# A single-centre feasibility study, measuring the outcomes of spontaneous pushing and directed pushing on maternal and neonatal outcomes among women without epidural analgesia during the second stage of labour

by Jiasi Yao

Thesis submitted in fulfilment of the requirements for the degree of

Doctor of Philosophy

under the supervision of

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# Certificate of original authorship

I, Jiasi Yao, declare that this thesis is submitted in fulfilment of the requirements for the award of Doctor of Philosophy, in the Faculty of Health at the University of Technology Sydney.

This thesis is wholly my own work unless otherwise referenced or acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

This document has not been submitted for qualifications at any other academic institution.

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## Acknowledgement of Country

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# Publications included in this thesis

## Statement of contributions to jointly authored works contained in this thesis

The systematic review and scoping review of the literature and results from this thesis have been submitted for publication in several peer-reviewed journals. I take full responsibility for the accuracy of the findings presented in these publications and in the thesis. All authors have given their permission for the publications to be incorporated into this PhD.

## Statement on the format of the thesis

This thesis is submitted as a Thesis by Compilation; it compromises of eight chapters. Chapter One introduces the evidence focusing on normal labour, birth and pushing practices during the second stage of labour. Chapter Two, a systematic review, has been published in *International Journal of Nursing Studies*. Chapter Three comprises of a scoping review on spontaneous pushing which has been submitted to *Nursing & Health Sciences*. Chapter Four outlines the study methods, with the protocol published in *JMIR Research Protocol*. Chapter Five details the feasibility results of the study and is currently under review with *Contemporary Nurse.* Chapter Six presents the results of women's postnatal survey on women's experiences and has been published in *Women and Children Nursing*. Chapter Seven highlight results from interviews with midwives and is under review with *Birth*. Chapter Eight discusses the study findings, linking them to the existing knowledge and offering recommendations for future research, education and clinical practice.

Publication details are outlined below, along with a statement of percentage of contribution of each author. Some repetition occurs between chapters, as each includes similar background information, allowing the publication to stand alone and provide necessary context for reviewers and readers of that particular journal.

**Incorporated as Chapter Two**

**Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu and Xianying Li, Kathleen Baird. (2022). Benefits and risks of spontaneous pushing versus directed pushing during the second stage of labour among women without epidural analgesia: A systematic review and meta-analysis. *International Journal of Nursing Studies.134*, 104324. DOI: 104324.10.1016/j.ijnurstu.2022.104324.

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## Permissions



## Conference presentations related to this PhD

**2022**

**Yao J.,** Roth H., Anderson D., Baird K. *Spontaneous versus directed pushing: a systematic review and meta-analysis* (3 Minute Thesis Oral presentation). University of Technology Sydney Research Student Forum, Faculty of Health, Sydney, New South Wales, Australia.

**Yao J.,** Roth H., Anderson D., Baird K. *Comparison of Spontaneous pushing versus directed pushing: a RCT protocol* (5 Minute E-Poster). University of Technology Sydney Research Student Forum, Faculty of Health, Sydney, New South Wales, Australia.

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# Glossary of terms

| | |
|---|---|
| ACNM | American College of Nurse-Midwives |
| ACOG | American College of Obstetricians and Gynaecologists |
| AWHONN | Association of Women's Health, Obstetric and Neonatal Nurses |
| CASP | Critical Appraisal Skills Programme |
| CEQ | Childbirth Experience Questionnaire |
| CEQ-C | Childbirth Experience Questionnaire (Chinese version) |
| ChiCTR | Chinese Clinical Trial Register |
| CI | Confidential Interval |
| CONSORT | Consolidated Standard of Randomised Trials |
| CRF | Case Report Form |
| CSC | China Scholarship Council |
| ICM | International Confederation of Midwives |
| JBI | Joanna Briggs Institute |
| MD | Mean Difference |
| NAATI | National Accreditation Authority for Translators and Interpreters |
| NICU | Neonatal Intensive Care Unit |
| PRISMA | Preferred Reporting Items for Systematic reviews and Meta-Analyses |
| PRISMA-ScR | Preferred Reporting Items for Systematic reviews and Meta-Analyses for Scoping Review |
| RCT | Randomised Controlled Trial |
| RR | Relative Risk |
| SD | Standard Deviation |
| SPIRIT | Standard Protocol Items: Recommendations for Intervention Trials |
| VAS | Visual Analog Scale |
| WHO | World Health Organization |

# Impact of COVID-19 pandemic on my PhD

The COVID-19 pandemic had an enormous impact on my PhD study. Due to the extended lockdown policy implemented by the Chinese government, I was unable to travel to Australia, and therefore I had no option but to commence my PhD online which presented several challenges. Although the University of Technology Sydney and the Faculty of Health provided numerous online training opportunities, the virtual platforms such as Zoom and Microsoft teams could not replace the experience of being physically on campus. This made it difficult to connect with other PhD colleagues and to meet with my new supervisors in person. As a result, the uptake of new knowledge and skills was less than satisfactory, and it affected the overall experience of starting my PhD. Despite these initial difficulties at the beginning of my PhD journey, I was very fortunate to have supervisors who were highly engaged, supportive and available via email and fortnightly online meetings.

Another unexpected challenge arising from the COVID-19 pandemic was the reduced opportunity to meet and recruit pregnant women as participants in my study. In China, many couples delayed plans to have a baby or chose to avoid hospital visits during pregnancy due to concerns about the COVID-19 virus. This created significant challenges in participant recruitment, which took much longer than anticipated and affected the overall progress of the study.

# Abstract

## Background

Directing a woman to push during the second stage of labour is common practice worldwide, including China, and is termed as 'directed pushing'. However, the mechanisms and outcomes of directed pushing have been insufficiently researched. Since the 1950s, the process and outcomes of directed pushing have been questioned and debated. More recently, 'spontaneous pushing' which occurs when a woman pushes involuntary by following cues from her body is being evaluated with the aim to increase a woman's control over her own labour and birth, leading to a more positive childbirth experience. Current evidence on pushing methods during the second stage of labour remains conflicting, with a lack of high-quality original trials. This study aimed to systematically review the literature on pushing strategies during labour and assess the feasibility of a future randomised controlled trial (RCT) comparing the effects of spontaneous pushing and directed pushing on maternal and neonatal outcomes in the Chinese context.

## Methods

The study was conducted using a mixed method design, over two separate phases. Phase One included a literature review of the evidence on spontaneous pushing and directed pushing, including a systematic review, meta-analysis and a scoping review. Phase Two consisted of a non-randomised, non-inferiority feasibility study comparing spontaneous pushing during the second stage of labour with standard care (directed pushing). Quantitative data on women's and newborn's health outcomes were collected using Case Report Forms while surveys were used to assess women's acceptability and childbirth experience. Qualitative data were collected through interviews with midwives who had facilitated spontaneous pushing and were analysed using thematic analysis.

## Findings

Findings from Phase One revealed that spontaneous pushing during the second stage of labour was associated with reduced rates of caesarean section and a lower risk of extended episiotomy. It also identified several strategies used to facilitate spontaneous

pushing. Phase Two demonstrated the feasibility and preliminary effectiveness of supporting spontaneous pushing in the Chinese context. Women's participation rate was 43% (423/995) with an overall retention rate of 24% (102/423). Women were generally satisfied with their experience. Importantly, spontaneous pushing did not increase risks for the woman and newborn, with showed potential benefits, including less blood loss volume at the birth of the placenta (P=0.046) and one hour after postpartum (P=0.033). Midwives viewed the approach as a welcome return to a more physiological process of childbirth. They reported the change in practice was easy to implement and expressed a desire to see it adopted more widely in the future.

## Conclusion

Supporting spontaneous pushing was found to be both feasible and effective within the Chinese context, confirming the feasibility of conducting a future RCT to compare the outcomes of spontaneous pushing with the routine practice of directed pushing during labour. The research confirmed spontaneous pushing offers benefits for women without increasing risks. Both women and midwives found the practice highly acceptable as an alternative to the routine practice. Recommendations for future studies include improving the recruitment process for participants and enhancing the prenatal education for women and training for midwives.

# Table of Contents

# Chapter One: Introduction

## 1.1 Chapter preface

Chapter One outlines the background of the midwifery model of care, with a focus on the physiological processes of labour and birth. It also provides an overview of current knowledge on pushing during the second stage of labour and presents the research questions, aims and objectives of the study. This chapter serves both as an introduction of the study and a guide to the structure of the thesis.

## 1.2 Background

Sexual, reproductive, maternal, newborn and adolescent health are essential components of the Sustainable Development Goals (United Nations Population Foundation, 2021). Intensive global efforts have led to great progress in reducing maternal and newborn mortality and improving the health and well-being of women and newborns (World Health Organization & United Nations Children's Fund, 2020). In the past two decades, maternal and neonatal mortality rates worldwide showed a reduction in these statistics of 35% and 42% respectively (World Health Organization & United Nations Children's Fund, 2020). In 2010, the '*Every Women Every Child Global Strategy'* was launched by the World Health Organisation (WHO), with the aim to improve the health and well-being of women and their babies (World Health Organization, 2015). After ten years of collaborative efforts, it was reported in the 2020 Progress Report that the past decade has been a time of great progress for women, children and adolescents worldwide (World Health Organization & United Nations Children's Fund, 2020).

As maternal and neonatal mortality rates began to reach their targets, the focus of healthcare gradually shifted towards ensuring not only survival and better health outcomes but also a positive experience for women and their families (World Health Organization, 2018). Global health agendas now call for actions to ensure women and their babies not only "survive" during labour and birth, but also "thrive" and reach their full potential in health and life (World Health Organization, 2018). The WHO published two reports illustrating the importance of a positive experience for women and their babies, both during labour and throughout the postnatal period (World Health Organization, 2018, 2022). The importance of 'experience of care' received has been highlighted as a critical

component of high-quality intrapartum and postnatal care and is no longer viewed as merely complementary to the provision of routine clinical practices (World Health Organization, 2018).

**Physiological processes of labour and birth**

Physiological labour and birth benefit women and newborns, both physically and psychologically (Dahan et al., 2024). Evidence has shown that non-pharmaceutical interventions, such as perineal massage, warm compresses and vocalisation during labour can reduce the risk of perineal trauma (Dwan et al., 2024). Furthermore, when women are supported to give birth physiologically and are actively involved in their birth process, their sense of self-trust and control during labour increases, leading to greater maternal satisfaction (Skrondal et al., 2020).

According to Henshall et al. (2024), the term 'physiological labour and birth', is defined in various ways across the literature and in stakeholder policies. Defining what actually constitutes a physiological birth can be challenging, as it requires consideration of obstetric, midwifery, and women's perspectives (Henshall et al., 2024). Despite these differing viewpoints and variations, there is some consensus around the key elements including 'spontaneous onset of labour', 'minimal intervention' and 'spontaneous birth' which are commonly included in definitions of 'physiological birth' (Henshall et al., 2025). Additionally, there is emerging evidence exploring an enhanced understanding of physiological labour and birth (Bjelke et al., 2019; Dahan et al., 2024; Weckend et al., 2024). Dahan et al. (2024) examined the relationship between physiological childbirth and the psychological state of 'flow' (the optimal psychological experience during physical activity) offering valuable insights into how it may support a deeper clinical understanding of undisturbed labour and physiological birth. In contrast Weckend (2024), highlighted the need to differentiate genuine failure to progress and natural physiological plateaus, challenging dominant biomedical interpretations and calling for a renegotiation of what constitutes normal progress during childbirth. Similarly, Bjelke (2019) critiqued the routine medical management of the 'passive phase', advocating for alternative, less interventionalist approaches that align with physiological processes instead of an active, medical approach. Collectively, these studies reflect a growing movement within maternity care, to not only understand but also to re-centre and trust in the physiological

process of childbirth, questioning entrenched norms and promoting more individualised, woman-centred care.

**The midwifery-led model of care and its benefits**

Midwifery significantly contributes to the quality of care for women and infants globally (Renfrew et al., 2014). A midwife's scope of practice includes antenatal, labour, birth, postnatal care as well as sexual and reproductive health (Butler et al., 2018). As the starting point of life, care during labour and birth is an essential part of midwifery, which is furthermore, closely linked to the whole life cycle (Qiao et al., 2021). In high-income countries, midwife-led continuity of care models have shown to provide high quality of care for women and their families (United Nations Population Foundation, 2021). In this type of model, a known midwife or small group of known midwives support a woman throughout her antenatal, intrapartum and postnatal continuum (United Nations Population Foundation, 2021). Continuity of midwifery care has been shown to reduce the risk of episiotomy, caesarean section and instrumental birth (Sandall et al., 2024). Women receiving midwife-led continuity of care were more likely to experience spontaneous vaginal birth and report a positive experience (Sandall et al., 2024).

Midwifery care has the potential to save the lives of women and children on a large scale (Renfrew & Malata, 2021). Evidence illustrates that skilled midwifery care improves short-, medium- and long-term outcomes in women and babies (United Nations Population Foundation, 2021). These outcomes include lower mortality and morbidity, fewer stillbirths and preterm births, reduced unnecessary interventions during labour and birth as well as reduced maternal anxiety (Petra et al., 2014). The underpinning core philosophy of midwifery care is the belief in a woman's natural ability to experience birth without interventions (Sandall et al., 2024). Midwives support women to feel empowered throughout the birth process, enabling physiological labour and birth, while also supporting a safe transition to parenthood and beyond (Sandall et al., 2024).

**Knowledge on pushing during the second stage of labour**

The process of labour begins with the onset of regular uterine contractions and ends with birth of the newborn and the expulsion of the placenta (Cunningham et al., 2014). Physiological labour and birth involves various labour mechanisms, one of which is the descent of the presenting part, the first requisite for birth of the baby (Cunningham et al.,

2014). As the presenting part descends, women typically experience a strong, spontaneous urge to push and bear down (Cunningham et al., 2014). The Ferguson Reflex, a neuroendocrine feedback loop involving sensory signals from the contracting uterus and birth canal, is activated and triggers the release of the hormone oxytocin, which in turn enhances uterine contractions (Tony & Anthony, 2015). While this reflex illustrates the physiological basis of maternal pushing, it is increasingly recognised that labour progress is also influenced by environmental and psychological factors. For example, Weckend (2025) suggests women may semi-consciously enter a plateau phase, potentially as a semi-conscious response when the birth environment feels unsafe or lacks supportive, familiar individuals, underscoring the interplay between physiology and environment during labour. During physiological labour, most women are unable to resist the urge to push or bear down with each uterine contraction. The combined force and physiology at a structural level, driven by contractions of the uterus and abdominal musculature, propel the fetus downwards, resulting in the birth of the baby (Cunningham et al., 2014).

The maternal effort of pushing and bearing down, plays a vital role in the birth process, and healthcare providers are increasingly focused on the effects of pushing on maternal and neonatal outcomes. The discussion on pushing during the second stage of labour mainly relates to two aspects: 'when to push' and 'how to push' (Lemos et al., 2017).

Regarding the aspect of 'when to push', there are mainly two types of practices: immediate and delayed pushing. The usual practice is to encourage women to push as soon as the cervix has fully dilated, which is called early, active or immediate pushing (Hansen et al., 2002). Studies found that women who use epidural analgesia, do not have a strong desire to push due to the diminution of sensation in the pelvis (Thorp & Breedlove, 1996). Hence, immediate pushing may not be suitable for women with epidural analgesia, leading to exhaustion and an increase in instrumental births (Lemos et al., 2017). Since the 1990s, trials proposed a method called 'delayed pushing' or 'passive descent' for women who use epidural analgesia during labour (Vause et al., 1998). Women are encouraged to wait for the presenting part to descend to the perineum which then would shorten the time and effort required to birth the baby (Lemos et al., 2017). An increasing amount of evidence has shown that, despite an increase in the length of the second stage of labour, delayed pushing is associated with several benefits, including less maternal fatigue, perineal injury, fetal acidosis and a reduction in instrumental births (Lemos et al., 2017; Roberts et al.,

2004). Overall, evidence consistently illustrates that passive descent for women with epidural analgesia shortens the length of women's pushing duration and increases spontaneous vaginal birth at the expense of an overall longer duration of the second stage of labour.

Regarding the topic of 'how to push', there are two main types of pushing strategies: spontaneous pushing and directed pushing. Spontaneous pushing supports women in the physiological process of labour. In contrast, directed pushing is commonly practised in many settings worldwide (Parnell et al., 1993), including in China. The origins, procedures and effects of both pushing strategies on maternal and neonatal outcomes will be discussed in detail in the following sections.

**The introduction of directed pushing**

At the beginning of the 20th century, labouring women in English-speaking, industrialised countries were expected to follow instructions on pushing during the second stage of the labour, as outlined in *A Manual of Midwifery* (Alfred, 1904). By the 1950's directed pushing was institutionalised. This approach characterised by sustained, long strenuous and coached bearing down was used to expedite the second stage of labour (Mary & Sharron, 1982 ), and to reduce the reliance on forceps births which were commonly used at the time (Simkin et al., 2017). Over time, directed pushing was adopted as standard and common practice in many maternity hospital settings around the world. In various maternity settings, the procedure of directed pushing practice varied (Koyucu & Demirci, 2017; Thomson, 1993; Yildirim & Beji, 2008). However, several key features define directed pushing and typically it involves four distinct elements. Firstly, pushing usually occurs under the guidance or instruction of pushing by a third party, usually healthcare providers, rather than the labouring woman herself. Caregivers often instruct a woman on when to push, how to push and how to breathe (Lemos et al., 2017). Secondly, it is evident that continued directed pushing usually requires a closed glottis technique. The labouring woman is usually instructed to take a deep breath, hold it, and push with a closed mouth while avoiding vocalisation (Lemos et al., 2017). Thirdly, it involves women pushing for a prolonged duration during each contraction. The woman is encouraged to push as long and hard as she can, usually 8-10 seconds or even 10-15 seconds. The combination of taking a deep breath and holding it with closed glottis is referred to as the Valsalva Manoeuvre (Lemos et al., 2017). The fourth element includes the effort of

multiple pushes throughout each contraction. Once the woman can no longer hold her breath, she is advised to release it, and to quickly inhale again, to initiate another push, repeating this cycle for as long as the contraction continues (Lemos et al., 2017).

Evidence has shown that directed pushing can be associated with potential adverse maternal and neonatal outcomes. Beynon (1957) challenged the practice of directed pushing, criticising caregivers' role in encouraging, or even coercing women to forcefully push the fetus through the birth canal as quickly as possible: '*…to aid and abet and even coerce the mother into forcing the foetus as fast as she can through her birth canal'* (Beynon, 1957, p. 815). Beynon theorised pushing too early or forcefully during the second stage of labour was too strenuous and could cause damage to the maternal pelvic floor tissues (Beynon, 1957). Building on Beynon's concerns, an increasing number of subsequent researchers also voiced their concerns associated with directed pushing (Parnell et al., 1993; Schaffer et al., 2005; Thomson, 1995). Instructing the Valsalva Manoeuvre, directed pushing, may contribute to potential adverse effects to both the woman and her fetus. For example, forced exhalation with closed glottis leads to an increased pressure within the thoracic cavity (Roberts, 2002), resulting in a reduction in venous blood returning to the labouring woman's heart. External signs that may be visible include the appearance of a woman's red face whilst pushing (Roberts, 2002). As a consequence of this action, reduced oxygenated blood travels to the placenta (Roberts, 2002), potentially compromising maternal-fetal blood gas exchange over time (Sampselle & Hines, 1999). This physiological outcome provides a rationale which supports why directed pushing using the Valsalva Manoeuvre is negatively associated with a poor fetal acid-base balance (Mary & Sharron, 1982 ), fetal heart rate increase or decrease (Caldeyro-Barcia et al., 1981), low umbilical cord pH and $PO_2$ levels (Yildirim & Beji, 2008), low Apgar scores at one (1) and five (5) minutes (Mary & Sharron, 1982 ) and decreased cerebral oxygenation (Aldrich et al., 1995). Overall, the primary rationale for directed pushing, introduced to shorten the duration of the second stage of labour, has not shown a significant impact on the length of the second stage of labour. In fact, it has contributed to a growing debate and recognition of the potential negative effects associated with directed pushing (Lemos et al., 2017).

**From directive to intuitive: Re-embracing spontaneous pushing during labour**

Spontaneous pushing, a physiological process once overshadowed by the routine use

of directed pushing is re-emerging in clinical discourse as recent evidence increasingly questions the efficacy and safety of directive approaches. A landmark trial examining the effects of spontaneous pushing was conducted in Uruguay by Caldeyro Barcia et al. (1981). In this study, the timing, duration and force of the pushing efforts were self-regulated by the mother (Caldeyro-Barcia et al., 1981). In this study, on average women pushed 4.29 pushes throughout a single uterine contraction, with each pushing effort lasting approximately five (5) seconds (Caldeyro-Barcia et al., 1981). Another early descriptive, comparative study by Joyce et al. (1987) found that women's spontaneous pushing behaviours differed from the instructions typically given during directed pushing. For example, when healthcare providers supported spontaneous pushing, the intensity of uterine contraction often increased to a level that evoked an involuntary urge to push. In such circumstances, women would typically push several times during a single contraction, usually lasting for around six seconds or less and interspersed with several breaths in between bearing down efforts (Joyce et al., 1987). Women were likely to use a combination of holding their breath and exhaling air, unlike the closed-glottis instruction that women received when applying the directed pushing method (Joyce et al., 1987). When healthcare providers facilitate spontaneous pushing, their practice tends to reflect woman-centred care. This approach recognises the woman as the expert of her own body, trusting her natural urges and capacity during the pushing phase of the second stage of labour. Given the individuality of each woman and her needs and preferences during labour, it may be difficult to standardise a single method of spontaneous pushing that is appropriate for all women.

