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Women and midwives' experiences of an audio-visual enhanced hospital birth environment: An interview study

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ABSTRACT

Problem: Most hospital birth environments remain clinical in appearance and are not attuned to the neurohormonal processes that orchestrate labour and birth. Hospital environments are therefore not aligned with the innate needs of a woman to feel safe and secure in the place where she gives birth.
Background: Research has suggested that audio-visual effects such as nature images and sounds may help promote physiological labour in women at low risk of complications. This study aimed to explore the experiences of women labouring in a hospital birth environment enhanced with audio-visual technology, regardless of pregnancy complexity and use of interventions. Experiences of midwives providing one-to-one midwifery care in this environment were also explored.
Methods: Transcripts of semi-structured interviews conducted with thirty-two women and six midwives were analysed thematically.
Findings: Universally, women reported that access to audio-visual imagery and soundtracks in the birth environment positively influenced their experience of labour. Nature images and sounds during labour helped create serenity and calmness within the woman and her surroundings, allowing her to relax and focus inwards. Midwives used this technology to create a calm and psychologically safe environment for women giving birth in the hospital. Projecting nature images and sounds became a medium for midwives to create ambience and instil calmness in the clinical environment. Midwives also reported observing positive impacts on the behaviours of other clinicians entering the room.
Conclusion: Audio-visual enhancement of the hospital birth environment was found to enhance women's birth experiences and support midwives providing woman-centred care.

Statement of Significance

Problem or issue:

Increasingly, birth spaces are characterised by pervasive technology and surveillance and at odds with an environment conducive to physiological labour.

What is already known:

Birth spaces play an important role in shaping women's experiences. Audio-visual effects may help promote a relaxing atmosphere in the hospital environment however this has not been explored with women experiencing complex pregnancies.

What this paper adds:

Altering the birth environment by projecting nature images and soundtracks during labour helped create a calm hospital birth environment for women, birth partners and midwives, even when interventions were used. Midwives reported observing a positive effect on the behaviours of other clinicians entering the room.

Introduction

To facilitate physiological labour and birth, a woman needs an environment that is calm, safe and secure, and quality care that minimises the risk of complications [1]. Many women place a high value on their capacity to give birth physiologically, expressed variously as

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'normal' or 'natural' birth, or birth without technical or pharmacological interventions [2]. When interventions are needed or wanted, women wish to retain a sense of personal achievement and control by being involved in decision-making [2]. Recognising the transformative experience of childbirth and placing the woman and her perception of safety and well-being at the centre of care has been established by the World Health Organization as a hallmark of good quality maternity care [3].

Parratt and Fahy [4] theorised that a safe and secure environment is one where the woman retains control of who is present and what attendants do. This environment enables the woman to let go of the need to be vigilant so that she can turn inward and respond intuitively to her body, facilitating her potential for a physiological birth [4]. When a woman can let go of the need to be vigilant, she enters gradually deepening levels of altered consciousness and, in this state, the hormonal cascade necessary for effective labour is optimised [5]. The production of endorphins is also optimal in this state, which assists the woman's endurance of labour and further letting go of inhibitions which ultimately leads to spontaneous birth [6]. A problem with the hospital birth environment is that increased technology has resulted in birth spaces that are characterised by high levels of surveillance of the birthing woman [1]. Stenglin and Foureur [1] criticised the lack of consideration to a woman's inherent, mammalian need to feel safe and secure in the space in which she gives birth. Midwives providing hospital-based intrapartum care report decreasing opportunities to provide the quality woman-centred physiologic care that evidence shows benefits childbearing women [7].

A scoping review [8] reported direct and indirect impacts of the physical environment on birth intervention rates. The authors noted that all sensory elements embedded in the space are important to create a calm and relaxing atmosphere. A systematic review published the following year [9] established means of distraction, comfort, relaxation, and a diminished technocratic environment as environmental aspects that positively influenced physical and emotional birth outcomes. Both reviews upheld that audio-visual technology was a strategy that may help promote a relaxing atmosphere, reduce anxiety, and produce physiological benefits for labouring women. However, for women experiencing complex pregnancies or interventions the impact of an altered birth environment has not been explored. One aim of this study was to explore the experience of women, regardless of pregnancy complexity, in an audio-visually enhanced hospital birth environment. The second aim was to explore midwives' experience of providing midwifery care in this changed hospital birth environment.

