at all anxious 0 (0)

○ 1 (1)

○ A little anxious 2 (2)

○ 3 (3)

○ Moderately anxious 4 (4)

○ 5 (5)

○ Very anxious 6 (6)

○ 7 (7)

○ Extremely anxious 8 (8)

Appendix J

Coding frame for Study 1: Phase 1 phenomenological qualities coding

Characteristic	Description	Rating rule
Detail	Specific Factual information relating to childbirth/early parenthood Emotional detail – relating to feelings Contextual information relating to giving birth/parenthood – time place, objects and people and spatial information	7 point Likert scale 1 (not very detailed) – 7 (very detailed
Vivid	Does the simulation give a strong clear image – along with any direct reference to the image being strong and clear, easy to see, feels real	7 point Likert scale 1 (not very vivid) – 7 (very vivid)
Sensory Detail	Information relating to sight, sound, smell, taste and touch/physical sensations -	Count of each time one of the five senses is mentioned
Positive emotion	Use of positive emotional language e.g. I will be so happy, I am excited, including feeling calm and peaceful	Count of each time a positive emotion is expressed
Negative emotion	Use of negative emotional language, I will be anxious, it's very scary, and a lack of positive e.g. I will not be happy, I am not excited	Count of each time a negative emotion is expressed
Emotional intensity	How strong the positive and/or negative emotions expressed were, e.g. I won't be very anxious vs I am so very worried about this happening	7 point Likert scale 1 (not emotionally intense) – 7 (very intense)
Specific steps	Count of each logical, specific step that takes the woman from the beginning of the event to the end	Number of individual steps the participants mentioned that explicitly related to them getting from the beginning to the end of the event

Appendix K

Example simulation transcripts

Example 1:

Childbirth

Okay. Gosh, so what do I imagine? I imagine, I imagine going into labour at home. And this is sort of I guess I could go into that anywhere. but In my imagination. I'm at home. It's probably sort of maybe evening time, like, yeah, like my husband would be here. And I was I imagine that this is sort of the most, like, anxious, exciting bit of is it happening? Is it not? And what do we do? And having to sort of like count contractions. And is it the right time to go to the hospital or wherever? Or is it not? I imagine this bit maybe being a little bit uncertain. But not necessarily. I imagine it was be excitement as well. I think that there's something about oh, the babies come in. So I guess there's something about Yeah, being at home, my husband's around and a bit idealistic in my head really, this is all going to be [unclear] wrong I'm sure. But that it's yeah, that I'm able to sort of, I guess, keep calm in those moments to sort of be able to go through that first stage of labour. I guess. Practising breathing. Yeah, keeping calm, trying to be as comfortable as possible. Maybe even I don't know, having a shower, putting the TV on distraction type things at that stage. I sort of imagine myself, maybe, maybe not being able to sleep but trying to get some sort of rest. And then, at some point, I guess those contractions get in sort of more regular and stronger. And us, I guess, go into where we're going to give birth. So we drive in the car there. And my husband is awful at navigation. So he has been told to do a recce beforehand, numerous times. So I guess in my imagination, he gets us there. Okay. But there is a slight apprehension that there will be, I don't know, some form of getting lost or something. I guess the one thing that does make me very anxious is I guess I'm quite controlling in a way like I'm very much a quite independent in control of things and I guess this this moment, I might necs I mightn't necessarily be in control. I feel like I'll be handing over and he'll be in charge of getting us there getting me in the car things like that and that bit of my imaginations, like all How will I deal with that? How I feel about that? Is this is this okay in terms of Yeah. So then I I imaginal also I'd like to give birth, we have a standalone midwife unit in Salford. So I imagine myself giving birth there. So it's a four bedded ensuite type unit,