A series of studies comparing directed and spontaneous pushing has confirmed spontaneous pushing does not increase the risk of harm to either the mother and/or their unborn baby (Debroah, 1984; Paine & Tinker, 1992; Parnell et al., 1993). Statistical results showed no significant differences in the duration of the second stage of labour (Debroah, 1984; Paine & Tinker, 1992; Parnell et al., 1993), Apgar scores (Debroah, 1984), umbilical cord blood pH (Paine & Tinker, 1992) or maternal report of fatigue (Debroah, 1984). However, women who pushed spontaneously during labour tended to have a better perineal integrity (Debroah, 1984) and a shorter expulsive phase (Parnell et al., 1993). Systematic reviews and meta-analyses were examined for more conclusive evidence, and three were identified that compared the benefits and risks of different pushing techniques (Lemos et al., 2017; Prins et al., 2011; Shinozaki et al., 2022). The Cochrane review by Lemos et al. (2017) revealed no clear difference in maternal and neonatal outcomes

between spontaneous pushing and directed pushing. This included the duration of the second stage of labour, incidence of third or fourth degree of perineal laceration, rates of episiotomy, five-minute Apgar score below seven, and admissions to neonatal intensive care. Another review by Shinozaki et al (2022) found that nulliparas who used spontaneous pushing while in the upright position during the second stage of labour experienced less postpartum urinary incontinence. Overall, current evidence supports that spontaneous pushing does not increase the risk of prolonged labour duration or compromise maternal and neonatal well-being.

**Understanding midwifery in the context of China's population dynamics**

According to the National Population Census, mainland China's population reached 1.41 billion in 2024 , with females comprising 49% of this number (National Bureau of Statistics of China, 2023). In recent years, in China, there has been a notable decline in the annual birth rate, decreasing from 14.6 million in 2019 to 9.5 million in 2024 (National Bureau of Statistics of China, 2023). Despite the forecasted reduction in the birth rate, the estimated annual births in China are projected to be approximately 8.5 million by 2030, which remains substantial (World Bank, 2025).

In recent decades nearly all births in urban China have occurred in hospital settings, while the rate in rural areas was approximately 99.8% (National Bureau of Statistics of China, 2023). Hospital-based childbirth has played a significant role in reducing maternal and neonatal mortality rate, with the mortality rate decreasing from 30.0 cases per 100,000 live births in 2010 to 15.7 in 2022 (National Bureau of Statistics of China, 2023). With growing emphasis on physiological birth, the national vaginal birth rate stands at around 63% though this varies by region (National Health Commission of the People's Republic of China, 2019). The use of medical pain relief during labour, primarily epidural analgesia during labour, also varies widely, ranging from 10-20% in rural areas to 40-60% in urban areas (Shenghua et al., 2021; Yan et al., 2020). Although no national report currently provides an exact figure, there has been a noticeable increase in the use of medical pain relief methods, particularly among nulliparous women (Shenghua et al., 2021; Yan et al., 2020).

Midwifery in China is deeply linked with tradition and cultural beliefs. However, before the 20$^{th}$ century, there were no professional midwives or formal midwifery education in China (Zhu et al., 2018). Following the establishment of the People's

Republic of China government in 1949, midwifery regulations, laws, education and professional pathways were gradually established (Zhu et al., 2018). Today, midwives play a vital role in supporting the large numbers of women giving birth across China. As of 2023, there were 36,976 hospitals, nationwide, with 20,815 of them offering obstetrics services (National Health Commission of the People's Republic of China, 2025). At present there are approximately 191,212 midwives and 191,273 obstetricians working in China (National Bureau of Statistics of China, 2023).

Currently, there is no independent professional registration for midwives in China, they are registered under nursing legislation. The pathway to becoming a midwife involves two steps. First, individuals must complete a course approved by the Ministry of Education, China that leads to registration as a nurse (Zhang et al., 2019). These programs may include a vocational college degree in nursing or midwifery, a Bachelor's or Master's degree in nursing. The second step is to obtain certification in maternal and neonatal care from the Ministry of Health in China (Chen et al., 2022). This qualification process approved by local government indicates completion of midwifery registration and ensures that midwives meet with core midwifery competencies (Chen et al., 2022).

The direct entry, Bachelor of Midwifery program in China was only established in 2017 (Zhang et al., 2019). With the growth of direct entry Bachelor of Midwifery programs, more graduates with a strong foundation in midwifery philosophy are now entering the workforce. This is expected to enhance the support for physiological childbirth in clinical practice.

Currently, most midwives in China work in hospital within obstetric departments, while some are based in community health centres, providing antenatal and/or postnatal care. However, due to a shortage of midwives and the absence of an independent professional registration body, midwifery remains relatively under-developed and continues to be regarded as a sub-specialty of nursing (Gao et al., 2019). As a result, intrapartum care is predominantly led by obstetricians (Ning et al., 2022). Within the hospital setting, similar to practices in many other countries, midwives are the primary caregivers for women experiencing physiological labour and birth, while obstetricians are consulted in cases of complications or deviations occur from the normal. Knowing the benefits of midwife-led care, midwives and professional organisations are advocating for greater public awareness and policy support for such models of care. In some pilot facilities, midwives are leading prenatal clinics and prenatal education programs

(Fangfang et al., 2020). These efforts aim to strengthen midwifery competencies, expand the midwifery scope of practice, and promote physiological childbirth for more women in China.

**Contextual overview of pushing practices during childbirth in China**

Although spontaneous pushing is the recommended practice in the national guidelines, common practice during most births in Chinese hospitals is directed pushing (Chinese Medical Association, 2020). Whist there is no national report available to support this statement, a local study provided some insight (Yan et al., 2021). This study, conducted in the northeast province of China, reports to implement directed pushing as 'routine practice' in 66% of the included hospitals and 'partially implemented' in the remaining 33% (Yan et al., 2021).

This current feasibility study, conducted as part of a PhD candidature was conducted in Hebei Province, situated in the middle region of mainland China. In 2023, the number of live births in Hebei Province was 436,227 (National Health Commission of the People's Republic of China, 2025). The socio-economic status of the population serviced in the Hebei Province is middle class (National Bureau of Statistics of China, 2023).

This study was conducted at the Fourth Hospital of Shijiazhuang, a large public maternity hospital located in the capital city of Hebei Province. With approximately 12,000 births per year, it has the highest annual birth rates in China. Of these, around 9,050 are vaginal births, representing about 75%, a rate higher than that in comparable regions (Ruiyun et al., 2023). The hospital operates across three sites (Tangu Site, Zhongshan Site and East Site) with this study taking place at East Site.

## 1.3 Rationale for performing the study

The WHO (2018) recommends that women in the expulsive phase of the second stage of labour be encouraged and supported to push spontaneously. In addition, both the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN) and American College of Nurse-Midwives (ACNM) advocate for spontaneous pushing as best practice. This approach aligns with physiological birth practices and is supported by evidence. (American College of Nurse-Midwives et al., 2013; Association of Women's Health Obstetric and Neonatal Nurses, 2008). In the Chinese context, national guidelines from the China Maternal and Child Health Association recommend that women be

encouraged to push spontaneously during a uterine contractions (China Maternal and Child Health Association, 2020). These recommendations reflect a favourable shift towards supporting physiological labour and pushing in the context of China's maternity care practices.

As discussed previously, there is a growing body of international evidence examining the benefits of spontaneous pushing during the second stage of labour, aligning with physiological birth practices and improved maternal and neonatal outcomes (Barasinski et al., 2023; Lee et al., 2018; Lemos et al., 2017; Yao et al., 2022). To better understand the applicability and effectiveness of these approaches in the Chinese context, a comprehensive literature review was conducted as part of this study. This review informed the design and implementation of a feasibility study aimed at comparing spontaneous pushing with directed pushing. The study included the development of a preparation program for midwives and the re-introduction of spontaneous pushing within routine clinical care. The feasibility study was undertaken to assess the practicality of conducting a future full-scale RCT, as well as to explore key facilitators and barriers to its future implementation.

The feasibility study also included an evaluation of the acceptability and effectiveness of a preparation program for midwives in enhancing their willingness and confidence to support spontaneous, physiological pushing. The study also assessed the feasibility of participant recruitment and retention of participants, midwives' adherence to the 'back to basics' preparation program and identified barriers implementing physiological pushing practices. In addition, the collection of outcomes data was evaluated. This data included key elements such as duration of the second stage of labour, mode of birth, blood loss during labour and birth, Caesarean section rates, perineal laceration rates, episiotomy rates, newborn Apgar scores, rates of newborn resuscitation, and rates of transfer to the neonatal intensive care unit.

## 1.4 Research questions

1. What is the evidence-based pushing strategy for women with a singleton pregnancy, without epidural analgesia during the second stage of labour?

2. What is the feasibility of conducting a future RCT to compare the effects of spontaneous pushing versus current practice (directed pushing) among Chinese women?

## 1.5 Research aims and objectives

The research aims are:

1. Systematically review the current literature on pushing strategies during labour

2. Test the feasibility of a future RCT to compare the effects of spontaneous pushing and directed pushing during the second stage of labour for maternal and neonatal outcomes.

Table 1 illustrates the interaction between the research questions, aims and objectives and identifies the two research phases.

**Table 1 Research question, aims and objectives**

| Research questions | Phases | Aims | Objectives |
|---|---|---|---|
| Question 1:<br>What is the evidence-based pushing strategy for women with a singleton pregnancy, without epidural analgesia during the second stage of labour? | 1. Literature review | 1.1 Systematically review the current literature on pushing strategies during labour | 1.1.1 Identify and evaluate evidence on pushing strategies during the second stage of labour |
| | | | 1.1.2 Conduct a meta-analysis to compare effects of spontaneous versus directed pushing on maternal and newborn outcomes |
| | | | 1.1.3 Undertake a scoping review focused on spontaneous pushing during labour |
| Question 2:<br>What is the feasibility of conducting a future RCT to compare the effects of spontaneous pushing versus current practice (directed pushing) among Chinese women? | 2. Feasibility study | 2.1 Test the feasibility of a future RCT to compare the effects of spontaneous pushing and directed pushing during the second stage of labour for maternal and neonatal outcomes. | 2.1.1 Recruit eligible midwives and develop a preparation education program for midwives to support spontaneous pushing |
| | | | 2.1.2 Recruit pregnant women to participate in the study |
| | | | 2.1.3 Develop and implement a postnatal survey on spontaneous pushing experiences for participating women |
| | | | 2.1.4 Extract of data from patient medical records to compare outcomes of directed pushing compared with spontaneous pushing |
| | | | 2.1.5 Conduct semi-structured interviews with midwives to explore their experiences of facilitating spontaneous pushing |
| | | | 2.1.6 Complete data analysis and develop recommendations for future clinical trials |

## 1.6 Structure of the thesis

The thesis, a PhD by compilation, includes six first-author publications which are presented in Chapter Two to Chapter Seven. Three of these remain under review at the time of submission of the PhD. There is some repetition between the six chapters, since the publications address a similar background at the beginning of each paper to allow the individual manuscripts to stand alone and provide context. Several methods were employed to achieve the research objectives. Each paper includes a methods section relevant to its specific aims. The study methodology was published as a protocol and is incorporated as Chapter Four. Therefore, the thesis does not contain a methods chapter. Figure 1 outlines the research design used with the corresponding chapters in the thesis.

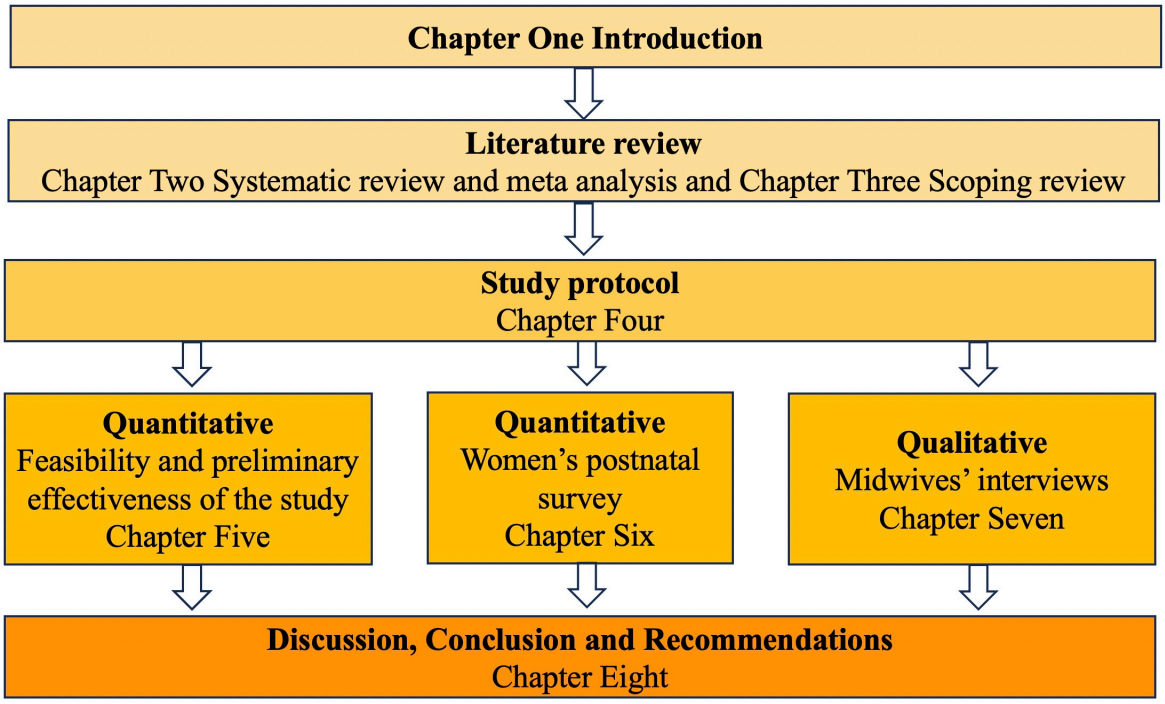


**Figure 1: Outline of the research design with corresponding chapters in thesis.**

Table 2 summarises the structure of the thesis in relation to the objectives and below, a brief description of the chapters.

**Table 2: Thesis structure and publications linked to research aims**

| Chapter | Title | Aims |
|---|---|---|
| Chapter One | Introduction | - |
| Chapter Two | Benefits and risks of spontaneous pushing versus directed pushing during the second stage of labour among women without epidural analgesia: A systematic review and meta-analysis | 1.1 |
| Chapter Three | Spontaneous pushing during the second stage of labour among women with or without epidural analgesia: a scoping review | 1.1 |
| Chapter Four | Comparison of spontaneous pushing and directed pushing during the second stage of labour among Chinese women without epidural analgesia: protocol for a noninferior feasibility study | 2.1 |
| Chapter Five | Feasibility and preliminary effectiveness of supporting spontaneous pushing during the second stage of labour: a prospective cohort study | 2.1 |
| Chapter Six | The experience of spontaneous pushing during labour among Chinese women: a cross-sectional questionnaire survey | 2.1 |
| Chapter Seven | Midwives' perspectives on facilitating spontaneous pushing during the second stage of labour: a qualitative study | 2.1 |
| Chapter Eight | Discussion and Conclusion | - |

**Chapter One** explains the background of the study and provided an overview of evidence regarding the pushing strategies during the second stage of labour. The aims and objectives of the study are also included in this chapter.

**Chapter Two** illustrates the benefits and risks of spontaneous pushing compared to directed pushing during the second stage of labour. It confirms that spontaneous pushing does not pose additional risks for women and baby, rather it offers added benefits, including lower rates of extended episiotomy and Caesarean section rates. This paper has been published.

**Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu and Xianying Li, Kathleen Baird. (2022). Benefits and risks of spontaneous pushing versus directed pushing during the second stage of labour among women without epidural analgesia: A systematic review and meta-analysis. *International Journal of Nursing Studies.134*, 104324. DOI: 104324.10.1016/j.ijnurstu.2022.104324.

**Chapter Three** presents the current evidence on spontaneous pushing method during the second stage of labour and summarises the current strategies used in its facilitation. This paper was submitted to *Nursing & Health Sciences* on 24th June 2025.

**Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Kathleen Baird. Spontaneous pushing during the second stage of labour among women with or without epidural analgesia: a scoping review (submitted to *Nursing & Health Sciences* on 24th June 2025).

**Chapter Four** outlines the methodology of the feasibility study comparing spontaneous pushing and directed pushing in a Chinese context, providing detailed information on the study design. This study protocol was published in *JMIR Research Protocol*.

**Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Huijuan Rong, Kathleen Baird. (2024). Comparison of Spontaneous Pushing and Directed Pushing During the Second Stage of Labor Among Chinese Women Without Epidural Analgesia: Protocol for a Noninferior Feasibility Study. *JMIR Research Protocol*, 13, e55701. https://doi.org/10.2196/55701

**Chapter Five** confirms the feasibility and preliminary effectiveness of supporting spontaneous pushing during labour. The outcomes support progressing to a full-scale trial in the Chinese context with some modifications. This paper is submitted to *Contemporary Nurse* on 16th June 2025.

**Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Huijuan Rong, Kathleen Baird. Feasibility and preliminary effectiveness of supporting spontaneous pushing during the second stage of labour: a prospective cohort study (submitted to *Contemporary Nurse* on 16th June 2025).

**Chapter Six** presents the results of a survey on women's childbirth experiences during spontaneous pushing in this study. The women reported an overall positive

experience with spontaneous pushing, supporting a change in practice to enhance positive childbirth experiences. This paper has been published in *Women and Children Nursing.*

> **Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Huijuan Rong, Kathleen Baird. (2024). The experience of spontaneous pushing during labour among Chinese women: a cross-sectional questionnaire survey, *Women and Children Nursing*, https://doi.org/10.1016/j.wcn.2024.12.001

**Chapter Seven** presents the qualitative results from interviews with midwives. They expressed that supporting spontaneous pushing is a return to a traditional practice, aligning with midwifery ethics. This paper is submitted to *Birth* on 6th June 2025.

> **Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Huijuan Rong, Kathleen Baird. Midwives' Perspectives on Facilitating Spontaneous Pushing During the Second Stage of Labour: A Qualitative Study (submitted to *Birth* on 6th June 2025).

**Chapter Eight** combines the quantitative and qualitative findings in this study, relate them to the contextual knowledge and together inform the development and refinement of the future study as well as midwifery education and clinical practice.

Tables and Figures are included in each chapter, numbered in the order of appearance with numbering recommenced at commencement of each chapter.

The appendices include proof of the mandatory University of Technology Sydney Research Integrity Modules completion (Appendix 1), a Research Data Management Plan (Appendix 2), and the Ethical approvals (Appendix 3). They also contain supplementary materials submitted as part of the individual publications (Appendices 4-16). Appendices are numbered continuously throughout the thesis.

## 1.7 Ethical considerations

This project required human research ethical approvals. University ethical approval was obtained as the researcher was a Ph.D. candidate, enrolled at UTS and the project was conducted under supervision from supervisors affiliated to UTS. The study received approval by two ethical committees: the University of Technology Sydney Medical Research Ethics Committee (ETH22-7072) (Appendix 3) and the Health Research Committee from The Fourth Hospital of Shijiazhuang, China (20230064) (Appendix 3).

## 1.8 Summary of Chapter

This chapter provided an introduction and background to the study, outlining the study questions, aims and objectives. The literature confirms that directed pushing during the second stage of labour remains a common practice worldwide, including China. Several professional midwifery organisations are committed to reintroducing physiological practices and woman-centred care which, in the context of this thesis, includes supporting the woman during spontaneous pushing. Chapter Two will present a systematic review comparing the two methods of pushing, spontaneous and directed pushing, and their impact on maternal and neonatal outcomes.

# Chapter Two: Benefits and risks of spontaneous pushing versus directed pushing during the second stage of labour among women without epidural analgesia: A systematic review and meta-analysis

## 2.1 Chapter preface

Chapter Two introduces the first of six manuscripts published or prepared for publication as part of this thesis. It examines the benefits and risks of spontaneous pushing versus directed pushing. This published paper addresses Research Aim 1.1: which systematically reviewed the current literature on pushing strategies during labour.

## 2.2 Publication details

The paper was published in the *International Journal of Nursing Studies* in 2022. The journal publishes peer-reviewed, clinical research papers that are of international interest. The accepted manuscript is reproduced in this chapter with permission under the Creative Commons Attribution Non-Commercial license. Five appendices were included in this publication and are attached at the end of this thesis.

**Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu and Xianying Li, Kathleen Baird, (2022). Benefits and risks of spontaneous pushing versus directed pushing during the second stage of labour among women without epidural analgesia: A systematic review and meta-analysis. *International Journal of Nursing Studies.134*, 104324. DOI: 104324.10.1016/j.ijnurstu.2022.104324

## 2.3 Abstract

Objective: The aim of this systematic review and meta-analysis was to assess the benefits and risks of spontaneous pushing and directed pushing used by labouring women without epidural analgesia during the second stage labour.

Design: Systematic review and meta-analysis.

Methods: Randomised controlled trials published in PubMed/ MEDLINE, CINAHL, Web of Science, Scopus, EMBASE, psycINFO, the Cochrane Library, and four Chinese databases were systematically searched from their inception to December 2021. Grey literature was also searched. Two authors independently screened the literature and evaluated the quality of the included studies.

Results: Ten studies with a total of 1510 women were pooled. Spontaneous pushing in the second stage of labour reduced the rates of Caesarean section and extended episiotomy. The difference was significant among spontaneous pushing group and directed pushing group, with relative risk and 95% confidence intervals of 0.42 and 0.19–0.94, 0.49 and 0.29–0.82, respectively. There was no significant difference in the duration of the second stage of labour, rates of spontaneous vaginal birth and newborn outcomes.

Conclusion: The results of this meta-analysis demonstrate that spontaneous pushing during the second stage of labour results in at least the same maternal and newborn outcomes, lower Caesarean section rates and lower incidence of extended episiotomy.

**Key words:** Directed; Spontaneous; Pushing; Labour; Second stage.

## 2.4 Introduction

The second stage of labour, defined as full cervical dilation to the birth of the baby, is a physiological process (Cunningham et al., 2014). During this process, the combination of uterine

contractions and fetal descent occur, which gives labouring women an involuntary urge to push. Maternal pushing or the effort of bearing down in this process has been discussed for decades in relation to maternal and fetal outcomes (Araujo et al., 2022).

Globally, the image of a midwife and/or birth attendant, directing the labouring woman to push can commonly be observed in the hospital setting (Lemos et al., 2017). The origin of this common practice, usually called 'directed pushing', can be traced back to the beginning of last century when labouring women, mostly in developed countries, were required to follow specific instructions on how to push during the second stage of labour (Alfred, 1904). The practice of directed pushing may be explained by promoters of vaginal birth, believing it can expedite the second stage of labour and avoid medical interventions, such as a forceps assisted birth (Simkin et al., 2017). In this context, women were usually asked to take a deep breath and push long and hard for the duration of the uterine contraction, often with closed glottis, also referred to as the Valsalva manoeuvre (Lemos et al., 2017). However, the physiological mechanisms of this practice were insufficiently researched (Joyce et al., 1987) and inclined to be accompanied by undesirable birth outcomes, such as fetal heart rate changes, hypoxia and acidosis (Lemos et al., 2017; Roberts et al., 2004).