Methods

The setting of the study was an obstetric-led birthing unit in a public hospital in northern regional Australia locally referred to as 'the birth suite'. One room in the hospital birth suite was fitted with a ceiling-mounted projector that projected imagery onto a motorised retractable screen that covered one wall of the room. Two speakers were also installed. An iPad tablet was connected to the projector via Apple Play. An application on the tablet offered a selection of 16 nature themed films with accompanying nature sounds or instrumental music.

This study was underpinned by Naturalistic Inquiry [10] and used an exploratory approach. Data were collected using semi-structured interviews and digital files were professionally transcribed. Thematic analysis offered a robust method for analysing and interpreting patterns across a qualitative dataset [11]. The six stages of Braun and Clarke's framework were employed: become familiar with the data; generate initial codes; search for themes; review themes; define themes; and produce a report of the analysis [11].

Women receiving care from the all-risk Midwifery Group Practice (MGP) care model were invited to participate. The decision to recruit from MGP was made because the intervention was considered to align with the MGP philosophy of care and to readily identify women potentially enrolled in the study when they presented to birth suite. Women were eligible to participate in this study if they were booked into MGP during the recruitment period, planned a vaginal birth, were at least 37 weeks' gestation at the onset of labour, and were able to provide informed consent in English. Women were excluded where the pregnancy was affected by a foetal abnormality and/or admission to Neonatal Intensive Care Unit was planned or deemed likely. Midwives were eligible to participate if they were employed in MGP during the study period; study team members were ineligible to participate.

Women were informed of the study by their primary MGP midwife from 28 weeks' gestation; those interested provided written consent. Woman participants were allocated to the room with the audio-visual enhancements if it was available at the time of presentation to the birth suite. Verbal and written information were provided to MGP midwives by midwifery members of the study team regarding the purpose of the study, the procedures, and the voluntary nature of participation; written consent was obtained from midwives who agreed to participate.

Convenience sampling was used; sample size was guided by data saturation for both participant groups. Evidence suggests little new information is obtained as the sample size approaches 20 interviews [12]. A separate and smaller convenience sample was drawn from the population of MGP midwives. Guest et al., [12] assert that in a homogenous sample the first five to six interviews produce most of the new information in a dataset.

Interview guides for the women and the midwives were developed based on principles outlined in DeJonckheere and Vaughn [13]. Open-ended questions invited participants to share their unique perspectives and experiences of the audio-visually enhanced birth environment. Midwives were invited to share the experience of caring for women in the altered birth environment.

Audio-recorded interviews were conducted face-to-face or via telephone, and professionally transcribed verbatim. A midwife conducted interviews with women. A senior researcher not directly involved with the midwives in a clinical or managerial role interviewed participating midwives. Any preconceived notions about the topic held by the interviewing researchers (MH, CN) were minimised by concentrating on participants' language and narrative and by verifying meaning with participants. Extensive field notes were written immediately post interviews.

The rigour and trustworthiness of the study was enhanced by adhering to widely accepted criteria introduced by Lincoln and Guba [10]. Techniques to address credibility included prolonged engagement with the data and researcher triangulation. Regular debriefing between first and last author provided external check on the research process, and, during data analyses, team meetings were held to discuss each of the themes in the thematic analyses. The process of peer debriefing helped expose aspects of the research that might otherwise remain unspoken [14]. Experienced investigators (WS, CN) debriefed novice researchers (MH, SH).

Researcher characteristics and reflexivity were important considerations in this study. The first author is a midwife working within the MGP care model and had direct experience caring for women using the projector during labour but was not interviewed for the study. This provided a unique lens through which to analyse the data after having personally experienced the use of the altered environment. Two other researchers involved in the analyses were employed in the birth suite but did not provide intrapartum care to women. Insider perspectives were considered likely to influence researcher interpretations and to address this the researchers engaged in reflexive journaling throughout the research process, allowing for critical reflection on her own assumptions and subjectivity [14].