that's really calm, only midwives there. And I guess it's I guess it's for low risk pregnancies. So I'm envisaging that I'll stay low risk. And that my pregnancy will progress nicely. There. I'm imagining, I guess, my husband being there maybe having one or two midwives Present And, I guess, length of time? I don't know. I'm not unrealistic. I'm not thinking it'll slip out half an hour? Maybe, you know, that helps. And like No, no more than seven hours or something. So anything less than Well, I don't know. That would be nice. You know, obviously, it might take hours, but these hours sure will be painful. But I guess I'm in sort of a degree of control. So for me, like the the things that made me anxiety, anxious is sort of like being out of control think of not being aware of what's going on around me of having lots of pain relief, or, you know, that and yeah, being out of it. That's the bit that makes me anxious, it potentially might happen. But in my imagination, I might be in pain. But I'm sort of still with it. And in control, I guess I'm not in control. But just in the room, I think that I'm aware of what's going on around me, to as much as I can be. And, and then I imagine a sort of, I guess, the vaginal birth. That the you know, the, I guess it's just dream . As I'm talking, I realise, its probably like very dreamy, its not going to happen. But you know, babies sort of given to me. And we can have a moment where Yeah, where it's sort of it's lay there, my husband will be there. Again, it's sort of like just quiet, dark, peaceful, there's probably some nice music on everyone will be in tears. And then then I'm fine after it baby's fine. And we can rest or whatever, maybe have to stay overnight. And then we can go home the next day. So that is my view of it. Which may be completely unrealistic. Like I'm not. I don't know what the word is. I think I'm realistic that might not happen like that. But I'd say I'm hopeful that it will happen like that. And if it doesn't happen like that, then what will be will be but I guess in my imagination. That's how I imagined it.

First Day

Okay, so I imagine we'll arrive home. And I can see myself I guess the baby will be in the car seat. And sort of putting them down in a sort of like front room. And probably just hitting me and my husband like a tonne of bricks of like, what the heck, what do we do now? And we're both the youngest in our families don't really have that much contact with little children and babies or children. And I feel like I don't have a clue as to what I would do. Hopefully, I guess Yeah, natural instinct. So I think we put it down we've got two cats. So we need to introduce the babies to the cat. So I can imagine at some point them coming in

sniffing the baby. Yeah, getting getting used to the baby. I imagine is just sort of like sitting looking at the baby just in, in awe and in. Yeah, just like what, what do we do? Well, what is this I'm hoping to breastfeed. And from what I've heard from friends, it's not it's not necessarily an easy process. So I'd say I have some nervousness around that. In terms of I guess that first few hours 24 hours, it will be me having to figure out how to breastfeed so I think I imagine that looking like a bit of a struggle, like I can see myself probably just like, in pyjama bottoms and no top on and just like, not a mess. But yeah dishevelled, with the baby here, not quite knowing what to do, or how to do it and probably feeling a little bit hopeless. And yeah, not knowing to stick at it. And yeah, that's, that's my anxieties around that. I think. I think that. Yeah. But I think that will be what that first, I think it'll just be the first 24 hours will just be us trying to get through it, and just start to get to know this baby and get to know them and then to get to know us, but I see it as being a struggle, I think, mixed in like an all and happiness. I only see me and my husband being there. Like I don't particularly want anyone coming round to the house on that day. So yeah, I would see it as just us two. I imagine there'll be we'll be on our phones sort of like sending pictures, texting people to say we're home and we're okay, but I wouldn't want anybody sort of coming around in those first 24 hours. Probably not the first week to be honest. I imagined that it'll just be a mix of us. Yeah, feeding, napping, them napping, and putting them down to bed and then probably waking up two hours later and feeding again and just being very tired. Not quite knowing, I guess just an air of uncertainty. Yeah, I think that's it, there's not much detail. It feels harder to think about that. I guess because there's not a part I feel like with Labour, there's like you can read about the process. Whereas with this day, it just feels like a bit of a mess. Like who knows what that process is