Subsequent research findings have challenged the mode of directed pushing. An early and pioneering report of the adverse consequences of directing women to push is a descriptive, comparative study by Beynon (Beynon, 1957). Evidence suggests directed pushing in a sustained, strenuous manner, triggers potentially adverse physiological consequences (Joyce et al., 1987). In directed pushing, usually with closed glottis, a woman's thoracic cavity pressure increases because of the strong and persistent pushing. This causes an unfavourable reduction of venous blood return to the maternal heart and results in reduced oxygenation of the uterus, placenta, and fetus (Roberts, 2002). Consequently, directed pushing unfavourably alters maternal physiology and contributes to adverse fetal heart rate changes, fetal hypoxia and acidosis at birth (Roberts, 2002).

In view of a more positive childbirth experience and improved health outcomes for women and newborns, evidence-based practice has been recommended. They address the facilitation of physiological birth and include practice recommendations for second stage of labour with reference to maternal pushing methods. For example, the WHO (World Health Organization, 2018) recommends that women in the expulsive phase of the second stage of labour should be encouraged and supported to follow their bodily desire to push, called 'spontaneous pushing'. Research that provides insight into spontaneous pushing indicates that when a woman pushes spontaneously, they take several breaths in between pushes and usually push several times throughout the duration of one contraction (Ann, 1995). Spontaneous pushing, as part of the management of second stage of labour, contributes to a reasonable chance to achieve complete normality for each woman (Beynon, 1957).

Two systematic reviews (Lemos et al., 2017; Prins et al., 2011) assessed the effects of directed pushing versus spontaneous pushing. Systematic review findings by Prins (2011) indicated a significant reduction in the duration of second stage of labour in Valsalva pushing groups, whereas a Cochrane review (Lemos et al., 2017) reported no difference between the two groups in relation to the duration of the second stage of labour. Limitations reported by both reviews include high heterogeneity and low quality of the included studies as well as variations of definitions. More recent randomised controlled trials (Araujo et al., 2022; Koyucu & Demirci, 2017; Lee et al., 2019) compared maternal and neonatal outcomes between spontaneous and directed pushing. A study by Koyucu and Demirci (2017) revealed a significant decrease of length of second stage of labour while Araujo's (2022) results did not show any difference in time duration, or any difference in the rates of episiotomy, perineal lacerations or mode of birth. Such findings demonstrate the importance of comparing the efficacy and safety of directed pushing versus spontaneous pushing, based on high quality randomised controlled trials.

Overall, current evidence on the mode of pushing, directed or spontaneous, is conflicting. A current systematic review and summary of the available evidence may further provide guidance for clinical practice. The aim of this systematic review and meta-analysis of

randomised controlled trials was to evaluate the benefits and risks of directed pushing versus spontaneous pushing on maternal and neonatal outcomes among women without epidural.

## 2.5 Materials and methods

This systematic review and meta-analysis was performed according to the Cochrane criteria (Julian et al., 2019) and Preferred Reporting Item for Systematic Reviews and Meta-analyses (PRISMA) statement (Page et al., 2021). The protocol was registered on PROSPERO (registration number: CRD42021292065).

### Search strategy

The search identified published and unpublished studies. PubMed/ MEDLINE, CINAHL, Web of Science, Scopus, EMBASE, psycINFO, the Cochrane Library, and four Chinese databases (CNKI, VIP, WANFANG, and SINOMED) were used as electronic databases. Grey literature included conference abstracts, trial registrations, internet resources such as OpenGrey (2021).

The search strategy consisted of Medical Subject Headings (MeSH) terms or keywords or text words and Boolean operators (AND and OR). These terms were developed by two authors in the research team and a librarian. The trials were identified with the use of a combination of the following terms: “spontaneous pushing” OR “physiological pushing” OR “passive descent” OR “directed pushing” OR “coached pushing” AND “second stage” OR “labour” OR “birth” OR “deliver*” and randomised controlled trials as publication type, from inception of each database to December 2021. Original full text journal articles written in English and Chinese were included and no restrictions on geographic location was applied. Re-runs of the databases were conducted prior to the final analysis to ensure available studies were all screened. Details about the search strategy are available in Appendix 4.

## Inclusion criteria

Selection criteria included randomised controlled trials where pregnant women were randomised to either a spontaneous pushing or a directed pushing group for the duration of the second stage of labour.

## Data extraction

Two authors (JY, KB) independently assessed inclusion criteria, risk of bias, data extraction and data analysis. In the event of a lack of consensus, a third reviewer (DA) was asked to assess. Data from each eligible study were extracted without modification of the original study onto custom-made data collection forms. Differences were reviewed and further resolved by common review of the entire process.

## Outcomes

Maternal outcomes include the duration of second stage of labour, mode of birth, degree of perineal laceration and occurrence of episiotomy. The neonatal outcomes include Apgar score, resuscitation at birth, admission to neonatal intensive care unit, and umbilical cord blood pH values.

## Risk-of-bias assessment

The risk of bias in each included study was assessed using the Cochrane Handbook for Systematic Reviews of Interventions checklist (Julian et al., 2019). Seven domains of bias were assessed in each study and categorised as “low risk,” “high risk,” or “unclear risk” of bias.

### Quality assessment

The Critical Appraisal Skills Programme (CASP) (2021) tool was used to assess the quality of the included studies. The tool contains 11 questions to help assess several aspects of the study under review, including study design, methodology, result, local usefulness and impact. Reviewer responses to the questions are recorded as: “Yes”, “No” or “Can’t tell” with option for rationale.

### Statistical analysis

The meta-analysis was reported following the PRISMA 2020 Statement and Review Manager 5.3 (Copenhagen: The Nordic Cochrane Center, Cochrane Collaboration, 2014) was used. For dichotomous outcomes, the RR with 95% CI was used to summarise treatment effects. For continuous outcomes, the mean difference (MD) was used to compare the outcome measurements. A random-effect model was used to obtain pooled estimates, and the results were illustrated using forest plots. Publication bias was assessed by using funnel plots of the study effect size relative to standard error. Heterogeneity was assessed using Cochran Q statistic, quantified using the $I^2$ value and Chi-square. An $I^2$ value > 50% or $p$-value < 0.1 were considered to indicate considerable statistical heterogeneity between studies.

## 2.6 Results

### Study selection and Study characteristics

The initial literature search identified 743 records, of which 329 were duplicate records. Duplicates were removed and the remaining 414 records were individually screened for title and abstract. As a result, 58 records were deemed relevant for retrieval and after full-text reading, 22 studies were assessed for eligibility. Five studies were excluded due to the inclusion of unrelated intervention and three due to unrelated outcomes. An additional four studies were excluded as

the full text was not available in English or Chinese, the combination of various interventions or study design did not meet criteria or the because the trial was ongoing. A total of 10 studies (Ahmadi et al., 2017; Araujo et al., 2022; Bloom et al., 2006; Jahdi et al., 2011; Koyucu & Demirci, 2017; Lam & Mcdonald, 2010; Low et al., 2013; Parnell et al., 1993; Thomson, 1993; Yildirim & Beji, 2008) were included in this systematic review and meta-analysis (Figure 2).

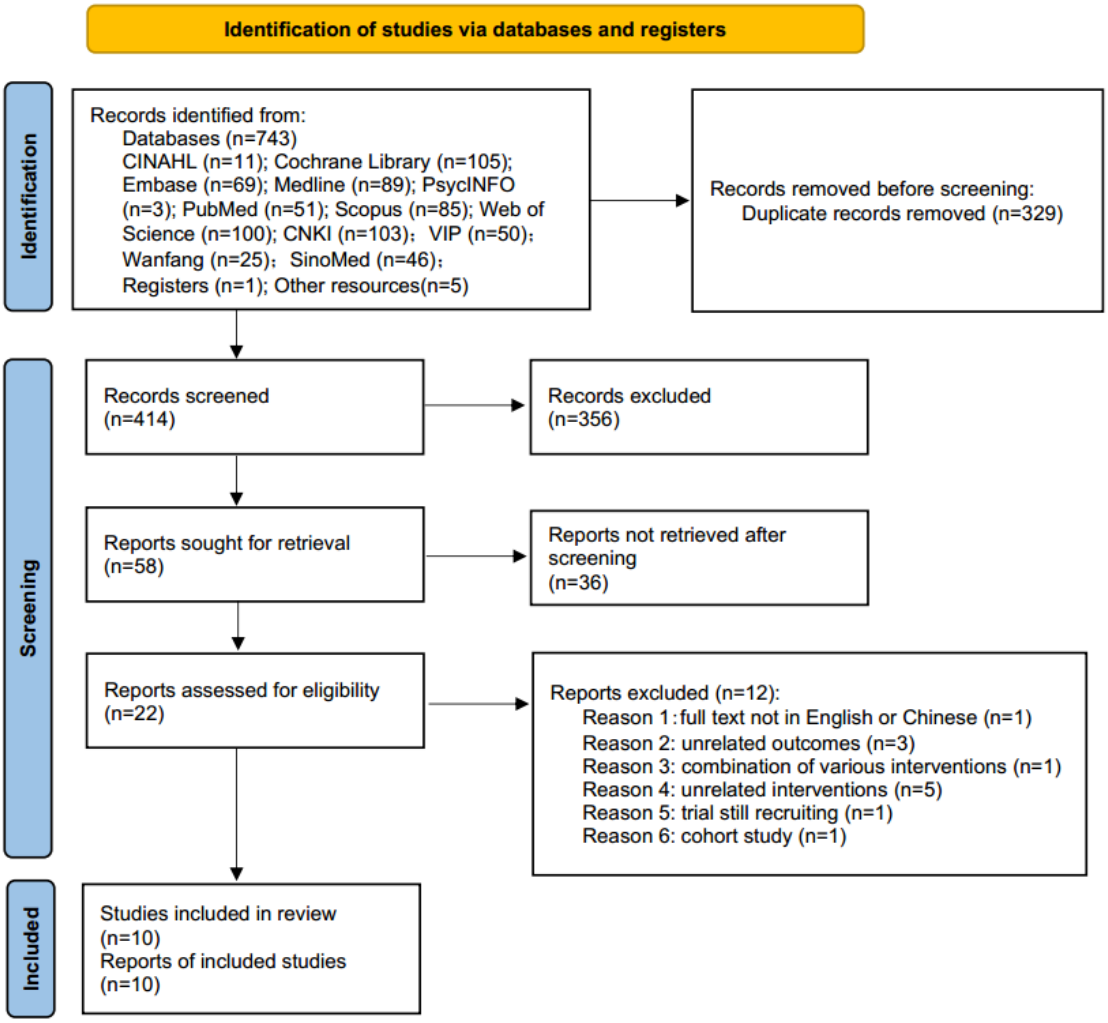


**Figure 2: PRISMA Flowchart of screening and selection process**

This review included 10 randomised controlled trials with participants from seven countries. Three studies were conducted in U.K (Ann, 1993) and U.S.A (Bloom et al., 2006; Low et al., 2013), one in Denmark (Parnell et al., 1993), Turkey (Koyucu & Demirci, 2017; Yildirim & Beji, 2008), Hong Kong, China (Lam & Mcdonald, 2010), Iran (Ahmadi et al., 2017;

Jahdi et al., 2011) and Brazil (Araujo et al., 2022). All studies with the exception of one due to an ill-defined description of study setting (Ann, 1993), were conducted within a labour ward setting in public hospitals. Eight out of the 10 studies compared spontaneous pushing versus directed pushing among primiparous women while two studies (Araujo et al., 2022; Jahdi et al., 2011) included both primiparous and multiparous women. The characteristics of included studies are displayed in Appendix 5.

## Results of syntheses

### Duration of the second stage of labour

The primary maternal outcome length of second stage of labour showed no significant difference in the duration between the spontaneous pushing group and the directed pushing group (MD= 4.87min, 95% CI -5.68, 15.41; 7 trials, 961 women; P = 0.37, $I^2$=78%) (Figure 3). The length of second stage of labour was eight minutes shorter in the directed pushing group when analysed in the nulliparous subgroup but with no significance (MD= 8.08 min, 95% CI -3.21, 19.37; 6 trials, 899 women; P = 0.16, $I^2$=78%) (Figure 4).

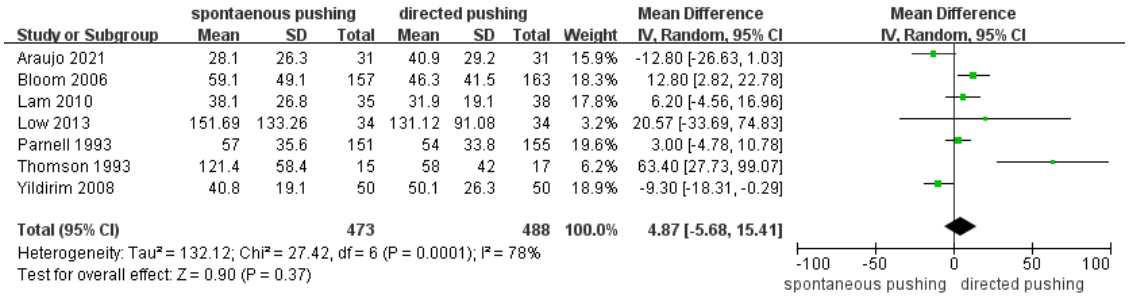


**Figure 3: Forest plot of duration of second stage of labour between different pushing groups**

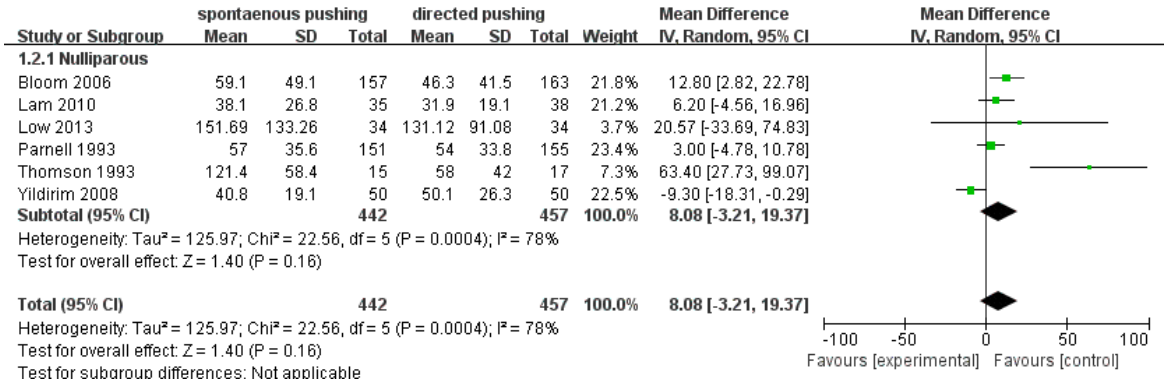


**Figure 4: Forest plot of duration of second stage of labour between different pushing groups (nulliparous subgroups)**

### Mode of birth

The meta-analysis compared mode of birth (vaginal birth and Caesarean section) among the spontaneous pushing group and the directed pushing group. Results indicate there was no significant difference in vaginal birth between the two groups (RR=1.16, 95% CI 0.42–3.18; 5 trials, 718 women; P=0.78, $I^2$= 12%) (Appendix 6). Birth by Caesarean section was significantly less likely in the spontaneous pushing group (RR=0.42, 95% CI 0.19–0.94; 4 trials, 645 women; P=0.03, $I^2$= 0%). The results thereby suggest a favourable outcome on the rate of Caesarean section in all settings (Figure 5).

In two studies, vaginal birth was reported in two categories: spontaneous vaginal birth and instrumental vaginal birth. Subgroup analysis indicated that although spontaneous vaginal birth showed no difference, a lower risk of instrumental birth was established in the spontaneous pushing group (RR=0.56, 95% CI 0.06–5.01; 2 trials, 393 women; P=0.60, $I^2$= 57%) (Appendix 6).

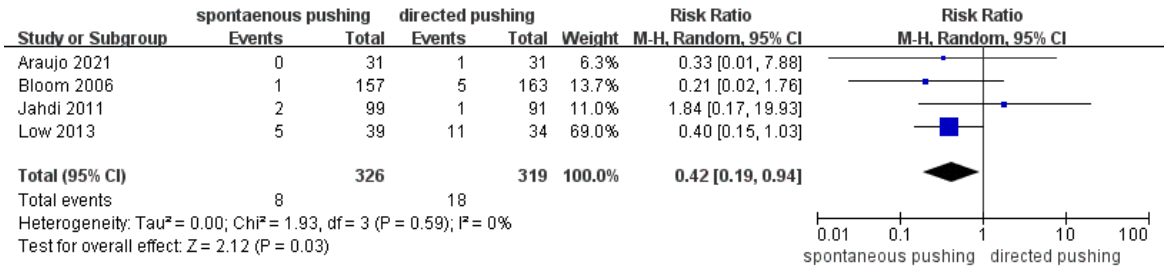


**Figure 5: Forest plot of mode of birth between different pushing groups (Caesarean section)**

### Perineal laceration

The occurrence of perineal laceration (no laceration, first degree, second degree, third degree, fourth degree and cervical laceration) were also compared between the spontaneous pushing group and directed pushing group (Appendix 6). There was close to equal risk of no laceration or first-degree laceration among the two groups (RR=1.07, 95% CI 0.92–1.24; 3 trials, 586 women; P=0.38, $I^2$= 0%). For other degrees of perineal laceration, the difference marginally favoured the spontaneous pushing group but with no statistical difference. Among these comparisons, the 95% CI (0.05–17.15) suggested high risk of cervical tears in some conditions. Overall, the risk of perineal laceration is significantly lower in the spontaneous pushing group (RR=0.80, 95% CI 0.58–1.10; Z=1.33; P=0.18). The 95% CI (0.58–1.11) of overall measurement suggest spontaneous pushing probably result in less perineal laceration in most settings. The interaction test for subgroup differences would suggest there is no difference between these subgroups (test for subgroups differences: Chi-square = 3.72; df = 4; P = 0.45).

### Episiotomy

There was no difference in the documentation of episiotomy amongst the spontaneous pushing group and the directed pushing group (RR=0.90, 95% CI 0.63–1.27; 5 trials,1088 women; P=0.54, $I^2$=61%) (Figure 6). The subgroup analysis illustrated an obvious decline of 'extended episiotomy' in the spontaneous pushing group (RR=0.49, 95% CI 0.29–0.82; 2 trials, 180 women; P=0.006, $I^2$=0%). Although the risk of 'episiotomy only' and 'episiotomy with 2$^{nd}$

degree laceration' were slightly higher in spontaneous pushing group, the difference was not statistically significant (episiotomy only: RR=1.09, 95% CI 0.76–1.56; 5 trials, 728 women; P=0.66, I2=43%; episiotomy with 2nd degree laceration: RR=1.21, 95% CI 0.59–2.49; 2 trials, 180 women; P=0.61, $I^2$=38%).

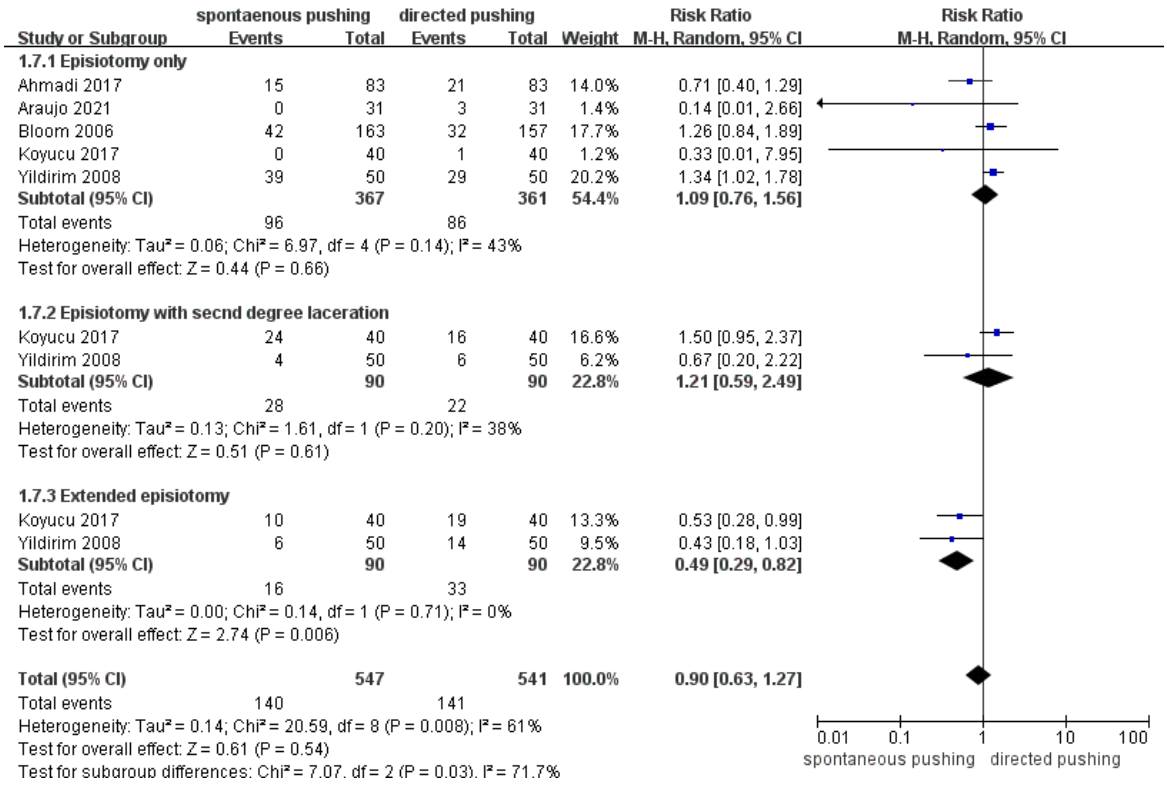


**Figure 6: Forest plot of episiotomy between different pushing groups**

## Apgar score

This meta-analysis compared Apgar scores at one minute and five minutes, as well as Apgar scores that were ≤7 at one minute and ≤8 at five minutes. Babies born to mothers in the directed pushing groups had a marginally higher Apgar score at one minute and at five minutes after birth, but the difference had no significance statistically (1 minute: MD=0.19, 95% CI -0.18–0.57; 3 trials, 479 women; P=0.31, $I^2$=85%; 5 minutes: MD=0.15, 95% CI -0.06–0.36; 4 trials, 559 women; P=0.17, $I^2$=82%) (Appendix 6). In addition, results established that there was no difference in the incidence one minute Apgar scores of ≤7 and five-minute Apgar scores of ≤8

between the two groups (Appendix 6). However, babies born to women in the spontaneous pushing group had relatively lower risk of a one-minute Apgar score of 7 or less or a five-minute Apgar score of 8 or less (1 minute ≤7: RR=0.20, 95% CI 0.01–4.11; 1 trial, 99 women; P=0.30; 5 minutes ≤8: RR=0.34, 95% CI 0.04–3.24; 2 trials, 518 women; P=0.35, $I^2$=0%).