Separate thematic analyses of interviews with women and interviews with midwives were conducted. Data analysis was initiated with repeated close reading of the transcripts. This step aimed for initial comprehension and familiarisation and the creation of preliminary

codes. The concepts embedded within the narratives were preliminarily coded when patterns were established firstly within one transcription, then across transcripts. Discussion between the authors allowed for finalisation of code names, and these were used in a further re-reading of data to identify concepts within an individual transcript which were tabulated. Themes were generated through the collating of the coded data and reviewed repeatedly in a systematic fashion, with names being formed, revised, and retitled through researcher discussions. The process required moving back and forth amongst the transcripts for the interpretation of the phenomenon to emerge as coherent and distinctive themes and sub-themes. Developing meaning and the verification of findings were determined by discussions between the researchers. Themes were illustrated by woman participant quotes denoted with 'W' and midwife quotes denoted with 'M' and a number indicating the chronological order of data collection. Care was taken to minimise the risk of inadvertently identifying any participant.

Findings

Interviews with 32 women were conducted at 4–6 weeks postpartum, between January and April 2020. Table 1 presents demographic and labour characteristics of woman participants. Most women were: in their twenties; multiparous; and experienced labour and birth interventions. Interviews with six midwives were undertaken in May 2020. All midwives reported nursing and midwifery experience prior to current MGP role (refer to Table 2).

Both participant groups expressed satisfaction with image and sound quality, and screen size. Women and birth companions were invited to control the use of the audio-visual equipment. The ability to retract the screen and switch off the equipment quickly, returning the room to a 'standard' room was expressed as desirable by midwives to cater for individual preferences of women and clinical needs. There were no reported negative impacts on medical procedures, and no safety concerns were raised about the use of the audio-visual technology; however, there were reported instances where the equipment was switched off during emergency management upon the request of clinicians.

Thematic analysis of women's transcripts

Three themes emerged from the analysis of the women's transcripts: Redirection of attention; Creation of serenity and calm; and Sensory immersion during childbirth. Each theme had two sub-themes as outlined in Table 3.

Table 1
Demographic and labour characteristics of woman participants.

	n (%)
Age range in years	
≤21	2 (6)
22–29	18 (56)
30–34	8 (25)
≥35	4 (13)
Ethnicity	
Caucasian	15 (47)
Aboriginal and/or Torres Strait Islander	2 (6)
Asian	3 (9)
Other/ Unknown/ Prefer not to say	12 (38)
Parity	
Primiparous	9 (28)
Multiparous	23 (72)
Onset of labour	
Spontaneous	9 (28)
Induced labour	23 (72)
Any labour or birth intervention*	
Yes	25 (78)
No	7 (22)

* Induction of labour; artificial rupture of membranes; Oxytocin infusion; epidural analgesia; episiotomy; assisted vaginal birth; Caesarean section

Table 2
Demographic and professional characteristics of midwife participants.

	n
Age range in years	
20–29	4
30–39	1
40–49	1
50–59	0
Year range of midwifery experience	
<1	0
1–2	3
3–5	1
6–9	1
≥10	1
Year range of Midwifery Group Practice experience	
<1	2
1–2	2
3–5	1
6–10	1

Table 3
Themes and subthemes from interviews with women.

Themes	Subthemes
One: redirection of attention	An outward view in early labour
	Distraction from time and place
Two: creation of serenity and calm	Seeking inner calm
	Sensing calmness in others
Three: sensory immersion during childbirth	Retreating inwards
	Emerging after birth

Theme one: redirection of attention

Women said the projected images altered the physical appearance of the room. The large and illuminated screen became the centre of attention while other features in the room, such as the computer desk and the bed, were less distinct. One woman reflected that "*Hospitals can be scary because they're so clinical, whereas the projector screen was calming. The different light that it brought off and just the different sounds was a nice distraction*" (W9). Another woman commented: "*It was a nice change of scenery considering hospitals are sterile, and you can't change the environment much, and there's a thousand machines around you*" (W28).