Six Weeks

Okay, so six weeks, I'm imagining a sort of early wake up. And I don't know what time maybe it's five. And it's probably been a poor night. Waking up to feed. And hopefully by this stage I yeah, I hope I'm still breastfeeding. I'm not if I am, if I was to be bottle feeding I won't be too sad. But in this imagined scenario, I'm still breastfeeding. And it's not painful. And I'm in a rhythm with it. It's nice. And I have I don't have any infections or soreness. And it's, it's, it's a nice experience. I can imagine, yeah, feeding, my husband will be sort of around that moment. Sort of like spend time with me and the baby, then he would go to

work. And I'll be off work. So imagine after that feed, maybe putting the baby back down to sleep for a bit longer. Think I imagined that I'll be able to sleep as well. Who knows. But yeah, in this scenario, I could have a little nap too. And then I guess we'll wake up again feed. Baby'll get dressed. I'll I guess I'm thinking like for me to sort of like shower and get dressed. And that somehow I'll have some form of contraption where the baby can lie in it. And I'm either getting showered and they're in the room with me. I think I'm imagining the baby at this point to be sort of like settled and calm. And that this is this will be an easy an easy sort of time, but it probably well, I guess maybe there is some sort of like crying in there and me having to sort of like juggle jumping out of the shower to sooth them. And who knows if I'll finish the shower or not. But at some point in the morning, we'll both be dressed. And I guess at that stage will probably be another sleep for the baby. Maybe I can have some breakfast or just do something around the house. And then I guess the baby will wake up and so potentially around, I don't know midday now another feed. And then I'd like to imagine that there'd be some form of something. So maybe we'll go for a walk, I think it's six weeks, maybe we'll just go for a walk. I'm imagining that I will physically might it might still be challenging. So it might only be like a 20 minute walk maybe I'll see a friend on that walk that might come with me go back home. And I guess back in that routine of sort of feed sleep. I guess there'll be something around doing sort of like tummy time and things like that at this stage. But I guess I'm seeing it's just me and the baby at this. It feels like a lot of just me and the baby trying to Yeah, learn about each other and get into some form of routine while still being able to go outside a little bit. Get some fresh air me still be able to eat and yeah, rest, then we'd wait for my husband to come home. He could probably then spend some time with the baby may gives me a bit of a break, although I don't know that probably hard for the baby to just have this new figure. And it's had me all the time. And then, yeah, I think I'm just imagining, hopefully some kind of routine at this stage of the sleep, eat, maybe a little bit of something else. And then guess that happens again, I'll repeat throughout the night and wake up the next day and do it. At six weeks, I'm hoping that I'll still be in the sort of getting to grips of it stage rather than bored of it stage. That I feel quite I feel like six weeks might be I guess, how I've told that is a hopeful one, but a part

of me is worried that it potentially might not look like that as well, I guess. But that's that's how I imagined it. But I'm cautious about that that imagined scenario, I would say.

Example 2:

Childbirth

I imagine that it's going to start home, tell me if I'm going on the wrong sort of tangent. But I imagine it will start at home. And I'm hoping that we can keep it quite peaceful. We've been trying to look at like Hypno birthing options, it's about keeping the lights dim and well, just trying to keep calm in general. And then as things progress, I imagined I'll get mum involved, and my partner and then we'll go to the hospital. I think that's probably where my anxiety is probably going to get worse because I don't think anyone likes the hospital anyway. Of those where you go to get help. It's it's like artificial lights, isn't it? Is it slightly just see all like negative, you just relate to a negative thing rather than a positive? And then I imagined I'm going to be in a lot of pain for a good few hours. Suppose I hadn't Yeah, hadn't really thought too much about how or what will happen. There's probably a bit of naivety, that if you don't think about it too much, you just can wing it. probably not The best way to be? Yeah, can't really think what else.