**Resuscitation at birth and admission to the Neonatal Intensive Care Unit**

There were less events of resuscitation at birth for babies born to women in the spontaneous pushing group than for those in the directed pushing group, but the difference was not significant (RR=0.85, 95% CI 0.41–1.77; 2 trials, 352 women; P=0.67, $I^2$=0%) (Appendix 6). Similarly, the events of admission to the Neonatal Intensive Care Unit showed no difference between the two groups (RR=1.02, 95% CI 0.28–3.74; 2 trials, 393 women; P=0.98, $I^2$=0%) (Appendix 6).

**Umbilical cord blood pH**

There was a slight difference in umbilical cord blood pH among spontaneous pushing group and directed pushing group (Appendix 6). Although remaining within the normal range, artery pH values were slightly lower in spontaneous pushing group than in the directed pushing group (MD=-0.02, 95% CI -0.03–-0.00; 3 trials, 726 women; P=0.05, $I^2$=0%).

**Other outcomes**

Only one study reported on maternal fatigue after birth (RR=0.43, 95% CI 0.11–1.60; 1 trial, 62 women; P=0.21), maternal satisfaction of childbirth experience (RR=1.00, 95% CI 0.23-4.42; 1 trial, 62 women; P=1.00), and the use of oxytocin (RR=1.12, 95% CI 0.57- 2.20; 1 trial, 163 women; P=0.73). Compared with the protocol registered on PROSPERO, three outcomes, maternal hypertension, postpartum haemorrhage, and duration of pushing were not analysed in this meta-analysis because they were not reported on in any of the included studies.

**Risk of bias**

A risk of bias of the included studies in this meta-analysis was assessed using the Cochrane criteria. Results showed that eight out of 10 studies had an overall bias of 'unclear' while only two studies had 'low' risk of bias. Each study was assessed in six domains: selection bias, performance bias, attrition bias, detection bias, reporting bias, and other bias. As for selection bias, four studies (Araujo et al., 2022; Jahdi et al., 2011; Lam & Mcdonald, 2010; Low et al., 2013) had low risk in random sequence generation while others had unclear description (Ann, 1993) or high-risk procedures. The procedure of allocation concealment had low risk of bias in half of included studies (Araujo et al., 2022; Bloom et al., 2006; Koyucu & Demirci, 2017; Low et al., 2013; Thomson, 1993). Further details of risk of bias are illustrated in Appendix 7.

Visual funnel plots were used for the assessment of systematic heterogeneity or bias. Generally, the funnel plots for the main outcomes were asymmetry while a few outliers were identified in some analysis. Further details of funnel plots are presented in Appendix 6.

**Quality of evidence**

The 10 studies were assessed for quality using the CASP checklist (2021). The checklist consists of four domains (study design, methodology, results and utilisation) and features 11 questions in total. The details of the evaluation process are presented in Appendix 8.

## 2.7 Discussion

This review identified 10 randomised controlled trials (Ahmadi et al., 2017; Araujo et al., 2022; Bloom et al., 2006; Jahdi et al., 2011; Koyucu & Demirci, 2017; Lam & Mcdonald, 2010; Low et al., 2013; Parnell et al., 1993; Thomson, 1993; Yildirim & Beji, 2008) including 1510 women, with the purpose of comparing maternal and neonatal outcomes relating to spontaneous pushing versus directed pushing during the second stage of labour. Results indicated that women

who pushed spontaneously during the second stage of labour were less likely to have a Caesarean section or experience an extended episiotomy. The women in the spontaneous pushing group were not given instruction on pushing, yet they did not experience a significantly longer duration of the second stage of labour and had an equal chance of having a spontaneous vaginal birth. There was no significant difference between the two groups in relation to newborn health outcomes.

No difference was found between the spontaneous pushing group and the directed pushing group in relation to the duration of the second stage of labour. When analysed as a nulliparous subgroup, directed pushing shortened the second stage of labour by eight minutes, although this was not statistically significant. This result is consistent with previous studies (Lemos et al., 2017; Prins et al., 2011) including a Cochrane Systematic Review (Lemos et al., 2017) which compared six trials including 667 women and found a 17-minute decrease in the directed pushing group.

The amount of heterogeneity in the analysis of second stage of labour was high and did not decline when analysed in subgroup analysis. One explanation for this finding may be connected to the official recording of the onset of second stage of labour when full cervical dilation was identified by vaginal examination. Late identification of full cervical dilation may result in a shorter duration of second stage of labour, leading to variations among different trials. Another consideration for the heterogeneity can be related to the position the woman may adopt for the second stage of labour. Gupta's research (2017) revealed that some maternal positions, for example the upright position, may shorten the length of the second stage of labour. However, there was no consensus on maternal positions in this review. In some studies, women in the directed pushing groups were advised to push while lying supine on the bed whereas women in spontaneous groups were supported to push in an upright position or any position they preferred to adopt (Bloom et al., 2006; Jahdi et al., 2011; Koyucu & Demirci, 2017; Low et al., 2013). In other studies, pushing positions were not established or reported (Ahmadi et al., 2017; Araujo et al., 2022; Lam & Mcdonald, 2010; Low et al., 2013; Thomson, 1993; Yildirim & Beji, 2008).

Spontaneous pushing reduced the likelihood of a Caesarean section birth, this important finding has not been reported in previous systematic reviews (Lemos et al., 2017; Prins et al., 2011). Although Caesarean section can prevent maternal and perinatal mortality and morbidity (Betran et al., 2016), it is associated with short- and long-term risks, which can affect future pregnancies (Betran et al., 2016; Sandall et al., 2018). Previous studies have concluded that Caesarean section rates at a population level higher than 10% did not reduce maternal and newborn mortality rates (Betran et al., 2015; Ye et al., 2016). Consequently, WHO recommends that there is no justification for any region to have a Caesarean section rate higher than 10-15% (Betran et al., 2016). Based on WHO global survey results (Lumbiganon et al., 2010), Caesarean section rates in Asia are 27.3%, as high as 35.6% in Thailand and 46.2% in China. Except for medical reasons, several non-medical factors appear to attribute to the high rates of Caesarean section, such as social/cultural factors, access to healthcare and clinical practice patterns in different contexts (Ye et al., 2016). Despite a call for action and multiple vigorous strategies, CS rates is variable among different countries, with some steadily declining (Qiao et al., 2021) while others continue to rise (Dorji et al., 2021), indicating that much more needs to be done to achieve the WHO recommended Caesarean section rates. The findings from this review suggest spontaneous pushing by women in the second stage of labour could be one effective strategy to reduce the occurrence of Caesarean section without medical indications.

In accordance with previous studies, there was no evidence that spontaneous pushing increased or decreased the rates of vaginal birth (Lemos et al., 2017; Prins et al., 2011). In most of the studies analysed, spontaneous vaginal birth and instrumental birth were not distinguished as they were all recorded as vaginal births. However, this could explain why vaginal births did not show a difference between the two groups. When analysed in subgroups to compare the difference between spontaneous vaginal birth and instrumental birth separately, spontaneous pushing moderately reduced the risk of instrumental birth.

In this review, spontaneous pushing slightly reduced the risk of perineal laceration and episiotomy, although this finding was not supported in previous reviews (Lemos et al., 2017;

Prins et al., 2011). However, this review included subgroup analysis, and spontaneous pushing was found to have a moderate effect on reducing the risk of women experiencing an extended episiotomy. Episiotomy is performed to prevent serious perineal damage or to facilitate the birth of the baby (Jiang et al., 2017). As it is a surgical cut of the vagina and perineum, it may cause pain, bleeding, infection, a prolonged hospital stay and significant long-term maternal health concerns, such as urinary fistula, urinary incontinence and faecal incontinence (Jiang et al., 2017). Medical indications, combined with clinical experience, may be the best guide to balance risks and benefits of use of episiotomy (Ye et al., 2022). Therefore, it remains a challenge to define a medically necessary rate of episiotomy (Ye et al., 2022). Despite the promotion of a restrictive use of episiotomy, rates continue to vary among different studies, and have not decreased substantially, especially in middle-income countries (Lai et al., 2009; Ye et al., 2022). Severe perineal lacerations are more commonly associated with an increased risk of pelvic floor dysfunction for many years after birth according to results from American College of Obstetricians and Gynaecologists (ACOG) (2018). Findings from this review suggest, spontaneous pushing during the second stage of labour may contribute to the restrictive use of episiotomy and the prevention of serious perineal laceration.

There was no evidence that spontaneous pushing had a positive or negative effect on newborns, which was consistent with previous studies (Lemos et al., 2017; Prins et al., 2011). No difference was found between the groups in Apgar scores, rates of at birth resuscitation and admissions to Neonatal Intensive Care Unit. In the spontaneous pushing group, newborns had a lower artery pH value, although previous studies have shown no difference between the groups (Prins et al., 2011). With a *p*-value of just 0.05 in this review, this result should be interpreted with caution.

Findings from this study demonstrated that there was no statistical difference in the duration of the second stage of labour between the two groups and the rates of Caesarean section and extended episiotomy were lower in the spontaneous pushing group. Therefore, we recommend supporting midwives to encourage women to push spontaneously rather than

directing them to push during birth. Implementing this practice could be an effective strategy for midwives to improve birth outcomes as well as women's birth.

## 2.8 Strength and limitations

The strengths of this review include the systematically searched literature with an aim to reduce the risk of selection bias. Furthermore, sensitivity and subgroup analyses were conducted to investigate the possible causes of heterogeneity, ensuring the results are rigorous. Nonetheless, the review also includes limitations. Firstly, only three (Ahmadi et al., 2017; Araujo et al., 2022; Koyucu & Demirci, 2017) of the ten studies were published less than five years ago, and six were published over ten years ago, therefore the conclusions should be interpreted with caution as clinical practice may have changed over time (Oliver & Parolin, 2018). Secondly, blinding of the pushing intervention to investigators was not possible and therefore there is a risk of bias. Thirdly, a sample size of 1510 low risk labouring women in this review may be considered an insufficient number to compare neonatal outcomes, such as resuscitation and admission to Neonatal Intensive Care Unit. Lastly, in search for published literature, language was restricted to English and Chinese, resulting in a reduced access to published studies in other languages.

## 2.9 Conclusion

Spontaneous pushing by women in the second stage of labour had favourable outcomes with respect to the reduction of Caesarean section and extended episiotomy rates. The second stage of labour, mode of birth, perineal laceration and neonatal outcomes were not negatively affected by spontaneous pushing. Furthermore, spontaneous pushing during the second stage resulted in at least the same and in some cases, better maternal and neonatal outcomes than directed pushing. In the future, high quality randomised controlled trials are needed in countries where clinical practice is still heavily geared towards directed pushing. This will compare the

efficacy and safety of spontaneous pushing and directed pushing, despite posing new challenges to midwives' education and women's willingness.

## 2.10 Summary of Chapter

In this chapter, spontaneous pushing and directed pushing during the second stage of labour were compared in terms of the benefits and risks on women and their babies. The reviewed literature confirmed that spontaneous pushing offers additional benefits, including lower rates of extended episiotomy and Caesarean section. The next chapter will review current evidence on facilitating spontaneous pushing during the second stage of labour, to further guide the development of the study design.

# Chapter Three: Spontaneous pushing during the second stage of labour among women with or without epidural analgesia: a scoping review

## 3.1 Chapter preface

Chapter Two examined the effects of spontaneous versus directed pushing during labour, confirming the benefits of spontaneous pushing. Chapter Three presents the second of the six manuscripts that have been published or prepared for publication as part of this thesis. This manuscript focuses on the evidence supporting spontaneous pushing and summarises the current strategies used to facilitate spontaneous pushing. It also addresses Research Aim 1.1: to systematically review the current literature on pushing strategies during labour.

## 3.2 Publication details

This paper was submitted to *Nursing & Health Sciences* and is incorporated as Chapter Three, a peer-reviewed journal that publishes clinical nursing relevant research. The submitted manuscript will be reproduced in this chapter with permission under the Creative Commons Attribution Non-Commercial license. One appendix was included in this publication and have been incorporated into this thesis as Appendix 8.

> **Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Kathleen Baird. Spontaneous pushing during the second stage of labour among women with or without epidural analgesia: a scoping review (submitted to *Nursing & Health Sciences* on 24th June 2025 and is incorporated as Chapter Three).

## 3.3 Abstract

*Aim:* To identify and map the current evidence on spontaneous pushing during the second stage of labour, to inform clinical practice and future studies.

*Design and Method:* Joanna Briggs Institute methodology guided this scoping review, and it was reported following Preferred Reporting Items for Systematic review and Meta-analysis Extensions for Scoping Reviews.

*Data sources:* Six global databases (PubMed, CINAHL, Embase, Cochrane Library, PsycInfo, Web of Science) as well as grey literature were searched from inception to December 2023 for relevant original studies regarding spontaneous pushing during labour. The search was repeated on 26th April 2024. Data selection was carried out by two independent researchers.

*Results:* Twenty studies were included in this review and two themes emerged: (1) pushing behaviours, which includes evidence on women's natural behaviours during spontaneous pushing; (2) facilitating strategies, indicating the facilitating strategies which are being used by midwives to support women's spontaneous pushing during labour.

*Conclusions:* Maternal spontaneous pushing behaviours outline a series of effective strategies to facilitate them. It also highlights a conflict between the instructions typically given to women during routine practice of directed pushing and their natural spontaneous pushing behaviours.

*Implications for profession/patient care:* To the best of our knowledge, this is the first scoping review to synthesis evidence on spontaneous pushing during labour. This review highlights a significant discrepancy between women's natural spontaneous pushing behaviours and the instructions of routine practice, emphasising an urgent need for a change in clinical practice and guidelines.

*Patient or Public Contributions:* No patient or public contributions as this study is a review of published evidence.

**Keywords**

Birth; Labour, Second stage; Pushing; Spontaneous pushing; Scoping review

**What does this paper contribute to the wider global community?**

- Spontaneous pushing during labour, a woman-centred and natural way of pushing, is shown to bring benefits to women and newborn and is recommended by World Health Organization and Chinese professional guidelines.
- Currently, there is no synthesised, conclusive evidence on how a woman should be supported to push spontaneously during labour.
- This review provides practical evidence for clinical practice supporting spontaneous pushing in labour.
- This paper reveals a divergence between a woman's natural behaviour during spontaneous pushing and the customary instructions given during routine practice, indicating an urgent need for a change in clinical practice.
- This paper provided insights into supporting spontaneous pushing to change clinical practice in China as well as other regions where directed pushing is routine, to better facilitate a woman's physiological labour and birth.

## 3.4 Background

During the second stage of labour, maternal pushing or bearing down effort plays a vital role in the birth of the baby and labour progress (Cohen & Friedman, 2024). More recently, increasing attention and awareness is being paid to maternal pushing to facilitate improved maternal and neonatal outcomes (Osborne & Hanson, 2014).

Globally, the routine practice of directed pushing has been the widely accepted practice (Lemos et al., 2017). This involves midwives giving instructions to women on when to push, and how to push and frequently involves breath holding (Kownaklai et al., 2024). In this context, a

woman is usually required to take a deep breath and hold it, push long and hard for usually 8-10 seconds with a closed glottis (Lemos et al., 2017). However, more recently, the practice of directed pushing is being challenged as the evidence is suggestive of potential harm of this practice on both the mother and baby. Long and strenuous pushing efforts in directed pushing practice are negatively associated with a poor fetal acid-base balance, low Apgar scores at 1 and 5 minutes, fetal heart rate increase or decrease (Lemos et al., 2017), and postpartum urinary incontinence (Shinozaki et al., 2022).

Due to ongoing evidence, the World Health Organization (2018) now recommends a woman be supported to push spontaneously during labour. Spontaneous pushing is described as a physiological way to push naturally, and entails supporting a woman to push following her own bodily urges, in a pattern that she finds most effective (Reed, 2015). Research suggests that during spontaneous pushing, a woman naturally takes multiple breaths between pushes and tends to undertake several short pushes during one contraction (Thomson, 1995). Women generally have the ability to push and birth naturally in most uncomplicated births (Roberts et al., 1987). Current evidence also indicates that spontaneous pushing does not increase risks to maternal and neonatal well-being and contributes to achieving normal uncomplicated births (Lemos et al., 2017; Shinozaki et al., 2022).

Despite recommendations from professional organisations, maternal spontaneous pushing during labour is not widely adopted in most regions around the world. In some settings, spontaneous pushing was supported over the directed pushing practice (Lee et al., 2019), however, this is not the case in China. A recent study investigating 61 facilities in southeast China confirmed directed pushing was routinely implemented in 66% and partially implemented in 33% of the included hospitals while only 1.6% of the hospitals supported spontaneous pushing (Yan et al., 2021). This indicates an obvious gap between professional recommendations and the actual implementation of a maternal pushing strategy. However, there is a lack of conclusive, synthesised evidence to fully understand and support women's spontaneous pushing during labour.

In a recent systematic review and meta-analysis (Yao et al., 2022), the authors compared the effects of spontaneous pushing versus directed pushing during the second stage of labour and found that spontaneous pushing brings benefits, including lower rates of extended episiotomy and lower incidence of caesarean section. However, large variations were identified regarding the manner in which spontaneous pushing was supported in the included studies, hence there remains a lack of synthesised evidence to inform clinical practice (Yao et al., 2022). Consequently, a thorough review of current literature and strategies facilitating spontaneous pushing is indicated.

The aim of this scoping review was to map and synthesise available literature on maternal spontaneous pushing strategy during the second stage of labour. This will contribute to the understanding of women's spontaneous pushing behaviours and how midwives may best support these. In addition, the review will help the researchers identify any gaps in literature and contribute to the changing of clinical practice to further support physiological childbirth.

In this review, the term 'midwife' is used as an umbrella term to encompass a range of healthcare providers who attend births across different regions and contexts such as midwives, nurse-midwives and others. We also acknowledge that doctors and other relevant professionals may be involved in supporting women during childbirth. It is essential for all maternity healthcare providers to understand the benefits of spontaneous pushing as identified in this review to support practices that promote optimal care.

## 3.5 Methods

This scoping review adhered to the Joanna Briggs Institute (JBI) framework for scoping reviews and the Preferred Reporting Items for Systematic review and Meta-analysis Extensions for Scoping Reviews (PRISMA-ScR) 2018 guidelines (Tricco et al., 2018).

This scoping review commenced with an *a priori* protocol developed before commencing the review and was registered with the Open Science Framework (Registration DOI: https://doi.org/10.17605/OSF.IO/Q6KX9).

### 3.5.1: Identifying the research question

The research question identified in this scoping review included: 1) What are the maternal natural behaviours in spontaneous pushing during the second stage of labour and 2) What strategies do midwives utilise to facilitate a woman's spontaneous pushing during labour?

### 3.52: Identifying relevant studies

According to JBI scoping review framework, a three-step search strategy was utilised to identify relevant studies (Aromataris & Munn, 2021). The search strategy was also discussed with an experienced university librarian. Firstly, an initial search of PubMed and CINAHL was conducted. Index terms and keywords that could describe potential research were extracted. Secondly, a Boolean combination of keywords, free words as well as Medical Subjects Headings terms all identified were used to search across six global databases (PubMed, CINAHL, Embase, Cochrane Library, PsycInfo, Web of Science) from inception to December 2023, repeated on 26th April 2024 with no restrictions on location. Thirdly, reference lists of identified evidence were manually searched for additional sources. A hand search of Google scholar, OpenGrey and ProQuest Dissertations was done to identify other key articles and grey literature. The search strategy and results in PubMed were displayed in Appendix 9.

### 3.5.3: Eligible criteria

The Population, Concept, and Context approach was used to develop the eligible criteria (Peters et al., 2021). The inclusion criteria were as follows: (1) Population: labouring women during physiological labour and birth, (2) Concept: spontaneous pushing in a physiological and

undirected process during the second stage of labour as an intervention or primary outcomes, (3) Context: public and private hospitals, birth centers and other birthing facilities, (4) Types of evidence sources: original studies, thesis and dissertations, reviews, guidelines, position statement and government documents published in English.

The exclusion criteria included: (1) studies not relevant to the research question, (2) full text not available or not written in English, (3) conference abstracts, trial registrations, study protocols, editorial, letters, discussion paper, comments or reply and duplicates were excluded. Original trials where the description of spontaneous pushing intervention was insufficient and was deemed irrelevant and then excluded.

All articles were reviewed for inclusion by the first author (JY), downloaded into EndNote and exported to Covidence. The second author (HR) read the title, abstract, and full text to determine the potential eligibility and relevance to the study. Any discrepancies between the two authors were discussed and a third reviewer (KB) was asked for consultation if required.

In databases and registers, 1917 records were identified. After removing duplicates, 1174 records were screened for title and abstract. Among these, 187 records were retrieved for screening and 107 records of them were screened for a full text review by two authors (JY and HR). After full text screening, 87 records were excluded for reasons such as the paper not being relevant to the research question, the papers were expert reviews, discussion papers and comments. A total of 20 studies were included in this review. An outline of the study screening and selection process is presented in the flow chart in Figure 7.