Sub-theme: an outward view in early labour

Women described being most aware of the surroundings when they first walked into the room and during early labour. A view to the world outside the birth suite opened the space and helped women settle in. "*My husband loves the ocean so when I saw the ocean one, I said 'oh, I'll put that one on and it will make us both feel at ease*'" (W13). Women who had their labour induced described being able to take in the scenery on the screen while waiting for labour to establish. For example, "*The midwife sat in her corner and let me do my thing. My partner and I sat in front of the screen on the ball for a little while and just watched it*" (W31).

Sub-theme: distraction from time and place

Women shared experiences of long labours, and the duration of labour came as a shock to some. A primiparous woman, reflecting on her labour, which was induced, stated: "*It wasn't what I thought it would be like. It was a huge shock. I couldn't see if it was daytime or night-time, so I wasn't paying attention to what time of the day it really was, or how long I was in labour for*" (W18). The projector distracted from time: "*The room was dark because of the projector. That helped. Even though I was there all day I didn't know what time it was, which was good. It didn't feel like I'd been there all day.*" (W5). And the projector distracted from place: "*My husband and I have done a bit of travelling so that made me think about the*

places we've been and reflect on memories" (W13).

Theme two: creation of serenity and calm

Women explored the impact of the birth environment on their emotional wellbeing during labour. The images and sounds playing on the screen helped create calmness within the woman herself, her surroundings, and her birth companions. One woman shared: "*I remember really well one part where I looked up and was watching the screen. The sound of the water and the birds chirping was really calming. It sounded so real, that they were all around the room*" (W9).

Sub-theme: seeking inner calm

This sub-theme captured the desire expressed by women to reach a state of calmness, and the conscious effort women put in to remain as calm as possible as labour unfolded. One woman recounted: "*The music really helped me control my breathing. 'Cause I was pretty set on using minimal pain relief as much as possible. I had already explored my breathing technique before going in and I think that the calming music helped me stay calm*" (W22).

Continuing with the projector was desired by some women even when labour did not go to plan or interventions were used. The projector became a tool to help ground one woman when she was feeling nervous and apprehensive despite effective epidural analgesia. The woman explained: "*They had already started talking about the lack of progress of labour. I don't know if it was the mood that changed because of what the doctors were talking about, but the projector screen was amazing at that time. I love the beach and the outdoors, and we put on an ocean film, and I just calmed instantly. I don't know if that's what did it, or the room being darker, or my known midwife being there. It was all calmer*" (W19).

Sub-theme: sensing calmness in others

Women readily talked about their partners and other birth companions. One woman expressed: "*I think, when you're in labour, the biggest thing you're worried about is the pain. My husband had never been through that experience either and the projector screen was something for him to be focused on, and you know, calm him down, as well as me. So then he had more of a chance to calm me down when he was calm"* (W9). Similarly, another woman stated: "*I was out of it because I was in so much pain. My husband was stressing out before the projector was put on. Once it was put on, he became calm. Like, if he got worried, he just stared at it for a while and he calmed right down. It calmed him down and because it was calming him down, it calmed me down*" (W7).

Theme three: sensory immersion during childbirth

Women spoke about using visualisation and mindfulness to help cope with intense contractions as labour progressed towards birth. "*I was watching the dolphins swimming in the water. I was just thinking of them being free and how my body would be free after giving birth"* (W13).

Sub-theme: retreating inwards

Women described retreating inwards to cope with the intense sensations of childbirth. Some were able to take in visual and auditory information from the projector even during advanced labour: "*I guess it was probably at transition. In my head, I didn't say it, but I was like 'oh my god, I can't do this'. I think it was during that time that I was looking at the screen and was kind of like 'take me away'. I was trying to completely take myself out of what I was in, the intensity of the pain*" (W11). Another woman described: "*I felt I was in a bit of a trance looking at the screen. I felt labour was really intense really quickly and that there just wasn't much of a break. I was on my back and the midwives were trying to help me up. I just felt it was way too painful to get up so yeah, I was lying there, and when she put the screen on, I just rolled over and was just staring at it*" (W25).