First day

I imagine it'll be me and my partner and we'll have lots of cuddles and I'm hoping that everyone doesn't come round at once. every one stays away and we can kind of just get to grips of what we've just done in a good way I don't think anything can actually mentally prepare you to bring in home like a little human that you've actually got to take care of that you're you know, you're their your full responsibility. But I can see us in this home. We've only just moved into this place really only been here a little while but it does feel like home. And yeah, it just seems glowy. Not scary. I'm sure parts of it will be scary. Yeah, that's it.

Six Weeks

I can see myself being happy. getting up. sorting the baby stuff out. Like, like changing and dressing and then doing a lot of chores because I'll be at home so it'll all be for me to do perhaps going out for a walk. My mum is going to be around a bit. She said she's going to

cut down some hours at work. um in the first few months, so I'll have someone to spend some time with. So I might, as much as I think it's going to be really good. I do think it's probably going to be a bit lonely as well. Because as much as no one wants to work we have to work don't we to earn money, but it's where you socialise and you get your adult conversation. So I think I might be a little bit lost for a little while. But I think that's probably why I feel more anxious about being six weeks on, because I know I'll be up at night. Six weeks is still fairly fresh, though. I'm not saying that babies are novelty sounds really bad. But I would have got into a routine and we'd like got in that routine of being quiet, doing everything quite solo. I feel like I just really waffled sorry. And then I'll come home eventually. And then if I go for a walk, my parents or my mum sorry, make dinner and start again the next day.

Example 3:

Childbirth

Wow, that's a tough one. From the moment that I'm in the birth centre, for example... And guess it's going to happen at home, I don't do much nowadays. So the first phase of labour will be at home, I did Hypno birthing course, so I will use breathing techniques. And the advice is to only go to the birth centre or hospital if my contractions are if I have three contractions within 10 minutes. So then I have to phone the birth centre which I chose, go in, they will examine me and if I'm four centimetres dilated, they will send me to the room. I want to have a water birth and my husband would be with me he was set up the room we prepared everything so I have a lavender scents and lavenders spray and pool playlist are different music. I also have an app for hypnobirthing so if I want to use the app and it will guide me through the breathing techniques and positive affirmations and I think I'm going to use gas and air I don't want to use anything else but I guess everything can change that's it really... Well, the the waters will break at some point I'm going to lose my mucus plug We

have to call a taxi, we don't have a car. And we will carry two luggage to the person for the one for the baby, for myself.

First day

This is what I never imagined. I tried, but I just can't, I have no idea. I guess I will be really tired and excited as [kind of at the] same time. So we'll come home and probably go to bed. I don't think I will be able to sleep because I will just watch her if she's still breathing. just focused on keeping her alive. Nice 24 hours. I think my husband will be here with me for at least two weeks. So that's what will maybe help. But we just don't know what we are doing I think. Yeah, it's really hard to imagine. I have no idea what we're doing.

Six weeks

don't really know how a baby is doing when, when it's just six weeks. So I also can't imagine I just think I will be less anxious if we made it to six weeks then we cannot be fine but yes, it's the same I have no idea I assume I will still feed her and I want to breastfeed, hopefully I can but I don't even know if it's still the every three hours or, or doesn't have to happen every three hours. I guess just because I don't have enough information or knowledge about it yet. I can't imagine. Yeah, okay. That's the 24 hours.

Appendix L

Coding frame for the sources of simulation question

Type of knowledge	Code
Semantic –general and personal conceptual knowledge that can be acquired through sources such as books, TV programmes, pregnancy, and parenting classes.	1
General autobiographical knowledge – general event memories or 'mini-histories' that can't be dated, not linked to a specific event	2
Episodic –event specific knowledge relating to their own experiences of the events being imagined.	3

Examples of sources of simulation question

Example 1

Childbirth

Erm just how I planned in my head how I wanted it to be so I've want it to run quite smoothly. I want a water birth. Because I think it looks quite soothing, quite calming. And that's all I really want. I just want to be calm and less pain as possible really.