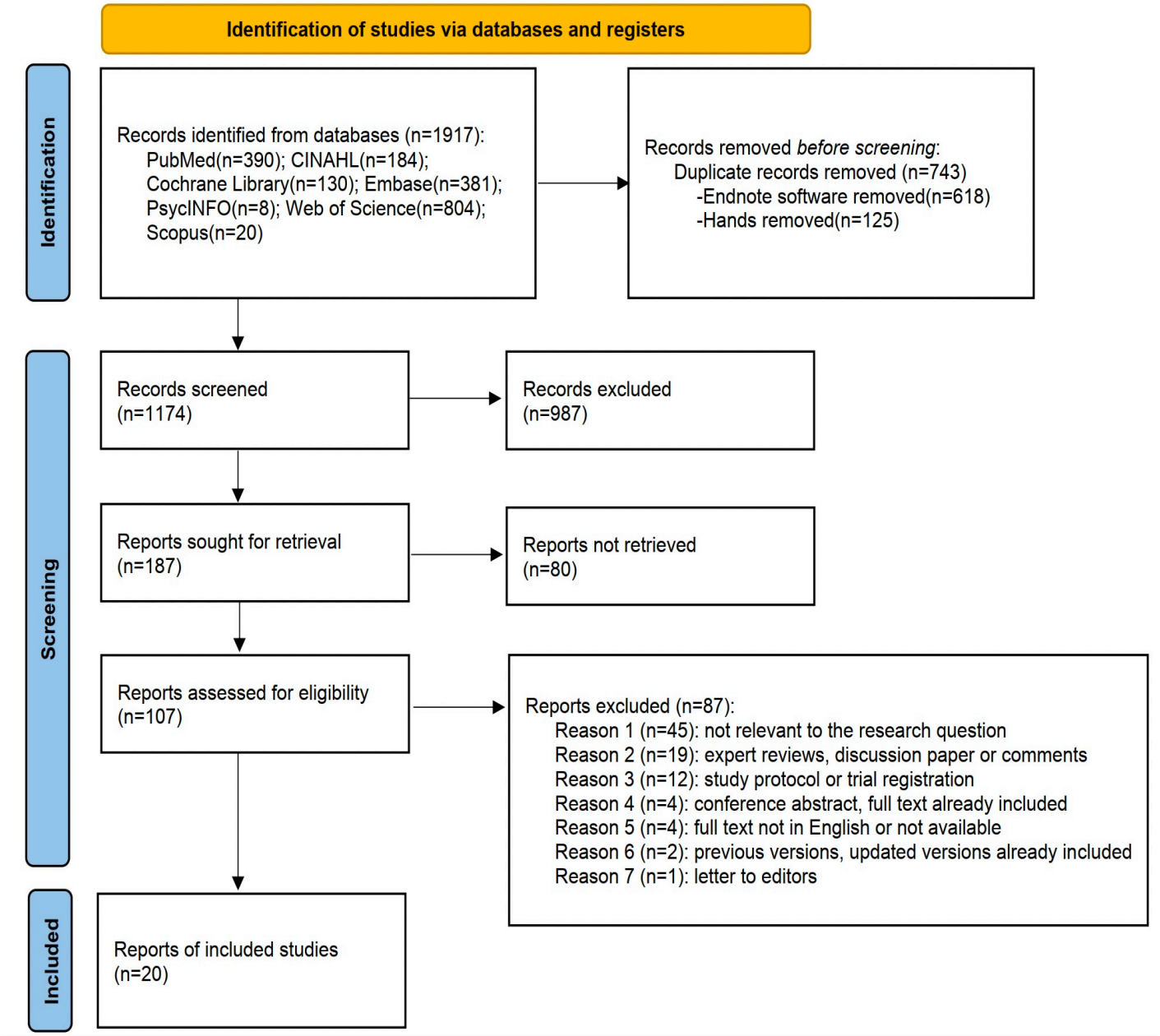


**Figure 7: Preferred Reporting Items for Systematic review and Meta-analysis Extensions for Scoping Reviews flowchart of literature search and inclusion**

### 3.5.4: Charting the data

A draft charting table was developed following the guideline for the development of scoping review (Peters et al., 2021). The form was piloted to record the included studies by one reviewer (JY) and verified by another reviewer (HR). A standardised data extraction form was finalised to extract key information of the included articles. Information extracted was the citation, country/region, study objective, study design, study sample, and summary of key findings related to the research question.

### 3.5.5: Summarising and reporting the results

A mixed methods approach of narrative synthesis and tabulation was used in the data analysis and presentation. Similarities and differences among research findings on a specific topic were summarised using a descriptive thematic analysis approach by Braun and Clarke (2022). Details of specific results were presented by tables and forms.

## 3.6 Results

### 3.6.1 Key characteristics of the included studies

The included 20 studies were all peer-reviewed articles (Table 3). There were fifteen interventional studies, including eleven randomised controlled trials (Ahmadi et al., 2017; Araujo et al., 2022; Bloom et al., 2006; Jahdi et al., 2011; Koyucu & Demirci, 2017; Lam & Mcdonald, 2010; Low et al., 2013; Parnell et al., 1993; Thomson, 1993; Vaziri et al., 2016; Yildirim & Beji, 2008), two quasi experimental studies (Chang et al., 2011; Oberg, 1988), and two interventional studies (Caldeyro-Barcia et al., 1981; Debroah, 1984). There were three descriptive studies (Roberts et al., 1987; Sampselle et al., 2005; Thomson, 1995) and two retrospective studies (Lee et al., 2019; Paine & Tinker, 1992).

The studies originated from a range of countries. Seven papers from the United States of America (Bloom et al., 2006; Debroah, 1984; Low et al., 2013; Oberg, 1988; Paine & Tinker, 1992; Roberts et al., 1987; Sampselle et al., 2005), three papers from Iran (Ahmadi et al., 2017; Jahdi et al., 2011; Vaziri et al., 2016), two papers from China including one from Hong Kong (Lam & Mcdonald, 2010), one from Taiwan (Chang et al., 2011), two papers were from England (Thomson, 1993, 1995) and two from Turkey (Koyucu & Demirci, 2017; Yildirim & Beji, 2008). One paper each emerged from Australia (Lee et al., 2019), Brazil (Araujo et al., 2022), Denmark (Parnell et al., 1993), and Uruguay (Caldeyro-Barcia et al., 1981).

**Table 3 Summary of included studies' characteristics**

| Authors (year), country | Study Objective | Study Design | Participant numbers (n) | Summary of key findings related to the research question |
|---|---|---|---|---|
| Low (2013), U.S.A | To test the effect of spontaneous pushing compared with directed pushing on incontinence outcomes in women evaluated 1 year after their first birth | A prospective randomised controlled trial | n=152 | Spontaneous pushing, with instruction provided prenatally via a standardised training video. This method included instructing the woman to follow her bodily sensations and push as she felt the urge. |
| Parnell (1993), Denmark | To compare the two methods of pushing in a randomised controlled trial | A prospective, randomised controlled study | n=151 | With the spontaneous method, the woman was encouraged to use her own urge to push, so long and so many times during each contraction as she felt necessary. Pushes per contraction was 3.8. |
| Chang (2011), Taiwan, China | To evaluate maternal labour pain, fatigue, duration of the second stage of labour, the women's bearing-down experiences and the Apgar scores when spontaneous pushing in an upright position. | A quasi-experimental study | n=66 | The researcher did not support their pushing but rather waited until they had a spontaneous urge to push. The woman was instructed to use an upright position and push three to four times during each uterine contraction, with a pushing period of around four to six seconds. She was encouraged to select the position with which she felt most comfortable. |

| | | | | |
|---|---|---|---|---|
| Araujo (2022), Brazil | To evaluate the efficacy of spontaneous pushing with pursed lips breathing when compared to directed pushing on maternal and neonatal outcomes. | A quasi-randomised controlled clinical trial | n=62 | Guidance about the breathing pattern associated with expulsive efforts, based on the spontaneous pushing physiology: pursed lips breathing associated with open glottis in tidal volume, controlled by the woman, along with abdominal muscle efforts and perineal relaxation. The team also used positive communication strategies. |
| Thomson (1993); Thomson (1995), England | 1. To assess whether spontaneous pushing activity increases the incidence<br>2. To describe maternal behaviour in spontaneous second stage of labour and to compare with directed pushing | A randomised controlled trial | n=32 | 1. Do not give this woman any instructions on how to push. you may encourage her to push when and how she feels. You may suggest she adopts any position, and you may suggest she alters position at any time.<br>2. None of the women started pushing as soon as the contraction started. Women did not always push with every contraction. |
| Lam (2010), Hong Kong, China | To determine the relationship between early postpartum fatigue and the pushing technique and to assess fatigue levels in the immediate postpartum period among Chinese women | A randomised controlled trial | n=73 | When women were assessed as having full dilatation of the cervix and a fetal head plus 1 below the level of the ischial spines of the pelvis, the midwives providing care suggested they commenced pushing only when they felt the urge to do so and gave no specific instructions about the timing and duration of pushing. |

| | | | | |
|---|---|---|---|---|
| Jahdi (2011), Iran | To compare the effect of physiological pushing during second stage of labour on the duration of the second stage, mode of birth and Apgar score. | A randomised controlled trial | n=191 | 1. Women commenced pushing only when they felt the urge to do so and midwives gave no specific instructions about the timing and duration of pushing. Women used upright position.<br>2. If midwives were concerned about the maternal and / or fetal wellbeing, or delivery was not imminent after 120 min for primiparous women and 60 min for multiparous women, the woman was reassessed to gauge condition and adopt whatever clinical management was deemed necessary. |
| Varizi (2016), Iran | To compare the effects of spontaneous pushing in the lateral position with the Valsalva manoeuvre during the second stage of labour on maternal and fetal outcomes | A randomised controlled trial | n=69 | Women pushed when they felt the urge to push while being in the lateral position during pushing. |
| Ahmadi (2017), Iran | To investigate the effect of breathing technique on perineal damage extension in labouring Iranian women | A randomised controlled trial | n=166 | Women were asked to take two deep abdominal breaths during the onset of pain, then take another deep breath, and push for 4–5 seconds with the open mouth, while controlling exhalation and then resume the process for the next push as trained. |
| Bloom (2006), U.S.A | To compare the obstetrical outcomes associated with | A randomised controlled trial | n=320 | Women were supervised by certified nurse-midwives but not given specific instructions on pushing technique. In essence, they |

| | | | | |
|---|---|---|---|---|
| | coached versus uncoached pushing during the second stage of labour | | | were told to ‘‘do what comes naturally.’’ It outlined a step-by-step technique. |
| Yildirim (2008), Turkey | To determine the effects of pushing techniques on mother and fetus in birth in the study setting | A randomised study | n=100 | Women in the spontaneous pushing group were encouraged and supported to push spontaneously in the second stage of labour, bearing down in response to contractions. |
| Paine (1992), U.S.A | To identify the relationship between maternal bearing down efforts and two specific outcomes: arterial umbilical cord blood pH and length of the second stage of labour | A retrospective survey | n=30 | Those who described their pushing efforts as being under their own control were classified in the spontaneous pushing group. Women in the spontaneous group had epidural analgesia. Women with an epidural have been observed to self-initiate open glottis pushing as the perineum and introitus stretch during crowning. |
| Sampselle (2005), U.S.A | To describe the association between provider communication and maternal pushing behaviours and to test differences in length of second stage and total maternal pushing time | Descriptive | n=20 | There are criteria to categorise pushing efforts into spontaneous pushing or directed pushing group. There is also a list of examples that are supportive of spontaneous pushing. A positive relationship was observed between communication and women's spontaneous pushing efforts. |

| | | | | |
|---|---|---|---|---|
| Robert (1987), U.S.A | To characterise involuntary bearing-down efforts and the behaviour accompanying maternal expulsive efforts | Descriptive study design | n=31 | 1. For all except two of the women, the fetal head was at a +l station or lower when they first experienced an urge to bear down. Mean station was +1.4.<br>2. Involuntary bearing-down efforts were categorised into somewhat controlled, uncontrolled, or breath holding. The duration of the breath holding was less than six seconds. |
| Yeates (1984), U.S.A | To contrast the effects of two learned approaches to parturient participation during the second stage of labour | Interventional study design | n=10 | Parturients who felt the urge to push before full cervical dilation were informed that the urge to push is a sign of progress. Women were encouraged only to follow their involuntary urge to bear-down. Relax and 'go with their bodies' as they felt the need. |
| Caldeyro-Barcia (1981), Uruguay | To compare the bearing-down efforts and their effects on fetal heart rate, oxygenation and acid base balance | Interventional study design | n=12 | 1.Mothers were instructed to push whenever they felt the urge. The duration and force of the efforts was self-regulated. The same applies for the timing of the efforts. Mothers were not instructed to close the glottis during the effort.<br>2. Mothers were sitting in the obstetrical chair with the lower limbs flexed and the thighs in abduction. The chair was adjusted to the most comfortable position for the mother. |
| Oberg (1988), U.S.A | To compare conservation of energy and structural integrity in the labouring woman using | Quasi-experimental design | n=40 | Women in spontaneous pushing group were observed to adopt semi-sitting position (n=12,67%) and reclining position (n=2,11%) and combination (n=4,22%). |

| | | | | |
|---|---|---|---|---|
| | spontaneous bearing down by variables of maternal and neonatal outcomes to the traditional pushing | | | |
| Koyucu (2017), Türkiye | To compare the maternal/fetal/ newborn results of valsalva method with those of spontaneous pushing method | Randomised prospective study | n=116 | Women were assessed as having full dilatation of the cervix, the investigator providing care suggested they commenced pushing only when they felt the urge to do so and gave no specific instructions about the timing of pushing, duration of pushing and their positions. |
| Lee (2019), Australia | To compare the effect of directed or spontaneous maternal pushing effort on duration of second stage labour, perineal injury and neonatal condition at birth. | Retrospective cross-sectional study | n=69066 | 1. Definitions of pushing techniques used during second stage were either “listen to and respond to her body’s urges” or “actively encouraged each contraction and directed to Valsalva” and “actively encouraged each contraction but not Valsalva”.<br>2. Maternal position during spontaneous pushing: all fours; lateral; recumbent; squatting; upright.<br>3. Both nulliparous and multiparous women were supported to push spontaneously. |

Two key themes emerged from the data: 1) Pushing behaviours, which describe the natural patterns and practices women adopt during spontaneous pushing, and 2) Facilitating strategies, which highlight the interventions and approaches that support optimal spontaneous pushing outcomes. These themes provide valuable insights and are described in more depth.

### 3.6.2 Theme 1: Pushing behaviours

The first theme identified was 'Pushing behaviour'. For the purposes of this review, 'Pushing behaviour' refers to the natural actions and responses of women when they were encouraged to push spontaneously during labour.

Evidence of this theme was drawn from three descriptive studies (Roberts et al., 1987; Sampselle et al., 2005; Thomson, 1995) and three intervention studies (Caldeyro-Barcia et al., 1981; Debroah, 1984; Parnell et al., 1993). The findings are categorised into three focus areas: (1) The initiation of pushing, (2) Pushing duration and patterns, (3) The control of glottis. Table 4 summarises the main findings for each focus area under this theme.

**Table 4: Focus areas and main findings of Theme 1**

| Focus areas | Main findings |
|---|---|
| (1) The initiation of pushing | • The timepoint to start pushing is when a woman exhibits an involuntary urge to bear down.<br>• Women do not always want to push as soon as they reached full cervical dilation. |
| (2) Pushing duration and patterns | • The duration of one pushing effort is five seconds on average, ranging from four to six seconds.<br>• There are four pushing efforts on average during one contraction.<br>• There is usually an interval between pushing efforts, which is two seconds on average, when woman takes several breath movements. |
| (3) The control of glottis | • Women usually use a combination of closed glottis (holding breath) and open glottis (letting air out).<br>• When using closed glottis pushing, women do not spontaneously take a deep breath before they started to push. |

#### 3.6.2.1 The initiation of pushing

Maternal desire to push spontaneously occurs in most physiological births. The timepoint to commence pushing is when a woman exhibits an involuntary urge to bear down, usually caused by full dilation of cervix, station of the fetal head or intrauterine pressure (Roberts et al., 1987).

It is important to note that some women did not always want to push as soon as they reached full cervical dilation (=10cm) (Thomson, 1995). Similarly, there does not seem to be a relationship between a woman's initiation of spontaneous pushing with the commencement of uterine contractions. The actual effort of pushing does not occur until uterine contractions are well established (Thomson, 1995). A sigh or moan was often observed at the beginning of a contraction, but women typically did not begin pushing until 20 or 30 seconds into the contraction (Sampselle et al., 2005). This contrasts with the directed pushing approach where midwives routinely instruct women to commence pushing at the onset of contractions.

#### 3.6.2.2 Pushing duration and patterns

Another characteristic of a woman's spontaneous pushing behaviours is the duration and pattern of her pushing effort.

Evidence shows that the average duration of a single pushing effort on average lasts five seconds (Caldeyro-Barcia et al., 1981). Similarly, another study found that the mean duration of each pushing effort increased from four to six seconds as the second stage of labour progressed (Roberts et al., 1987). Additionally, more frequent contractions were associated with shorter and less intense pushing efforts (Roberts et al., 1987).The average number of pushing efforts during one contraction is 4.3 (Caldeyro-Barcia et al., 1981) or 3.8 (Parnell et al., 1993). There is usually an interval between maternal pushing efforts, which on average is two seconds (Caldeyro-Barcia et al., 1981). During this interval, a woman usually makes several breathing movements,

helping her to replace the $pO_2$ in the maternal arterial blood (Caldeyro-Barcia et al., 1981).

#### 3.6.2.3 The control of glottis

The descriptive studies also revealed that a woman does not always push with a closed glottis during spontaneous pushing. Instead, there are three types of glottis-controlled pushing. The first one is controlled (with an audible grunt or groan, 48%), another is uncontrolled (crying out, 7%), and the last one is breath holding (no audible sound, 24%) (Roberts et al., 1987). When using closed glottis pushing, women were holding their breath but none of the women spontaneously took a deep breath before they started to push (Thomson, 1995) and the breath holding usually only lasted for less than six seconds (Roberts et al., 1987).

Overall, the evidence provides an overview of maternal behaviours during spontaneous pushing during labour. In this context, women experience an involuntary urge to push as the intensity of uterine contraction increases (Roberts et al., 1987). During a contraction women typically push several times, combining breath-holding with exhaling, with each push lasting around six seconds or less, and taking several breaths in between pushes (Roberts et al., 1987).

### 3.6.3 Theme 2: Facilitating strategies

The second theme identified in this scoping review was ‘Facilitating strategies. This theme encompasses various strategies, principles and practices used by midwives to facilitate women’s spontaneous pushing during labour. This evidence is categorised into five focus areas including procedures, maternal positioning communication patterns, safety protocols and other related factors. Table 5 outlines the main findings in each focus area under this theme.

**Table 5: Focus areas and main findings in Theme 2**

| Focus areas | Main findings |
|---|---|
| (1) Procedures | 1) Tell the woman simply to do what comes naturally or whatever she feels the urge to do.<br>2) Wait until the woman has a spontaneous urge to push.<br>3) Position the woman as she desires whether that be on her back or either side or encourage the woman to change position, such as to lie on one side or sit. |
| (2) Maternal position | • Women are encouraged to adopt any position she finds most effective, to alter position at any time, and to use a variety of pushing positions. |
| (3) Communication patterns | • Communication in spontaneous pushing practice should be encouraging and woman-centred.<br>• Midwives need to adopt a set of behaviours and skills that differ from giving simple instructions. |
| (4) Safety protocol | • If birth does not occur within 90 minutes (or 120 minutes for primiparous women and 60 minutes for multiparous women), midwives would reassess the woman to gauge maternal and fetal condition and would adopt whatever clinical management deemed necessary to facilitate a safe birth. |
| (5) Other related factors | • A criteria system was developed to categorise pushing efforts into spontaneous pushing or directed pushing.<br>• Eligible women included nulliparas and multiparas, aged between 18 to 45 years old, gestational week of 37-42, with or without pharmacological pain relief methods. |

#### 3.6.3.1 Procedures

In several of the studies, support strategies were briefly explained in the study procedure (Jahdi et al., 2011; Koyucu & Demirci, 2017; Lam & Mcdonald, 2010; Parnell et al., 1993; Thomson, 1993; Yildirim & Beji, 2008). Women were typically encouraged to bear down in response to their own contractions (Yildirim & Beji, 2008),

and to engage in spontaneous pushing. Using their own natural urge to push, women were encouraged to push as many times and for as long as they felt necessary during each contraction (Parnell et al., 1993), without receiving specific instructions on the timing or duration from midwives (Jahdi et al., 2011; Koyucu & Demirci, 2017; Lam & Mcdonald, 2010).

In two of the trials, step by step procedures to support spontaneous pushing were outlined (Bloom et al., 2006; Chang et al., 2011) and included: 1) Encourage the woman to do what comes naturally or follow her urges (Bloom et al., 2006). 2) Wait for the woman to feel a spontaneous urge to push (Bloom et al., 2006). 3) Support the woman in choosing her preferred position (Bloom et al., 2006) or encourage position changes, such as to lying on one side or sitting (Chang et al., 2011). In a study in 1981 (Caldeyro-Barcia et al.), women were instructed to commence pushing whenever they felt the urge to "push". Women controlled the duration and force of their pushing, without receiving instructions to close glottis during pushing (Caldeyro-Barcia et al., 1981). In another study by Paine and Tucker in 1992 women in the spontaneous pushing group were encouraged to begin pushing when they felt an urge to bear down or if more than 20 minutes elapsed after complete dilatation of the cervix had been determined. Women were instructed to give short pushes of no longer than six seconds, to push with a slight exhale and to make noises if needed or desired (Paine & Tinker, 1992). Similarly, in another study, women were asked to push for 4-5 seconds with open mouth (Ahmadi et al., 2017).

#### 3.6.3.2 Maternal positions

In spontaneous pushing, a woman is encouraged to find her own effective way of pushing, including selecting her own position for pushing, women were also encouraged by midwives to alter her position at any time (Thomson, 1995). Results from the study revealed midwives' encouragement of adopting a more upright position appeared to aid women with their expulsive efforts (Thomson, 1995). In addition, women in the spontaneous pushing group used a variety of pushing positions and were less likely to

have their hands behind their knees or have their feet raised and placed on their birth attendants' hips than women from the directed pushing group (Thomson, 1995).