While some women continued to watch the screen, others closed their eyes. "*When I had my eyes closed, I could sort of see the changes in the light due to the different light shades*" (W22). Another woman elaborated: *"The image was underwater and blue. I was having a waterbirth. I could still hear, and I could still see blue light around the room anyway so even when I wasn't looking directly at it, I could still sort of get visual information from it*" (W21). One woman, faced with similar interventions as her previous birth, shared how she needed to shut everything out, including what was happening to her body. "*When I was pushing, that's when I was faced to the side, my face was turned to the side to look at the screen. I was trying not to look at everyone in the room. I was looking at it for a bit of a distraction from the pain when I could, and to distract me from what was going on*" (W29).

While many women continued with the projector until birth, some found it unhelpful when labour was at its most intense and either chose to turn it off or ignored it completely. "*I think by the time I was in the shower I was blocking out everything. Beforehand it was easy to focus on it. Things were getting hectic once I was in the shower*" (W31). Another woman stated: "*To be honest I wouldn't have noticed if it was on or off at the hairy end of things*" (W16).

Sub-theme: emerging after birth

Women described intense sensations and emotions after the birth of the baby. "*Even after the placenta was out, I was still in a lot of pain, like I remember, I was shaking. I don't know how long it took, but it wasn't comfortable for a long time*" (W25). Painful stimuli continued for some even though the baby was born. "*The images were still playing after the birth. By the time the midwife got to suturing, I'd been poked and prodded. It was nice that I could still continue to look at the screen*" (W28). Continuing the same sounds and light in the room helped transition the woman to the postpartum. "*Even after the birth we just left it on, and baby was looking at it, and we were all just relaxed, and it was all still kind of happening, and I think that was nice*" (W21).

One woman reacted negatively when the screen was abruptly turned off after the birth. "*The music stopped at one point. I don't know if that was just after I had given birth and we stopped it, but I really noticed that it was a lot, just a change in the sound, that it was gone. And I couldn't imagine not having heard it*" (W11). Another woman described how she felt immediately after the birth: "*Even afterwards, I was absolutely exhausted, I had sweat dripping off me, and I was just sitting there in the bed absolutely exhausted, and the music in the background was just playing, and it was just one of those moments, you know, you can't beat that moment. I'm getting goose bumps just talking about it because that moment was so nice*" (W4).

Thematic analysis of midwives' transcripts

Three themes emerged from analysis of the midwives' transcripts: Belief in the creation of a safe birth environment; Holding space for the woman; and Improving the experience of providing care.

Theme one: belief in the creation of a safe birth environment

Projecting images and sounds during labour as a medium to create a safe and secure birth environment resonated with the midwives and aligned with their identity as a midwife and their birthing philosophy. "*I like it because I am a quiet, dark labour room midwife. I think the more clinical, the more medicalised; the more lighting*" (M4). Another midwife explained: "*It takes away that real clinical feel. It's nice to be able to make the room really dim and turn all the lights off. It usually creates enough light in itself to light up the room. It just makes it feel like a really safe environment. I think when they feel safe, they're always much more receptive to trying different things"* (M2).

Alleviating fear and anxiety during childbirth were important to midwives. "*The projector screen added something calming and happy to the room when they could otherwise be quite anxious about what was happening*"

(M1). One midwife reflected on her role when caring for women during childbirth. "*I guess I just really believe creating that environment where someone feels comfortable is extremely important for their mental state and their ability to cope with pain during labour"* (M3).

Midwives recognised the need to also support partners during labour and birth. "*Partners get anxious as well. When you're creating that positive birth environment, it was keeping them just as calm as mum was*" (M1). This was expounded by another midwife. "*It [the projector] really engaged the partners. I think it gives them some sense of control. Because it's an unknown environment, they don't really know what to do. They can't take the pain away. I feel like a lot of the men do feel overwhelmed by that because there's not really any way they can help. It gives them some sense of control. Because I usually would put them in control of picking the films. I found I would look over often and just see them sitting there watching it*" (M2).