First day

Just an ideal situation of how I would like it to be. From Seeing friends have babies and how their days have been when I've seen them with their partners when they just come home and family. I've also got eight nieces and nephew so experienced my brothers and sisters bringing their babies home, how they've got on with it,

Six weeks

So I've had quite a lot of practice again, just from previous experience with friends and family how they've been with their baby six weeks after. having lots of practice with newborn babies, I kind of know what to expect from it.

Example 2

Childbirth

"That's it? Yeah. And so, in part, my mom and my own team, and a lot of time talking about all the horrific outcomes of labour. And I remember even as a young teenager hearing No. Never been able to wee the same again, horrific. Yeah, unhelpful definitely backfired a bit and my mum and she had me have an accident which meant that her pelvis was misaligned when she was younger and that really impacted her birth with all of her children. Yeah, she's got four and all of the birth quite hard because of the pelvis not begun. is quite open.

First day

You know, and seeing people's images around that first 24 hours, so often you see the photo of the back of the dad carrying the car, see that kind of thing? And that's a picture of my husband carrying shopping bags. When we were on our honeymoon. And I often think of that picture without the shopping bags, but with a car seat, which is a bit strange. Yeah. And kind of merging two, two pictures together. I think I definitely think think a lot about my husband holding a baby. And so I don't particularly know where that pictures come from. But in a, in a dream a dream about a that. And and I've got pictures of kind of probably mixed in with things I've seen with myself when I was little kind of having a bath in the sink. Oh yes, those those those Oh old fashioned pictures Yeah, kind of imagining what that would be like if it was a baby, my baby and I think my husband's black I'm white so like we have a mixed race child and I think I sort of had pictures of seeing mixed race children and kind of imagining a little bit of what our child might look like but almost their faces often not really there in a dream and I think partly because we don't know what they look like they could look in lots of different ways and ways our child could look. I don't imagine like a mini me. Am I more imagine a mini my husband? I think because I kind of picture him more in them than me. And but that's it. Really happy. It's not a horrible thing. And and then I think possibly in sort of things like one born every minute and kind of the kind of all that you tend to see in the new parents just staring at the baby and what do we do now. Yeah, I'm seeing family members and friends who've gone through that early, early stage of just like constant breastfeeding and nappy changing and not much sleep. So just see [unclear] living out alongside them. Yes, seeing a new baby. I think that may be where things come from. Yes. Lovelace much, much more positive. There isn't. I don't really have negative. And so I haven't really got negative pictures or imagery when I think about that bit of having a baby.

Six Weeks

Friends and family. So I've got a few close friends where they when they've had a baby, and they've got older children, I've been there for kind of when that's feeding and putting that older child to bed, but I've gone to support that premise and kind of been the extra pair of hands Oh, baby. And so I think sort of being in the thick of someone else's six week ish, and life and kind of having a new baby and adjusting to that. And definitely just just visiting people and seeing what their homes are like. I think we've talked myself and my husband have talked about it quite a lot in terms of the routine and kind of him being at work and me

being at home. And so definitely, just the conversations we've had. Little things like you want to move the rooms around the furniture changes. So when I was imagining it, I was imagining it, how it talked about it being so like, different. So furniture and things, and cupboard spaces looking different and kind of that kind of, it's more kind of things we've talked about. And, and then I think probably things I've seen on TV as well, and things I've read about. And so mixture really, I definitely think that picture kind of both of washing hung everywhere. Yeah, something I've seen long. Yeah.

Example 3:

Childbirth

So I think recently from like, reading about hypno birthing, and I've just started pregnancy yoga, well actually I've not just started doing for about nine weeks now. And I think that has drastically changed how I view giving birth. I think beforehand, I would have envisaged like lying on my back in a hospital with medics around me. It'd be, you know, bright lights, very medicalised. And I think that has changed actually, since being pregnant and doing some reading on it actually.

First day

I'm probably … from friends, friends, experiences of having newborns and hear hearing about

Six weeks

Again, probably from just what I've heard from friends.

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