Two studies instructed women to use upright positions during spontaneous pushing, including standing, sitting and squatting (Chang et al., 2011; Jahdi et al., 2011). A woman suffering with labour pain was simultaneously shown pictures of the upright position, including sitting, squatting, using hands and knees, and kneeling and were encouraged to select the position with which she felt most comfortable (Chang et al., 2011). However, in some contexts, the woman's preference to push spontaneously was not fully encouraged, thereby placing some restrictions on the position women could adopt. For example, in one study, midwives raised the head of bed up 30 degrees and positioned a woman lying on her back or side (Bloom et al., 2006). In another study, all women were encouraged to push in a lithotomy position, to follow the standard local practice (Yildirim & Beji, 2008). While women were freely to change positions, retrospective studies found that the most common maternal positions during pushing were recumbent, semi-recumbent and lateral (Parnell et al., 1993). Notably, 80% of women only used one or two positions while only 20% changed their position from three to ten different positions (Parnell et al., 1993).

#### 3.6.3.3 Communication patterns

Provider communication contributed a significant role in influencing a birthing woman's pushing behaviours (Sampselle et al., 2005). Supporting spontaneous pushing required midwives to adopt a set of behaviours and skills that go beyond providing simple instructions (Debroah, 1984). Midwives are required to share information that supports and enables the woman to release bodily tension, build her confidence in her body's ability to give birth, and understand the meaning of the different sensations she experiences during the birthing process (Sampselle et al., 2005).

Communication from the midwife should be encouraging and woman-centred. Typical phrases that can be used include: *"You're doing good."* (Sampselle et al., 2005, p. 698) *"You're probably feeling a lot of burning and stretching."* (Sampselle et al.,

2005) *"You're moving the baby down."* (Sampselle et al., 2005) *"Well done, the baby's head is moving."*(Thomson, 1995) *"Push as your body tells you."*(Thomson, 1995) *"Push if you want to. Push as your body tells you. Relax and go with it"* (Thomson, 1995).

#### 3.6.3.4 Safety protocol

Safety protocols for implementation of spontaneous pushing were outlined in some of the studies. One study illustrated that if birth does not occur within 120 minutes for primiparous women and 60 minutes for multiparous women (prolonged second stage of labour), midwives would reassess the woman to gauge maternal and fetal condition and would adopt whatever clinical management deemed necessary, to facilitate a safe birth (Jahdi et al., 2011). Another study added that if midwives are concerned about maternal and/or fetal well-being at any time, they could discontinue the trial and institute normal unit policy (Thomson, 1995). One study recommended the time range for reassessment as 90 minutes regardless of parity (Thomson, 1995).

#### 3.6.3.5 Other related factors

A descriptive study by Sampselle et al. (2005) observed 20 cases of women supported to push spontaneously during labour and summarised a set of criteria outlining core principles that define both spontaneous and directed pushing efforts. This criteria system could offer practical guidance and supporting evidence to implement spontaneous pushing as shown in table 6 (Sampselle et al., 2005).

**Table 6: Criteria system to categorise spontaneous pushing (Sampselle et al., 2005)**

| | Criteria |
|---|---|
| 1 | Breathing pattern during contraction and pushing is self-directed |
| 2 | Time of initiating push is irregular (woman initiates push independently, and pushing often begins once contraction is well established) |
| 3 | Pushing may be characterised by grunting with pushing, short and more frequent bearing-down efforts with each contraction, or both |
| 4 | Open glottis pushing (i.e., grunting noise while pushing) |
| 5 | Woman follows cues from own body |
| 6 | No verbal instruction as to how to push is given |
| 7 | No nonverbal instruction is given (e.g., provider does not take a deep breath to provide a cue) |
| 8 | Caregivers offer encouragement and praise only, not instruction |

From the included studies, we summarised the eligible criteria of recruiting women for spontaneous pushing during the second stage of labour. Four aspects were considered regarding the eligible criteria, and included:

1) Maternal age: Some of the interventional studies placed a restriction on the age of participants to be under 35 years of age (Ahmadi et al., 2017), or 40 years of age (Jahdi et al., 2011; Koyucu & Demirci, 2017; Lam & Mcdonald, 2010; Thomson, 1995) or 45 years or older (Araujo et al., 2022).

2) Gestational week: Most of the studies included women who gave birth at term between 37 to 42 weeks' gestation, thereby excluding women experiencing a preterm birth (Araujo et al., 2022; Chang et al., 2011; Debroah, 1984; Paine & Tinker, 1992; Thomson, 1995; Yildirim & Beji, 2008). Two studies included the exclusion criteria limited to 40 weeks' gestation (Koyucu & Demirci, 2017; Vaziri et al., 2016).

3) Parity: Most of the interventional studies only included nulliparous women. Five interventional studies included both primiparous and multiparous women (Bloom et al., 2006; Debroah, 1984; Jahdi et al., 2011; Low et al., 2013; Paine & Tinker, 1992). One retrospective study compared spontaneous pushing between the two parity groups (Lee et al., 2019).

4) Use of pharmacological pain relief: several interventional studies, excluded participants who used pharmacological pain relief during labour, as it may interfere with the reflexive urge to push (Bloom et al., 2006; Koyucu & Demirci, 2017; Lam & Mcdonald, 2010; Oberg, 1988; Thomson, 1993, 1995). Similarly, retrospective studies excluded women who received epidural analgesia during their labour (Lee et al., 2019). In contrast, some studies included women using pharmacological pain relief (Ahmadi et al., 2017; Chang et al., 2011; Jahdi et al., 2011; Vaziri et al., 2016). Notably, Yildirim and Beji (2008) conducted their study in a hospital where epidural analgesia was not available.

In conclusion, the criteria for spontaneous pushing during labour as outlined in the included studies can be summarised as follows: women aged above 18 years of age with a singleton fetus in cephalic presentation at term, with no obstetric or fetal complications. This applies to both nulliparous and multiparous women including those who used pharmacological pain relief methods.

## 3.7 Discussion

This scoping review systematically examined evidence from 20 studies on spontaneous pushing during the second stage of labour. It explored maternal spontaneous pushing behaviours and identified strategies to support this approach.

The review identified that spontaneous pushing differs significantly from what women have traditionally guided to do during pushing. In spontaneous pushing, women are encouraged to respond to their natural reflexive urges, supported by words of

encouragement by a midwife (Bloom et al., 2006). Typically, this involves the woman giving several short pushes with an open or closed glottis during one uterine contraction (Thomson, 1995). In contrast, directed pushing involves instructing a woman to give long and hard pushes with a closed glottis (Chalk, 2004). The instructions given to a woman during directed pushing may not align with a woman's bodily urges (Roberts et al., 1987). This mismatch can undermine a woman's confidence in her own confidence in her own bodily signals during labour (Debroah, 1984), potentially leading to feelings of disempowerment and a loss of autonomy (Cooper, 2016; Debroah, 1984).

The findings from this scoping review suggest most women in labour can be supported to engage in spontaneous pushing. Many of the studies focused on nulliparous women as they typically experience a longer duration of the second stage of labour, providing more and therefore details on maternal pushing behaviours. However, the same approach applies to multiparous women who also engage in spontaneous pushing during labour. While some studies excluded women with epidural analgesia during labour due to masked reflexive urge, retrospective studies (Lee et al., 2019; Paine & Tinker, 1992) provided some important evidence demonstrating that women with epidural analgesia can also push spontaneously without direction. Overall, the evidence supports spontaneous pushing for both nulliparous and multiparous women with or without epidural analgesia.

There may be a misconception that spontaneous pushing means a woman is left alone to push without professional midwifery support. However, this is not the case. Midwives during this time play a crucial role by providing supportive and encouraging communication, monitoring progress and addressing any potential risks. Previous research has shown that spontaneous pushing is less technique-focused with midwives emphasising and focusing on the coordination of a woman's natural urges and discussing expected bodily sensations and behaviours during labour (Cooper, 2016; Debroah, 1984). When women request guidance on how to push, midwives should offer supportive, non-directive communication to boost confidence in their body's ability to

progress labour and birth (Sampselle et al., 2005). This approach reflects a significant shift from directive guidance to a more supportive facilitation of spontaneous pushing.

### 3.7.1 Implications for research and practice

This review has important implications for future research and practice, particularly in countries where directed pushing continues to the normal practice. The mismatch between maternal spontaneous pushing and the routine practice of directed pushing challenges standard practice in many birthing centres. Currently, there continues to be a dearth of studies exploring women's spontaneous pushing behaviours. Further studies, particularly prospective or descriptive study design, are needed to better understand these behaviours, especially across different parities, pain relief methods, and maternal age groups. Additionally, randomised controlled trials are also necessary to compare the benefits and risks of spontaneous versus directed pushing providing high quality evidence for clinical decision making.

While efforts have been made to implement spontaneous pushing, most studies in this scoping review lacked detailed information on how this practice is implemented. Future research should focus on the development and implementation of guidelines to support spontaneous pushing, which can facilitate its wider adoption in clinical practice.

### 3.7.2 Strengths and limitations

To our best knowledge, this is the first scoping review to systematically examine current evidence regarding spontaneous pushing during labour in peer-reviewed journals and grey literature. Compared with a recent systematic review by Kownaklai and colleagues (2024), this review has also included descriptive and retrospective studies. A descriptive thematic analysis approach was used to synthesis the evidence, providing richer insights into supportive communication patterns and the strategies to support spontaneous pushing. There are also some limitations in this review. Firstly, this review focused on maternal behaviours and facilitating strategies regarding spontaneous

pushing, but not on effects and/or outcomes of spontaneous pushing. Secondly, this review also only includes literature published in English language and therefore there may be other literature available published in other languages which has not be reviewed or included.

The authors acknowledge that some of the studies included in this scoping review have also been cited in a previous systematic review and meta-analysis by our team (Yao et al., 2022). However, it is important to clarify that these two reviews addressed different aspects and research questions. The previous meta-analysis focused on comparing the effects of directed pushing with spontaneous pushing whereas this scoping review explored the nature of spontaneous pushing and strategies to facilitate it during the second stage of labour. Additionally, this review includes descriptive and retrospective studies that were not part of the previous meta-analysis, offering deeper insights into maternal pushing behaviours and the strategies that support them.

## 3.8 Conclusion

This scoping review systematically examined current evidence on maternal spontaneous pushing behaviours and the strategies currently used to facilitate them. The findings highlight a persistent mismatch between maternal spontaneous pushing and the routine practice of directed pushing, emphasising the need for systematic change in clinical management. Additionally, the review underscores the urgent need for future prospective or descriptive trials to better understand maternal spontaneous pushing behaviour across diverse demographic backgrounds. Revising practice guidelines to support spontaneous pushing could further promote and encourage its adoption and implementation into clinical practice.

## 3.9 Update to the literature review

The literature review chapters of this thesis include a systematic review and meta-

analysis (Chapter Two) conducted in 2021, and a scoping review (Chapter Three) submitted to *Nursing & Health Sciences* in June 2025. Since the publication/submission of both chapters, further papers of interest/importance have been published. To ensure a comprehensive analysis and up-to-date relevance, the literature review was updated in March 2025, using the original search strategies and inclusion and exclusion criteria. No new eligible evidence was identified, confirming the validity and robustness of the findings presented in both reviews. While no new original studies were identified, two recent expert reviews and clinical guidelines on pushing management during labour were considered noteworthy (Keating et al., 2024; National Institute for Health and Care Excellence, 2023). One review focused on the physiological effects of sustained breath holding pushing during labour, summarising its impact on on the various organ systems (Keating et al., 2024). Based on their findings Keating et al. (2024) recommended offering spontaneous pushing to mitigate the potential risks associated with sustained and prolonged directed pushing using a closed glottis technique. The National Institute for Health and Care Excellence (NICE) (2023) in the United Kingdom updated its for intrapartum care guidelines, confirming that spontaneous pushing shortens the second stage of labour without significant differences in outcomes. This aligns with the findings in the systematic review and meta-analysis, which confirmed that spontaneous pushing is not associated with increased risks and may offer additional benefits for both women and newborns (Yao et al., 2022). These findings reinforce the possible value for conducting a future RCT, to generate high quality original evidence on optimal pushing strategies during labour.

## 3.10 Summary of Chapter

This chapter reviewed current evidence on facilitating spontaneous pushing during the second stage of labour, serving as a background and foundation for the study design and implementation. The following chapter will describe the methodology of the feasibility study, in accordance with a previously published study protocol.

# Chapter Four: Comparison of spontaneous pushing and directed pushing during the second stage of labour among Chinese women without epidural analgesia: protocol for a noninferior feasibility study

## 4.1 Chapter preface

Chapter Three clarified the content and strategies for facilitating spontaneous pushing during labour, providing an evidence base for the development of the study. Chapter Four presents the third of the six manuscripts that have published or prepared for publication as part of this thesis. This chapter outlines the methodology of the feasibility study comparing spontaneous pushing and directed pushing within a Chinese context. The published paper addresses Research Aim 2.1: to test the feasibility of a future RCT comparing the effects of spontaneous and directed pushing during the second stage of labour on maternal and neonatal outcomes.

## 4.2 Publication details

The paper was published in *JMIR Research Protocol* in 2024. The journal is peer-reviewed and focuses on research protocols that introduce new methodologies in health research. The submitted manuscript is reproduced in this chapter with permission under the Creative Commons Attribution Non-Commercial license. Two Appendices were included in this publication, and all were incorporated into this thesis.

**Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Huijuan Rong, Kathleen Baird. (2024). Comparison of Spontaneous Pushing and Directed Pushing During the Second Stage of Labor Among Chinese Women Without Epidural Analgesia: Protocol for a Noninferior Feasibility Study. *JMIR Research Protocol*, 13, e55701. https://doi.org/10.2196/55701

## 4.3 Abstract

**Background:** Maternal pushing during the second stage of labour could influence labour progress and maternal-neonatal outcomes. Although the image of healthcare providers directing the labouring women to push during the second stage of labour could be commonly observed globally, this practice is not sufficiently researched and is questioned regarding its effects and outcomes on mother and baby. Meanwhile, a strategy referred to as 'spontaneous pushing', which supports women to push by following their bodily urges, has been evaluated in several trials. However, in China, spontaneous pushing is not common practice. Notwithstanding the evaluation of spontaneous pushing there is a lack of high-quality evidence to support either of the directed or spontaneous pushing strategies.

**Objective:** This study aims to test the feasibility of a future randomised controlled trial to compare the effects of spontaneous pushing and directed pushing during the second stage of labour for maternal and neonatal outcomes in China.

**Methods:** A non-randomised, single group, non-inferiority feasibility study will be conducted in a public hospital in Hebei Province, China. One hundred and five women meeting the selection criteria will be recruited to receive the intervention (spontaneous pushing) while 105 sets of medical notes from women who received routine care (directed pushing) will be identified and reviewed to compare outcomes for both cohorts. A mixed methods approach will be used to assess primary outcomes (feasibility and acceptability) and secondary outcomes (effectiveness).

**Results:** Data collection took place between May and October 2023. A total of 110 women received the intervention of spontaneous pushing. Midwives' interviews were conducted and will be transcribed for analysis in March 2024. The data analysis is planned to be completed by May 2024.

**Conclusions:** This feasibility study will provide important information on the conduct of a full-scale clinical trial in the future as well as the potential facilitators and barriers

of it. A future randomised controlled trial is likely to have considerable policy and funding impacts regarding pushing management during the second stage of labour and improvement on women's childbirth experience.

**Trial Registration:** Chinese Clinical Trial Register (ChiCTR2300071178)

**KEYWORDS**

spontaneous pushing; directed pushing; labour stage, second; feasibility study

## 4.4 Introduction

### Background

To achieve physiological childbirth, it is acknowledged that sound maternity practice should aim primarily at giving every woman an opportunity to achieve normality, if that is what women choose (Beynon, 1957). More recently, clinical practice which supports a woman to follow their bodily desire to push during the second stage of labour has been evaluated in several clinical trials (Araujo et al., 2022; Bloom et al., 2006; Jahdi et al., 2011; Schaffer et al., 2005). This practice is called 'spontaneous pushing'. However, this is not a new practice, rather it is a return to previous practice, because it is believed that women in the past gave birth unaided. During spontaneous pushing a woman takes several breaths in between pushes and are encouraged to give several short pushes throughout the duration of one uterine contraction (Ann, 1995). This could occur with open and/or closed glottis, depending on women's preference (Ann, 1995). Evidence from a systematic review confirmed spontaneous pushing did not necessarily lead to a longer duration of the second stage of labour (Lemos et al., 2017). In addition, women in the spontaneous pushing group are less likely to experience an extended episiotomy and caesarean section during labour (Yao et al., 2022).

Meanwhile, in most hospital settings around the world, directing a woman to push during labour is commonly observed (Lemos et al., 2017). This is usually called 'directed pushing'. In this context, women are required to follow specific instruction from healthcare providers and to push in the Valsalva manoeuver, involving taking deep breath and pushing long and hard with closed glottis (Lemos et al., 2017). At the beginning of the last century in developed countries, promoters of natural birth introduced and advocated this way of directed pushing (Alfred, 1904). They believed that directed pushing can expedite the second stage of labour and avoid the use of forceps, which is commonly used at that time (Simkin et al., 2017). However, subsequent findings revealed that directed pushing unfavorably alters maternal physiology and contributes to adverse fetal outcomes (Roberts, 2002), including poor fetal acid-base balance (Mary & Sharron, 1982 ), fetal heart rate increase or decrease (Caldeyro-Barcia et al., 1981), low umbilical cord pH and $PO_2$ levels (Yildirim & Beji, 2008), low Apgar scores at 1 and 5 minutes (Mary & Sharron, 1982 ) and decreased cerebral oxygenation (Aldrich et al., 1995).

Effective spontaneous pushing during the second stage of labour contributes to satisfactory labour progress and improved maternal and neonatal outcomes. The World Health Organization (WHO) (2018) recommends that women in the expulsive phase of the second stage of labour should be encouraged and supported to push spontaneously. Both the Association of Women's Health, Obstetric and Neonatal Nurses and American College of Nurse-Midwives advocate the use of spontaneous pushing as best practice, consistent with physiological birth practices and evidence and improved outcomes (American College of Nurse-Midwives et al., 2013). In a Chinese context, spontaneous pushing has been recommended by a national guideline by China Maternal and Child Health Association titled "Clinical Practice Guideline for Normal Birth". The guideline recommends 'women are 'allowed' to push (spontaneously) during a uterine contraction' (China Maternal and Child Health Association, 2020). Despite the guideline, the routine practice of directed pushing remains in China. Spontaneous pushing is only conducted in an extremely small proportion of hospitals (Yan et al.,

2021). More evidence is needed to narrow down the gaps between practice guidelines with clinical routine practice. Consequently, high quality original trials are required to further explore the evidence on pushing management and outcomes in the Chinese context.

### Aim

As this study will involve a change of practice in the Chinese context, it is ethically responsible to conduct a feasibility study before a full scale randomised controlled trial (RCT) can be performed. This study will be conducted as part of a PhD candidature, and therefore there were time constraints to be considered in the design and application of the research. The study aimed to test the feasibility of a future RCT to compare the effects of spontaneous pushing and directed pushing during the second stage of labour for maternal and neonatal outcomes.

This study will include 1) preparation program for midwives and 2) implementation of spontaneous pushing during the second stage of labour for women and a comparison with normal standard care (directed pushing).

### Objectives

The primary objective is to test the feasibility of a future RCT to compare the effects of spontaneous pushing and directed pushing for maternal and neonatal outcomes. The secondary objective is to explore the effectiveness of spontaneous pushing and directed pushing for women without an epidural during the second stage of labour.

## 4.5 Methods

### Study design

This feasibility study is a non-randomised, single group, non-inferiority trial. All participants will receive the intervention (spontaneous pushing). A mixed methods approach will be used to assess primary and secondary outcomes. This protocol adheres to the Standard Protocol Items: Recommendations for Intervention Trials (SPIRIT) guidelines (Chan et al., 2013).

Table 7 illustrates the objectives, outcomes and the corresponding study design.

Table 8 and Table 9 illustrate the chart of the study designs, visits and assessments for both women and midwives. The flow diagram (Appendix 10) demonstrates enrolment, allocation, follow up and assessment process for women to compare effectiveness of intervention.

**Table 7: Objectives, outcomes and study design**

| Objectives | | Outcomes | Study design |
|---|---|---|---|
| Primary objective | To test the feasibility of a future RCT to compare the effects of spontaneous pushing and directed pushing for maternal and neonatal outcomes | 1) Feasibility: recruitment rates, retention rates, attendance rates of participants; | Quantitative study design |
| | | 2) Acceptability: women's and midwives' perspectives and acceptability of the intervention. | Quantitative study design (survey for women); Qualitative design (interviews for midwives) |
| Secondary objective | To explore the effectiveness of spontaneous pushing and directed pushing for women without an epidural during the second stage of labour. | Maternal and neonatal outcomes | Quantitative study design |

**Table 8: Chart of study design, visits and assessment for women**

| Timepoint | | Visit 1 | Visit 2 | Visit 3 | Visit 4 | Visit 5 |
|---|---|---|---|---|---|---|
| | | During late pregnancy at clinics | At clinics or admission to prenatal ward | During the second stage of labour | Within 2 hours after birth | During stay in postnatal ward |
| Recruitment | Eligibility screening | ✓ | ✓ | | | |
| | Informed Consent | ✓ | ✓ | | | |
| Intervention | Spontaneous pushing | | | ✓ | | |
| Assessment | Case Report forms | | | | ✓ | |
| | Survey for women | | | | | ✓ |

**Table 9: Chart of study design, visits and assessment for midwives**

| Timepoint | | Visit 1 | Visit 2 | Visit 3 | Visit 4 |
|---|---|---|---|---|---|
| | | Before the preparation program | During preparation program | During women's labour | At the end of the study |
| Recruitment | Eligibility screening | ✓ | | | |
| | Informed Consent | ✓ | | | |
| Intervention | Preparation program for midwives | | ✓ | | |
| | Support women's spontaneous pushing | | | ✓ | |

| | | | | | |
|---|---|---|---|---|---|
| Assessment | Focus group interview for midwives | | | | ✓ |

**Sample size determination**

One of the objectives of the feasibility study is to gain estimates for a sample size calculation in a future RCT (Pearson et al., 2020). Although a formal sample size calculation is not necessarily needed in a feasibility study, sample size was calculated based on the duration of the second stage of labour as parameter outcome in previous studies. Statistical power analysis was used to estimate sample size in PASS 15.0 software with statistical power at 90%, α at 0.05, dropout rate at 20%. Sample size was calculated to be 105 in each group. Based on clinical judgement and the number of labouring women eligible in the site-specific hospital, a sample size of 105 is set for each group.