Theme two: holding space for the woman

One midwife described becoming more aware of the impact of the birth environment after experiencing the effects of the projector. "*I really enjoyed the effects from it. I liked seeing how it relaxed the women and the partners and made the room less clinical. So, I think I started incorporating those really relaxing things and encouraging them to be as relaxed as possible"* (M2). The midwives also noticed an impact on other midwives and doctors. "*When other health professionals are coming into the room, I can notice a difference in their tone of voice and how they approach the woman with the projector on, which I think is really helpful as a practitioner*" (M3). The midwife explained: "*When we're caring for women one on one in a continuity of care model like MGP, we feel quite strongly about advocating for our women and the kind of birth that they want. I guess the projector was kind of a physical manifestation of that which was then projected to other staff, which then in turn made us feel more confident in caring for them in the way that they'd chosen to be cared for"* (M3). The projector helped midwives hold space for women. "*Everyone should have their birth space protected. I think it has changed our practice a bit, made us more aware. If someone was coming from outside the room, rather than just walking in guns blazing, it was almost like an upfront conscious reminder; 'okay, this is a calm room, and we need to keep our voices calm'*" (M1).

Theme three: improving the experience of providing care

Witnessing the effect of the projector motivated one midwife to encourage its use with other women. "*Women used the projector screen differently. Some didn't like the music, and some put it up really loud. Some just liked the visual. It just made me more excited to go into that room, because I'd had this really lovely experience with one of my ladies*" (M5). Several midwives reflected on their own wellbeing when caring for women using the projector. "*As a midwife, I feel very calm in the environment as well*" (M2). "*It naturally just calms you. So, you being calm, helps you calm the woman*" (M1). A third midwife participant related: "*I was really calm in the room too. I think it actually reduces your intervention because you're calmer and you're less overthinking things" (M6)*.

Midwives shared professional and emotional challenges sometimes faced when caring for women in the hospital environment. "*I think sometimes caring for certain women in labour can be quite stressful. I think as a health practitioner the projected images and sounds helped set the tone for the care that we're going to provide to that woman*" (M3). The calming effect of the projector helped one midwife in a stressful situation. "*The monitoring machine was finding it quite hard to find baby, so I had to constantly hold it on her. Then I found that I was just sitting with her watching the screen and listening to the music*" (M4). The same midwife provided another example of how the projector helped 'pace' her clinical care. "*I had one woman; she was being induced because her baby had passed away. We just had the Northern Lights playing for hours and hours and hours. The background music was soothing. It was, I think, a little bit of a break from the room for me. You could dive in and be caring and then you could take a step back and have a look at the Northern Lights and have a listen to the music and then get back in. It was almost a way for me to be able to pace my care for her*" (M4).

Discussion

Our study offers insights into women's and midwives' experiences of an audio-visually enhanced hospital environment and included women experiencing complex pregnancies. The mood and atmosphere of a space should not be underestimated as it can support the birthing woman by influencing hormones [15]; creating "sanctum space" [1], offering empowerment [16], and emotional support [17]. A present challenge of the hospital birth environment is balancing medical indication for surveillance and clinical safety features while promoting a calming and protective space for women [18]. The audio-visual effects in our study allowed women to redirect attention away from the clinical surveillance occurring in the room and subjectively lowered stress by instilling a sense of calm and awe using vivid imagery and sounds and thus created 'atmosphere' and a birth environment that felt calm and protective to women and midwives.

Woman participants wanted to experience physiological labour and birth as much as possible and appreciated the opportunity to labour in an environment that promoted physical and emotional wellbeing, consistent with findings of a systematic review [2]. There is growing interest in ways to enhance both the experience of the woman and promote physiological birth, to reduce over-medicalisation and increase maternal satisfaction [19], and support midwifery's woman-centred professional philosophy to protect physiological birth [20]. Maximising physiology optimises a woman's ability to give birth [5] and should be facilitated for women experiencing complex pregnancies as high rates of interventions and lack of self-determination are contributing factors to psychologically traumatic births [21,22]. The audio-visual enhancement of the hospital birth environment offers a strategy that may help provide a birth environment that better meet women's physiological and psychological needs.