To cover all four shifts of roster, a total of 6 midwives will be recruited to deliver the intervention. All the midwives recruited to the study will be interviewed at the end of the study to assess midwives' acceptability and experience in participating the study.

**Setting**

This study will be conducted in a single Birth Centre in the Fourth Hospital of Shijiazhuang, Hebei Province, China. The economic status of the population and the medical resources of Hebei Province is on average level among all the provinces in China (National Bureau of Statistics of China, 2023) with the annual live birth rate of 762,376 in 2019 (National Health Commission of the People's Republic of China, 2023). The chosen hospital has one of the largest numbers of annual birth rate in Hebei Province with around 15,600 births in 2022. The default pushing strategy at this hospital is directed pushing, which also aligns to most other hospitals in China.

## Participants

All participants will be recruited from the Fourth Hospital of Shijiazhuang, Hebei Province, China.

One hundred and five women will be recruited to receive the intervention. At the same time, 105 sets of medical notes will be identified, and relevant information will be extracted to compare health outcomes between the two cohorts. These medical notes will be from women who received standard care, i.e., 'directed pushing' during second stage and met the same selection criteria as the women in the spontaneous pushing group. The women whose notes will be reviewed will not be recruited into this study, but permission have been obtained from the site-specific hospital to examine the deidentified medical notes. The demographic data, i.e., age and parity and labour care section of the medical notes will be reviewed and examined and parity in two cohorts will be matched for further comparison.

Six midwives will be recruited to support spontaneous pushing. They will be rostered to cover all four shifts of roster to ensure that every recruited woman will be supported to push spontaneously by a recruited and trained midwife. All recruited midwives will be interviewed for the qualitative study part.

## Eligibility criteria

The eligibility criteria for women and midwives are presented in tables (Table 10 and 11). The medical note audit will include women who received directed pushing during the second stage of labour and met the same eligibility criteria as the women in the spontaneous pushing group.

**Table 10: Eligibility criteria for women**

| Inclusion criteria | Exclusion criteria |
|---|---|

| | |
|---|---|
| • Above 18 years of age<br>• Gestation 37+ weeks at birth<br>• Single, healthy fetus in cephalic presentation<br>• No complications during labour | • Administered epidural analgesia<br>• Any medical or obstetric complication affecting 2nd stage management<br>• Unable to comply with guidance<br>• Undergo Caesarean section during labour |

**Table 11: Eligibility criteria for midwives**

| Inclusion criteria | Exclusion criteria |
|---|---|
| • Qualified with certificate in maternal and neonatal care by the Ministry of Health, PR China<br>• Employed at the Birth Centre of the Fourth Hospital of Shijiazhuang, Hebei Province, China<br>• Providing care at the birth site<br>• Willing to participate (not allocated by manager)<br>• Have at least one year of post registration practice | • Unwilling to participate<br>• Allocated by manager to participate<br>• Doula or other non-registered, lay birth support person |

**Recruitment**

**Recruitment of women**

The researcher will approach and recruit women into the study during their third trimester of pregnancy. This will allow the women enough time to read the information leaflet for the study, ask any questions and make an informed decision about participating in the study without any undue pressure.

The study will be advertised using posters and information leaflets in the antenatal services of the hospital. The researcher will approach women while they are in the waiting room awaiting their appointment and will talk to them about the study assessing their willingness to receive further information about the study. Verbal information and a written information sheet outlining the study will be provided to the women to take home and review again before their next visit (Appendix 11). At the women's subsequent visit, the researcher will meet women who are willing to participate, provide

them with an opportunity to ask any further questions about the research and seek their consent to participate in the study by asking them to sign a consent form.

**Recruitment of midwives**

Study information will be shared at one of the midwives' regular meetings or workshops and written information will be provided. Midwives will be encouraged to take the information sheet home to review, and those interested in participating in the study will be encouraged to contact the research team.

Upon permission, recruited midwives will be recruited to participate in a preparation program, which will be in a workshop format. The workshop will help to prepare them to provide care to women in the spontaneous pushing group. At the end of the study, the midwives will all be invited to attend a focus group interview to gain their views and thoughts about the implementation of the study, the intervention and their experience of participating in the study. Midwives will not be rewarded for participating in the study. With permission from the birth center manager, the participation of midwives will occur during their normal working hours.

**Patient and public involvement**

Patients and the public were not directly involved in the development of this protocol. However, the development of the research question and the preparation program content are in accordance with the previously published studies on labouring women's and midwives' experiences and priorities.

**Ethical considerations**

**Approval**

All the methods will be performed in accordance with the relevant guidelines and regulations. The protocol is approved by two ethical committees, University of Technology Sydney Medical Research Ethics Committee (ETH22-7072) and the Health

Research Committee from The Fourth Hospital of Shijiazhuang, Hebei Province, China (20230064). All participants will be provided with informed, written consent prior to their enrollment in the study. De-identified findings of this study will be shared locally via staff forums and education sessions in China, through peer-reviewed journal publications, international conferences, seminar presentations and included as part of first author (JY)'s Doctor of Philosophy degree thesis.

**Informed consent**

Informed consent from both women and midwives will be obtained. A member of the research team (JY) will discuss the study with the women and midwives and provide them with details about the study and obtain written consent.

All women participating in the study will be given a study code number and this will be documented in their medical records and in all study documents. A sticker with the logo of this study will be tagged in the top right corner of the participant's medical notes. This will help midwives identify the recruited women when they arrive at the birth center in labour.

**Participants Safety and Withdrawal**

A participant (including labouring women or midwives) may choose to withdraw from the study at any time. With consent, data before participant withdrawal will be retained and used in data analysis. Participant withdrawal may happen for several reasons, including but not limited to the following:

- Participant decision
- Inability to comply with study procedures
- The occurrence of what the participant perceives as an intolerable adverse effect

In addition, chief researcher (KB) will discontinue a participant if it is considered necessary for any reason, including but not limited to following:

- Clinical decision

- Ineligibility (either arising during the study or retrospectively having been overlooked at screening)
- Significant protocol deviation
- Significant non-compliance with intervention

The nature and reason for the withdrawal/discontinuation will be recorded.

## Intervention

### Preparation program for midwives

Before the commencing of the study, a preparation program will be provided to the recruited six midwives. The program was developed and informed by the research team's midwifery experience, engagement with the literature and a systematic review (Yao et al., 2022).

The aim of the midwifery preparation program is to provide midwives with comprehensive and evidence-based practice information on the management of pushing but in particular the management of spontaneous pushing during the second stage of labour. This will ensure midwives feel confident to support women with spontaneous pushing during the second stage of labour. The program will run over three weeks, will include six sessions, five hours in total over three weeks. The training plan is displayed in Table 12.

**Table 12: Preparation program for midwives**

| Session | Content | Duration |
|---|---|---|
| Week 1 Session 1 | Induction<br>1) Introduction of the project and the research team<br>2) Midwives to introduce themselves and discuss their expectations of the program, allowing the researcher to answer any questions they may have<br>3) The procedure of the feasibility study<br>4) The role of the midwife in the feasibility study<br>5) Time for question & answers | 50 mins |
| Week 1 Session 2 | Review of the current evidence<br>1) Pushing during the 2nd stage of labour: a scoping review<br>2) Directed pushing vs Spontaneous pushing: meta-analysis<br>3) Discussion | 40 mins |
| Week 2 Session 3 | How to support spontaneous pushing<br>1) Standard procedures of directed pushing management<br>2) Strategies to support spontaneous pushing<br>3) Comparison of spontaneous pushing and directed pushing<br>4) Simulation in pairs<br>5) Time for question & answers | 90 mins |
| Week 2 Session 4 | Q&A: Expectations or questions on pushing management<br>1) This session will be conducted online using the social media application Tencent Meeting.<br>2) In this session, midwives will be encouraged to share their expectations or questions on managing the second stage of labour.<br>3) Questions about the process of the study will be answered by the researcher. | 30 mins |
| Week 3 Session 5 | Further discussion of the research and participant withdrawal options<br>1) Brief recap of the research and refresh of the training content (highlight of the items that directly relate to midwives)<br>2) Safety and distress protocol will be explained to midwives<br>3) Withdrawal options and its procedures will be explained to midwives | 30 mins |
| Week 3 Session 6 | Scenario based learning and practice<br>1) Scenario based learning<br>2) Time for question & answers | 50 mins |

### Strategies to support spontaneous pushing during labour

Spontaneous pushing encourages a woman to push following her own bodily instincts. A standardised step by step procedure may not be suitable for every labouring woman. The following strategies are shown to facilitate the spontaneous pushing during labour:

- Encourage woman to select the most comfortable position for her during pushing (Lemos et al., 2017).
- Offer a woman information about progress of her labour and about any sensations she may feel (Sampselle et al., 2005).
- Affirm to the woman how well her body is working and encourage her to work with and listen to her body urges (Sampselle et al., 2005).
- Support the woman to wait for pushing urges, instead of coaching her to push immediately when the contraction begins (Sampselle et al., 2005).
- Support the woman to push with open glottis, including sighing, moaning or even crying (Ahmadi et al., 2017).
- Support and encourage the woman to give several short pushes (usually 4 to 6 seconds) instead of one long push (8 to 10 seconds or even longer) (Parnell et al., 1993).

## Outcomes

The outcomes measured will include three domains: feasibility, acceptability and effectiveness.

### Primary outcomes

The primary outcomes will include: 1) Feasibility: recruitment rates, retention rates, attendance rates of participants; 2) Acceptability: women's and midwives' perspectives and acceptability of the intervention.

**Secondary outcomes**

Secondary outcomes will include duration of the second stage of labour, maternal pushing position, mode of birth, rates of caesarean section, perineal laceration, rates of episiotomy, newborn Apgar scores, rates of newborn resuscitation, and rates of transfer to the neonatal intensive care unit. Table 13 illustrates the primary and secondary objectives, outcomes, criteria for success, methods for analysis and measurement tools.

**Table 13: Primary and secondary outcome criteria, analysis and measurement**

| Objectives | Outcomes | Criteria for success | Methods of analysis | Measurement / tool |
|---|---|---|---|---|
| Primary objectives: To test the feasibility of a future RCT to compare the effects of spontaneous pushing and directed pushing for maternal and neonatal outcomes. | Recruitment | Complete recruitment within 6 months | Descriptive | Researcher work log |
| | | Women recruited / women accessed *100% > 10% | Descriptive | Researcher work log |
| | | Numbers of women recruited / numbers of women who bring Information Sheet home *100% > 30% | Descriptive | Researcher work log |
| | Retention | Loss of follow-up under 30% | Descriptive | Researcher work log |
| | | Numbers of women who completed spontaneous pushing during labour / numbers of women recruited *100% > 30% | Descriptive | Researcher work log |
| | | Numbers of women who completed postnatal questionnaire / numbers of women who completed spontaneous pushing during labour *100% > 80% | Descriptive | Researcher work log |
| | Attendance of participants | Percentage of completion of all session of midwives' preparation program (midwives) > 80% | Descriptive | Researcher work log |
| | Acceptability of the 'intervention' | Overall score of the questionnaire survey above 4/5 (Childbirth Experience Questionnaire above 3/4) | Descriptive | Questionnaire survey |
| | | Midwives' focus group | Framework analysis method | Qualitative data |

| | | | | |
|---|---|---|---|---|
| Secondary objectives:<br>To explore the effectiveness of spontaneous pushing and directed pushing for women without an epidural during the second stage of labour. | Duration of second stage of labour | From full cervical dilation to the birth of the baby | mean (SD), or medians for continuous variables | Case Report Forms |
| | Mode of birth | Normal vaginal birth, Forceps extraction, Vacuum extraction, Breech delivery, Caesarean section | N (%) for categorical variables | Case Report Forms |
| | Perineal laceration | Intact, I degree, II degree, III degree, IV degree | N (%) for categorical variables | Case Report Forms |
| | Episiotomy | mediolateral episiotomy,<br>midline episiotomy, intradermal suture | mean (SD), or medians for continuous variables | Case Report Forms |
| | Apgar score | Apgar scores in 1 minute, 5 minutes and 10 minutes after birth | mean (SD), or medians for continuous variables | Case Report Forms |
| | Admission to neonatal intensive care unit | Newborn transferred to neonatal intensive care unit because of any emergency | mean (SD), or medians for continuous variables | Case Report Forms |
| | Neonatal resuscitation | Resuscitation strategies following China Neonatal Resuscitation Guideline* | mean (SD), or medians for continuous variables | Case Report Forms |

## Data collection

The primary and secondary outcomes will be measured using a combination of qualitative and quantitative methods. Three data collection tools will be used during this process.

### Case Report Form

A self-designed Case Report Form (CRF) will be used by the researcher to extract effectiveness outcomes from a woman's medical notes. These will include the duration of the second stage of labour, maternal pushing position, mode of birth, rates of caesarean section, perineal laceration, rates of episiotomy, newborn Apgar scores, rates of newborn resuscitation, and rates of transfer to the neonatal intensive care unit. The researcher will also record the name of the midwife who supported which of the recruited woman with spontaneous pushing. This will be only recorded on the researcher's work log. As the maternal pushing position is not routinely recorded in medical notes, the researcher will ask the midwife about a woman's pushing position during labour and will record it on the CRF. Midwives will also be advised to record the maternal pushing position in the labour notes during the preparation sessions.

### Survey for women

A questionnaire with closed-ended and open-ended questions will be used to explore women' satisfaction of the pushing, their childbirth experience and experience in joining the study. The researcher will access women during their stay in the postnatal ward for the completion of the survey. For women who withdrawn from the study, for personal or medical reasons a withdrawal note will be recorded in their CRF.

### Focus group with midwives

The focus group with the midwives will form the qualitative part of the study. At the end of the intervention phase of the study, midwives will be invited to attend a

face-to-face focus group to share their experience of supporting women with spontaneous pushing and their experiences of being part of the study. The discussion will be moderated by a senior researcher from the research team and will be guided by several open-ended questions.

As the primary objective of this study is to explore the feasibility of a future RCT, it is important to fully understand how midwives and women feel about the intervention, the procedure and the enablers or/and barriers. The questions in the surveys for women and interviews for midwives will focus on the perceptions of both the women and midwives' during the pushing phase of labour as well as their experience of being part of the study.

After a lengthy literature search, it was evident that there was not a validated survey tool available that would meet the aims of this study. Therefore, the survey for women was developed based on the principles and domains advocated by Deborah (2009). Section B 'Childbirth Experience Questionnaire' in the survey for women is a freely available tool, which has been published in English and validated in Chinese by Xiu Zhu in 2019 (Zhu et al., 2019).

**Data analysis**

The data in this study includes both quantitative and qualitative data. For quantitative data, 'Intention-to-treat' analysis will be used. Statistical description will be conducted by the description of mean value, standard deviation, number of cases and percentage. Pearson chi-square test will be conducted for categorical variables. Independent group *t* test will be conducted for continuous variables. The threshold for statistical significance will be set at 0.05. For qualitative data, a Framework Method will be used, which is commonly applied for thematic analysis of interview transcripts (Gale et al., 2013). After a verbatim transcription of the audio recording, the Framework Method will help to create and apply an analytic framework in the data analysis process in five steps (data familiarisation, framework identification, indexing,

charting, mapping and interpretation) (Goldsmith, 2021). The quantitative and qualitative data will be combined to compile recommendations from the feasibility to conduct a future RCT.

**Trial Registration**

This study protocol was preregistered with Chinese Clinical Trial Register (ChiCTR) (ChiCTR2300071178).

## 4.6 Results

This study will provide both quantitative and qualitative data on the feasibility of a future RCT, including the rate of and ease of recruitment, retention and attendance of participants during the process. Qualitative results from midwives' focus group interview will be presented to illustrate midwives' acceptability of the intervention. In addition, a series of labour and birth outcomes will be compared to explore the effectiveness of the intervention. The study is expected to conclude in May 2024.

## 4.7 Discussion

This is a protocol for a study assessing the feasibility, acceptability and effectiveness of spontaneous pushing during the second stage of labour among Chinese women without epidural analgesia.

A challenge for this study may likely be the recruitment of labouring women. One of the exclusion criteria for women to this study is 'administered epidural analgesia' (Table 7). A large proportion of recruited women may be excluded due to the use of epidural analgesia during labour. The epidural analgesia rate varies from one hospital to another in China (Wang et al., 2020). However, the most recently noted rate within the study hospital was around 65% for primiparous women. Despite the anticipated high loss rate of labouring women, this exclusion criterion is set based on the

underpinning midwifery philosophy that labour and birth under the use of epidural analgesia is not considered a physiological process. The International Confederation of Midwives (ICM) (2014) state "Normal birth is where the woman commences, continues and completes labour with the infant being born spontaneously, in the vertex position at term, without any surgical, medical, or pharmaceutical intervention." The use of epidural analgesia inhibits nerve conduction by blocking painful impulses form the nerves (Anim-Somuah et al., 2018). Although epidural analgesia is considered to be an effective way of pain relief in labour and birth (Aune et al., 2021), by blocking of pain impulses also blocks other impulses conducted by the nerves, including pushing or bearing down urges. At the same time, the 'intervention' in this study, spontaneous pushing, encourage labouring women to feel their bodily urges and push in their most effective way. From this perspective, women who used epidural analgesia during labour may have difficulty in feeling their pushing instinctive, and hence, they are excluded in this study. The criteria of excluding women who used epidural during labour does not mean to influence women's choices for their pain relief methods. The reasons for this criteria item will be formally explained to women to avoid their potential shame of the use of epidural analgesia during labour.

**Strengths and limitations**

- A strength of this study is the mixed methods that will be used to measure outcome assessment, including quantitative data for effectiveness outcomes and focus group data for acceptability and feasibility outcomes.
- Another strength of the protocol is that a detailed preparation program for midwives is developed to support spontaneous pushing during labour.
- A potential limitation of the study is that participants will be both primiparous and multiparous women as we assume that a larger proportion of primiparous

women will use epidural analgesia during labour which will exclude them during the study.

- Another limitation of the study will be the risk that crossover in the clinical context may occur where midwives may facilitate spontaneous pushing when taking care of women from the routine practice group.

## 4.8 Conclusion

Conducting this feasibility study will be used to evaluate the feasibility of conducting a full-scale RCT in the future as well as providing an opportunity to explore the potential facilitators and barriers of implementing an RCT. A future RCT will aim to compare the maternal and newborn outcomes between directed pushing and spontaneous pushing in women without epidural analgesia during the second stage of labour. The findings in this study are likely to have considerable policy and funding impacts regarding pushing management during the second stage of labour in line with WHO recommendation to improve normality during labour and improve a woman's childbirth experience.

## 4.9 Summary of Chapter

This chapter described the design of the feasibility study, illustrating both the quantitative and qualitative part of the study. The next chapter will report on the first part of the quantitative results, the feasibility and preliminary effectiveness of supporting spontaneous pushing during the second stage of labour.

# Chapter Five: Feasibility and preliminary effectiveness of supporting spontaneous pushing during the second stage of labour: a prospective cohort study

## 5.1 Chapter preface

Chapter Four detailed the methodology of the feasibility study. Chapter Five will present the first part of the results, focusing on the feasibility of implementing spontaneous pushing in a Chinese context and its preliminary effectiveness. This chapter features the fourth of six manuscripts that have been prepared for publication. This paper addresses Research Aim 2.1: to test the feasibility of a future RCT comparing the effects of spontaneous pushing and directed pushing during the second stage of labour for maternal and neonatal outcomes.

## 5.2 Publication details

This paper was submitted to *Contemporary Nurse*, a peer-reviewed, open access journal, in June 2025. The manuscript is included in this chapter with permission under the Creative Commons Attribution Non-Commercial license. Appendix 11 from the original publication is also attached (Appendix 11).

> **Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Kathleen Baird. Feasibility and preliminary effectiveness of implementing spontaneous pushing during the second stage of labour: a prospective cohort study (submitted to *Contemporary Nurse* in June 2025, is incorporated as Chapter Five)

## 5.3 Abstract

**Objective:** To test the feasibility and preliminary effectiveness of maternal spontaneous pushing compared with instructed directed pushing during the second stage of labour in China.

**Design:** A non-randomised, non-inferiority, prospective cohort study.

**Setting:** Large maternity hospital in China.

**Participants:** Out of 995 women approached, 423 women were recruited and 112 women completed spontaneous pushing. Medical notes from 112 women who received routine directed pushing were matched and reviewed. Nine midwives supported the spontaneous pushing group.

**Intervention:** Nine midwives participated in an educational preparation program. The program provided them with strategies to facilitate spontaneous pushing. Recruited women were supported by midwives to push spontaneously during labour, with a focus on the woman following her bodily urges and pushing spontaneously.

**Main outcome measures:** To test the feasibility of a future full-scale trial, data were collected by documenting the research process and conducting postnatal survey. To test preliminary effectiveness, labour and birth outcomes were collected using a Case Report Form and compared. Women's labour and birth information were extracted postnatally from the medical notes of all women in the intervention group. For the comparison cohort, a review of women's medical notes (labour and birth section) was conducted at the end of the study.

**Results:** Of all women approached, 43% participated in the study, with over 24% completing spontaneous pushing during labour and completing the postnatal survey. Participants were generally satisfied with their experience, and their suggestions were collected for further improvement of future studies. The spontaneous pushing group experienced a second stage duration that was three minutes longer (P=0.002) and had

less blood loss volume at the birth of the placenta (P=0.046) and one hour after postpartum (P=0.033). There were no statistical differences between two groups regarding the duration of the first stage of labour (P=0.588), episiotomy rates (P=0.446), blood loss volume two hours after birth (P=0.840), perineal trauma (P=0.170), or newborn Apgar scores (P=0.319).

**Conclusions:** Results from this research indicates supporting spontaneous pushing during labour is both feasible and effective. Results from this study justify progressing to a full-scale trial with some necessary modifications to its implementation.

**Trial registration number:** ChiCTR2300071178.

**Strengths and limitations**

1. Prospective data collection enables achieving data integrality.

2. Feasibility study design provides recommendations for future study design.

3. Potential crossover between the two groups in a clinical context when midwives may facilitate spontaneous pushing for women in routine care.