Midwives lament the disruption to physiological birth occurring in hospital and hindrance of the provision of clinical care aimed at a physiological approach to birth [23,24]. Such risk focused birth environments restricts midwifery autonomy and practice [25] and contribute to dissatisfaction and burnout among midwives [23]. Midwife participants found that the audio-visual enhancements helped minimise disruptions to the woman. When midwifery and obstetric colleagues entered the room, midwife participants observed a quieter approach by staff and a greater awareness of the disruption to the labouring woman. The audio-visual enhancements thus helped protect the space for the labouring woman similar to the 'making space for the woman' described in Davis and Walker [26] and afforded the midwife autonomy to facilitate the birth environment which they felt best supported the woman.

The impact on midwives' own wellbeing was evident. Midwifery care during labour involves the midwife instilling a sense of confidence in the woman's embodied ability to give birth while attending to routine assessments and tasks. This tension is described as the 'swan effect' [27]; on the surface the swan may look calm and serene, suggesting a confident belief that everything is fine, everything is normal; but below the surface the feet are 'peddling fast'. Participant midwives recognised that the job was stressful and spoke about their own ability to remain calm in a risk focused environment. Nature images and sounds assisted the midwife in "setting the tone for the care" and being emotionally present with woman. It has been posited that if midwives feel supported by the physical environment and experience enhanced wellbeing they will be better positioned to provide quality woman-centred care [28].

The comfort and wellbeing of the partner or birth companion directly impacted the woman's wellbeing and satisfaction with birth experience. The relaxing effect of the projected images and sounds allowed the partner to withdraw for rest when needed. This contributed to reducing the woman's concerns and stress stemming from her concern for the

partner. Nielsen and Overgaard [29] shared a similar finding and reported that women spoke positively about their partner's role and found the wellbeing of the partner very important for their own psychological state of mind during labour. With the often limited comforts available to birth companions in hospital birth environments [30], the audio-visual enhancements were welcomed by partners in our study.

Woman participants for whom the light and sound emitting from the projector continued after birth reported very positive effects from its use at this time. Women experience labour and birth on a continuum and not in 'stages' [5]. This is supported by the current understanding of physiological labour and birth and peak oxytocin surge occurring at the time of birth and immediately postpartum [31]. Respectful quiet and continued ambience within the room was appreciated by the women in our study and helped facilitate undisturbed contact with the newborn. Undisturbed contact after birth has an impact on breastfeeding, newborn wellbeing, and bonding [32] and clinicians should be made aware to minimise disruptions at this time. The chance of undisturbed contact with the newborn was improved in an enhanced birth environment room in another study [33].

Strengths and limitations

The inclusion of the experiences of women with complex pregnancies and interventions is a strength of this study. Exploring the experiences of women and midwives outside a MGP model may offer further insights as continuity of midwifery care is known to improve the experiences of women and midwives [34]. This was a single site study and none of the women were from non-English speaking backgrounds. The views of the birth partners were beyond the scope of the study; however, we elicited their experiences through the views of the women. The views and opinions of hospital midwifery and medical staff were not the focus of the study; however, some participant midwives related observed comments and impact on this group.

Future research

This study provides foundational evidence to support the design of a multicentre randomised controlled trial with multiculturally diverse women to further evaluate the use of audio-visual enhancements in the hospital birth environment for women experiencing complex pregnancies. It is of importance to gain insight into the experience of women with complications during pregnancy or childbirth and how best to support them.

Conclusion

An audio-visually enhanced hospital birth environment positively influenced women's birth experiences. Women appreciated the opportunity to labour in an audio-visually enhanced environment and found the audio-visual effects effective in creating a calm birth environment during hospital birth. Midwives wished to continue the use of imaging and sound projection and reported enhanced wellbeing and improved experiences of providing care.

CRediT authorship contribution statement

Mariann Hadland: Data curation, Investigation, Formal analysis, Writing – original draft. **Sari Holland:** Conceptualisation, Formal analysis, Writing – review and editing. **Wendy Smyth:** Supervision, Formal analysis, Writing – review and editing, Validation, Project administration. **Cate Nagle:** Supervision, Project design, Data curation, Investigation, Formal analysis, Writing – review and editing, Validation.

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Ethical statement

Ethical approval of the study was granted by the Hospital Human Research and Ethics Committee (HREC/2018/QTHS/47964). The study was undertaken according to research ethical guidelines, participation was voluntary, and informed consent was obtained from all participants.

Declaration of Competing Interest

None declared.

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