4. The use of self-reported questionnaire by women may lead to bias.

## 5.4 Introduction

In midwifery-led models of care, the physiological process of labour and birth is highly valued (Sandall et al., 2016). Physiological labour and birth consist of various labour mechanisms (Cunningham et al., 2014). With the presenting part descending, the women typically begin to feel a spontaneous urge to push and bear down (Cunningham et al., 2014). Most women, when in labour when approaching the second stage of labour (without epidural analgesia), will feel a strong physiological urge to push or bear down, each time the uterus contracts. The combined force created by contractions of the uterus and abdominal musculature, propels the fetus downward

and leads to the baby's birth (Cunningham et al., 2014). The maternal pushing or bearing down effort play vital roles in the birth of the baby and healthcare providers are paying increased attention to the effects of pushing on maternal and neonatal outcomes.

There are two types of pushing strategies utilised: directed pushing and spontaneous pushing. Directed pushing is the common practice in many settings around the world (Parnell et al., 1993), including in China. It originated from the beginning of the last century and was popularised in the 1950s (Alfred, 1904). Despite variations in various settings, directed pushing usually evolves guidance or instruction of pushing by a third party, for example healthcare providers, and long, repeated pushing with closed glottis (Koyucu & Demirci, 2017; Thomson, 1993; Yildirim & Beji, 2008). The primary rationale for this kind of long strenuous pushing effort has been to expedite the second stage of labour (Mary & Sharron, 1982 ), and avoid forceps births which were commonly used at the time (Simkin et al., 2017). However, because of the repeated breath holding and long pushes, there was a belief that directed pushing may contribute to potential adverse effects to both the woman and her fetus. Directed pushing leads to an increased pressure within the thoracic cavity (Roberts, 2002), resulting in a reduced oxygenated blood travelling to the placenta (Roberts, 2002), compromising maternal-fetal blood gas exchange (Sampselle & Hines, 1999) and leading to fetal heart rate increases or decreases (Caldeyro-Barcia et al., 1981).

With increasing public attention now being paid to the normality of labour and birth, spontaneous pushing which supports a woman's physiological process of labour is starting to regain popularity. A descriptive study by Joyce et al. (1987) which explored spontaneous pushing suggested that a woman's spontaneous pushing behaviour was different from when they were being instructed to hold their breath and directly push. In spontaneous pushing, a woman would push several times during one contraction, usually for 4 to 6 seconds for each push, taking several breaths in

between bearing down efforts (Joyce et al., 1987). The labouring woman was more likely to use a combination of holding their breath and exhaling air, unlike the closed-glottis instruction that woman received when applying the directed pushing method (Joyce et al., 1987). When healthcare providers were supportive of spontaneous pushing, this philosophy of care acknowledges the woman as the expert of their labour, trusting in their bodies, during the second phase of labour.

Literature reviews were conducted to assess evidence on both directed and spontaneous pushing. The Cochrane review (Lemos et al., 2017) revealed no clear difference in maternal and neonatal outcomes between spontaneous pushing and directed pushing. A systematic review and meta-analysis (Yao et al., 2022) conducted prior to commencing the research established spontaneous pushing reduced the risks of an extended episiotomy and caesarean section. Current evidence to support or refuse either directed pushing or spontaneous pushing remains limited and is of low quality, and therefore further high-quality original trials are required examining alternative pushing strategies during the second stage of labour.

Although spontaneous pushing is a recommended practice in a Chinese national guideline (China Maternal and Child Health Association, 2020), the common practice in most if not all Chinese hospitals is directed pushing. After a lengthy literature search and review, only one study provided some evidence on pushing strategies in a northeast province in China (Yan et al., 2021). A study investigating 61 facilities from four regions in Zhejiang Province confirmed directed pushing was routinely implemented in 66% of the investigated hospitals and partially implemented in 33% (Yan et al., 2021). Hence, a full-scale trial is needed to promote the recommended practice of spontaneous pushing in China.

Before conducting a full-scale trial, a feasibility study was necessary to assess and evaluate the feasibility and potential facilitators and barriers of implementing a full-scale trial in the future. Conducting the feasibility study will identify maternal

and newborn outcomes between directed pushing and spontaneous pushing in women during the second stage of labour in a large hospital in China.

This study aims to test the feasibility and preliminary effectiveness of maternal spontaneous pushing compared with routine directed pushing during the second stage of labour in China. The objectives of the study include:

1) Primary objective: To test the feasibility of supporting spontaneous pushing during the second stage of labour in a future full-scale trial.

2) Secondary objective: To compare the effectiveness of spontaneous pushing and directed pushing for women without an epidural during the second stage of labour.

## 5.5 Method

### Study design

This feasibility study was a non-randomised, non-inferiority trial. A cohort of participants were recruited to receive the intervention (spontaneous pushing). At the same time, data from another cohort were extracted from medical notes to compare health outcomes between the two cohorts.

### Setting

This study was conducted in a large public maternal hospital in Hebei Province, situated in the middle region of China. The number of live births in Hebei Province was 762,376 in 2019 (National Health Commission of the People's Republic of China, 2023). The economic status of the population and the medical resources of Hebei Province is middle range level among all the provinces in China (National Bureau of Statistics of China, 2023).

## Participants

Women attending the hospital for maternity care and midwives working at the site-specific hospital made up the participants in the study. Although a formal sample size calculation may not be required for a feasibility study (Pearson et al., 2020), the sample size for labouring women in each group was calculated to estimate the different effect of two pushing strategies in two groups. The duration of the second stage of labour was used as parameter outcome according to a previous study (Koyucu & Demirci, 2017). Statistical power analysis was used to estimate sample size in PASS 15.0 software with statistical power at 90%, α at 0.05, dropout rate at 20%, measured by the mean and standard deviation. The sample size for women was calculated to be 105 in each group. The sample size for midwives was estimated to range from 6 to 9 in order ensuring coverage for all four shifts of roster. All the midwives participating in the study were interviewed at the conclusion of the study to evaluate their acceptability and experience in participating the study.

Midwives who were qualified with certificate in maternal and neonatal care by the Ministry of Health, PR China, employed and providing care at the Birth Centre of the site-specific hospital and with at least one year of post registration practice were included. Midwives who were unwilling to participate, or other non-registered lay birth support person were excluded. The eligibility criteria for women are presented in Table 14. The medical note audit included women who received directed pushing during the second stage of labour and met the same eligibility criteria as the women in the spontaneous pushing group.

**Table 14: Eligibility criteria for women**

| Inclusion criteria | Exclusion criteria |
|---|---|
| • Above 18 years of age<br>• Gestation 37+ weeks at birth<br>• Single, healthy fetus in cephalic presentation<br>• No complications during labour | • Administered epidural analgesia<br>• Any medical or obstetric complication, such as heart disease or hypertension which are medically considered not suitable for pushing<br>• Unable to communicate effectively with maternity staff<br>• Undergo Caesarean section before labour without a trial of vaginal birth or pushing efforts |

## Study procedures

### Recruitment of midwives

The recruitment of midwives was endorsed and supported by the manager of the birth centre. Information about the study was shared and discussed at midwives' staff meetings and study workshops. The presentation provided an overview of the study, its purpose and aims. Written information about the study was also provided to midwives. Midwives interested in participating in the study were encouraged to contact the research team. Written consent was obtained from all midwife participants.

### Recruitment of women

The study was advertised using posters and information leaflets in the antenatal clinic of the hospital. The researcher approached women during their third trimester in the waiting area before their midwife/doctor appointments, providing study details and a written information sheet. The researcher answered any questions. Written

consent was obtained from willing participants during pregnancy. Recruitment took place from 20th May 2023 to 26th September 2023.

**Preparation program for midwives**

A total of 9 midwives were recruited to participate in the study. Before the study commenced, a preparation and education program were provided to the midwifery participants. The program was developed and informed by the team's midwifery experience, current research evidence and a systematic review (Yao et al., 2022). The aim of the midwifery preparation program was to provide midwives with comprehensive and evidence-based practice information on the management of the second stage of labour with a focus on the management of spontaneous pushing. The program was conducted over three weeks, included six education sessions, five hours in total.

**Implementation of spontaneous pushing**

Midwives who attended and completed the training and education program supported women in the spontaneous pushing group during their labour. The implementation and instruction of spontaneous pushing was overseen as indicated in Appendix 12.

**Data collection**

Data for feasibility and acceptability were recorded in the researcher's work log which recorded the process of the study, and data for effectiveness was collected using a self-developed Case Report Form.

The Case Report Form was used to collect women's labour and birth information from the two cohorts. For the intervention cohort, the researcher extracted the women's labour and birth information when they meet with the woman during their postnatal stay in hospital. At this time the women completed the postnatal survey, which collected information about the woman's satisfaction with spontaneous pushing

during the second stage of labour. For the comparison cohort, extraction of information from the woman's medical notes occurred at the end of the study, from 30th September 2023 to 7th October 2023. The extraction of medical information from the comparison cohort was permitted by the site-specific hospital. The same inclusion and exclusion criteria were applied to select women for the comparison group. Deidentification of medical notes was completed before the researcher accessed them. The demographic data, including age and parity and the labour care section of the medical notes were examined.

**Measures**

The primary outcomes of this study were feasibility, including recruitment, retention, participation, and acceptability.

Recruitment was assessed by the numbers of women eligible and recruited women who agreed to participate in the study. Retention was assessed by the attendance of midwives at the end of the study and women's completion of the postnatal survey. Participation was assessed by the numbers of participants versus the number of women accessed and eligible to participate. Acceptability of the study was assessed by asking women to rank their acceptability of the study materials, procedures and the intervention using a 5-point Likert scale from agree (=5) to disagree (=1). Two open-ended questions were used to assess women's willingness to advocate the study and the rationale and their suggestions for future studies.

The secondary outcomes of this study were the effectiveness of spontaneous pushing. The difference between the intervention cohort and the comparison cohort included maternal and neonatal outcomes extracted from the medical notes using the Case Report Form. The duration of the second stage of labour (minutes) was calculated by the timepoint of recorded full cervical dilation and the birth of the newborn. Blood loss volume (ml) were assessed by midwives' evaluation at three different timepoints, at the birth of the placenta, 1 hour after birth and 2 hours after

birth. Apgar scores were assessed by midwives according to the principles in guidelines at three timepoints, at 1 minute, 5 minutes and 10 minutes after birth (American Academy of Pediatrics Committee, 2015). Cord blood pH was measured using an automated analyser (ABL80 FLEX RadioMeter) under standardised procedures. The degree of perineal laceration and or trauma was measured by midwives using the standards in according to the Chinese guidelines, the five categories included: intact, I, II, III and IV degree laceration (Zhang et al., 2022).

**Data analysis**

Data was analysed using the software SPSS for MacBook, Version 27 (IBM Corp. Armonk, NY, USA) 'Intention-to-treat' analysis was used. The normality of distribution of numerical variables was assessed and found to be non-normal distribution ($P<0.05$), so nonparametric tests were used. For comparison of numerical variables, the mean value and standard deviation were used for description and the Mann-Whitney U test was applied. Categorical variables were described by number of cases and percentages, and chi-squared tests and risk ratios were used to compare across groups. Fisher's exact test was applied when expected cell frequency was less than 5. The significance level for the comparison was set at 0.05.

At the end of the postnatal survey, women could complete two open-ended questions about their satisfaction and suggestions for a future trial. These free-text comments were analysed using content analysis and categorised into different topics.

**Ethical considerations**

Ethical approval was obtained from the Health Research Committee from The Fourth Hospital of Shijiazhuang, Hebei Province, China on 14th February 2023 (Reference number: 20230064) and University of Technology Sydney Research Ethics Committee on 3rd May 2023 (Reference number: ETH22-7072). Informed consent was obtained from all participating midwives and women. This study was

reported according to the Consolidated Standard of Randomised Trials (CONSORT) guidelines.

### Patient and public involvement

No public or patient was involved in the development of this study.

## 5.6 Results

Results of the study comprised of two aspects: feasibility and effectiveness. Feasibility outcomes included the recruitment rates of both midwives and women, retention and participation rates and acceptability. Effectiveness outcomes measured the difference between the two cohorts of women and included the duration of the second stage of labour, blood loss volume, Apgar scores, cord blood pH values, episiotomy rates, perineal lacerations, mode of birth, newborn resuscitation at birth, transfer to Neonatal Intensive Care Units at birth.

### Feasibility

### Recruitment of midwives

A total of n=16 midwives attended the meeting and n=9 midwives consented to participate in the study. All nine midwives signed the consent form before their first preparation session. The demographics of the nine midwives are shown in Appendix 12.

### Recruitment of women

Recruitment occurred over a five-month period. The researcher was present in the clinic five mornings a week over five months. During this time a total of 995 women were accessed in the antenatal waiting room. The women were approached and assessed for their interest and willingness to receive further information about the

study. Of the 995 women approached, 572 women declined to participate in the study for a variety of reasons including: planned caesarean section, hesitation to participate, planned use of an epidural for analgesia during labour. Overall, a total of 423 women agreed to be recruited into the study and provided written consent. The flow diagram was shown in Figure 8.

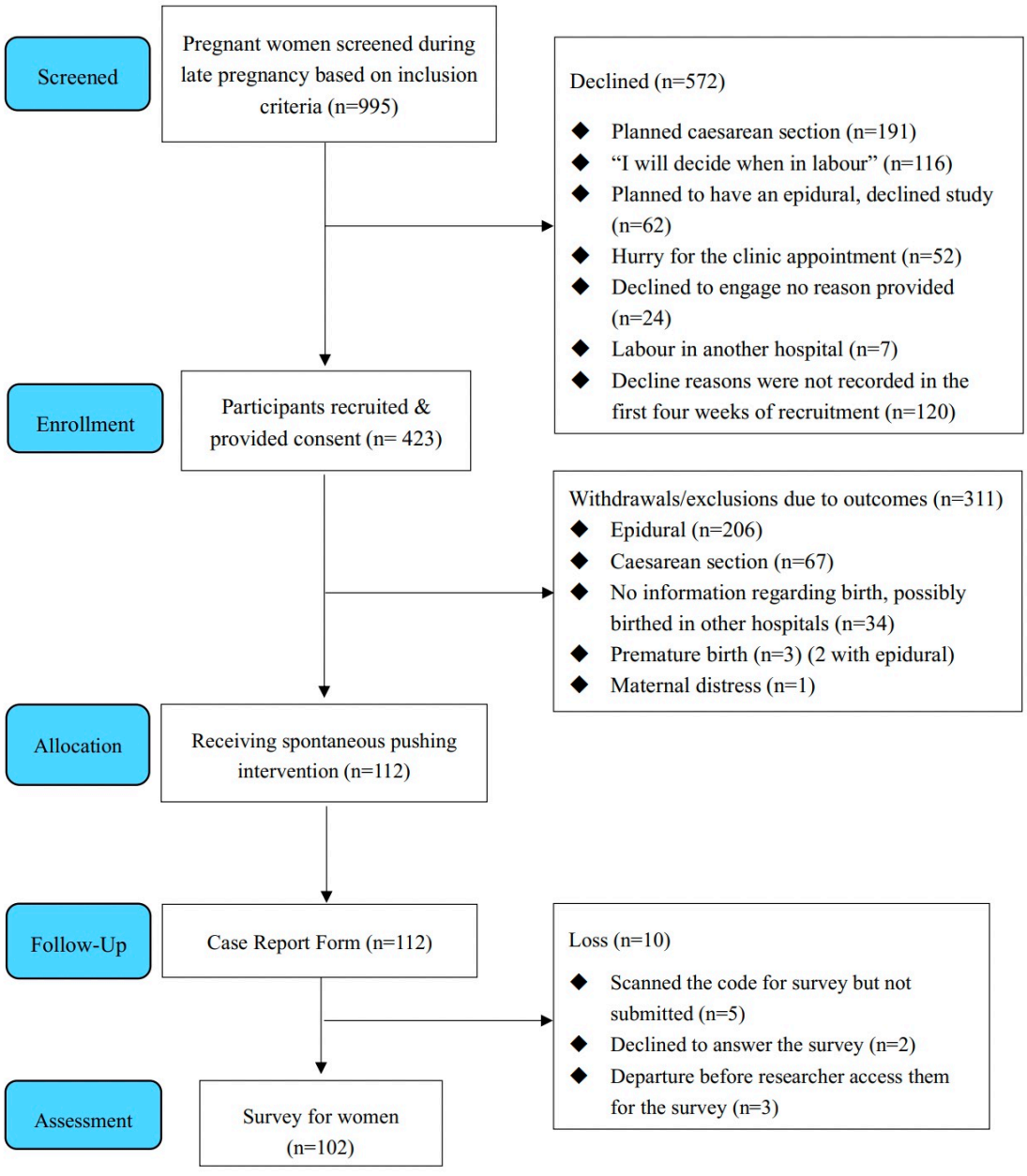


**Figure 8. CONSORT flow diagram of recruitment of women**

**Retention and participation**

In total 16 midwives were introduced to the study, of the 16, nine midwives were recruited, with a participation rate of 56% (9/16). Six midwives completed the preparation program. Four weeks later an additional three midwives completed the preparation program and joined the study. Eight out of the nine midwives completed the whole study period, while one took one month's leave. Table 3 in Appendix 12 illustrates the participation of the nine participating midwives over the data collection period.

A total of 995 women were accessed for suitability to participate in the study and a total of 423 were recruited into the study. The participation rate was 43% (423/995). At the end of the study, 112 women exercised spontaneous pushing during the second stage of labour and 102 of them completed the postnatal survey, with an overall retention rate of 24% (102/423) (Figure. 8).

**Acceptability**

The mean ranking for women's acceptability of the study is presented in Appendix 12 Table 4. Results indicate 94% of women agreed or mostly agreed that midwives provided enough professional support (mean score, 4.57) and communication on spontaneous pushing (mean score, 4.56). 88% (89/101) of the participants agreed or mostly agreed that this study was of interest to them (mean score, 4.40). Most women reported answering the postnatal survey did not affect their rest in postnatal wards (95, 93%), and the materials were easy to understand (mean scores, 4.44). Many agreed they would be prepared to adopt spontaneous pushing in their future births (mean score, 4.44) and recommend it to other women (mean score, 4.43). Generally, 93% (95/102) of the women agreed or mostly agreed the study is meaningful (mean score, 4.50) and were satisfied with the experience of their participation (mean score, 4.49). Importantly, 91% (93/102) of the women agreed or mostly agreed that this study benefited their childbirth (mean score, 4.48).

### Women's preference on the timepoint to engage in the study

With the aim to provide more information for a future clinical trial, the research team also wanted to explore women's preference on a suitable timepoint for each procedure of the study. Overall results (see Appendix 12 Table 5) indicate women prefer to be asked for their interest and willingness to participate in a study during the third trimester of pregnancy. They also considered it acceptable to be approached in the antenatal clinic (49%, 49/101). An alternative venue and preference for some women would be during the prenatal education classes (37%, 37/101). Gaining consent to participate in the study most women preferred late pregnancy in the antenatal clinic (45%, 45/101) or on their admission to the prenatal ward (34%, 34/101). Most women appeared to be accepting of completing a research survey in the postnatal ward with (85%, 86/101) agreeing this was an appropriate time and place. All the timepoints implemented in this study were consistent with women's preferences, providing reassurance for a larger clinical trial in the future.

### Preliminary effectiveness

### Baseline data

Baseline data for intervention group and control group are summarised in Table 11. Participants had a mean age of 31.72 (SD 3.664) years, ranging from 23 to 41 years of age, most of participants had postgraduate qualifications including a diploma or degree (75%, n=169). There were 17 primiparous women and 95 multiparous women in each of the two groups. 80 (36%) of the women had a gestational week of 39 weeks. The women gave birth to a total of 224 newborns, 90 were female and 134 males.

There were no differences found between the two groups for any of the baseline demographic characteristics except a statistically significant difference between

groups for numbers of pregnancy at baseline, with the intervention group reporting higher numbers of pregnancy ($P < 0.05$) (see Table 15).

**Table 15 Baseline character of intervention group and control group**

| Variable | Intervention group (n=112) Mean (SD) or n (%) | Comparison group (n=112) Mean (SD) or n (%) | Total (n=224) Mean (SD) or n (%) | P |
|---|---|---|---|---|
| Age | 31.94 (3.391) | 31.50 (3.920) | 31.72 (3.664) | 0.292[a] |
| Education | | | | |
| *Middle school and below* | 11 (10%) | 11 (10%) | 22 (10%) | |
| *High school* | 10 (9%) | 6 (5%) | 16 (7%) | |
| *Technical diploma* | 12 (11%) | 2 (2%) | 14 (6%) | 0.065[b] |
| *Diploma* | 45 (40%) | 59 (53%) | 104 (46%) | |
| *Bachelor* | 32 (29%) | 33 (30%) | 65 (29%) | |
| *Master and above* | 2 (2%) | 1 (1%) | 3 (1%) | |
| Marital status | | | | |
| *Married* | 112 (100%) | 111 (99%) | 223 (100%) | |
| *Divorced* | 0 (0%) | 0 (0%) | 0 (0%) | 0.498 [b] |
| *De facto* | 0 (0%) | 1 (1%) | 1 (0%) | |
| Numbers of pregnancy | 2.78 (1.221) | 2.46 (0.899) | 2.62 (1.082) | 0.047[a] |
| Pregnancy gestation | | | | |
| *37* | 8 (7%) | 9 (8.0%) | 17 (7%) | |
| *38* | 22 (20%) | 31 (28%) | 53 (24%) | |
| *39* | 46 (41%) | 34 (30%) | 80 (36%) | 0.477 [b] |
| *40* | 32 (29%) | 33 (30%) | 65 (29 %) | |
| *41* | 4 (4%) | 5 (5%) | 9 (4%) | |
| Newborn gender | | | | |
| *Female* | 43 (38%) | 47 (42%) | 90 (40%) | 0.586 [c] |
| *Male* | 69 (62%) | 65 (58%) | 134 (60%) | |
| Newborn weight | | | | |
| *Less than 2500g* | 2 (2%) | 3 (3%) | 5 (2%) | |
| *2500~4000g* | 101 (90%) | 104 (93%) | 205 (92%) | 0.628 [b] |
| *More than 4000g* | 9 (8%) | 5 (5%) | 14 (6%) | |

Note: a. Mann-Whitney U test; b. Fisher's exact test; c. Pearson's Chi-square test.

**Comparison of maternal and neonatal outcomes between the two groups**

Statistically differences were observed between the two groups in the duration of second stage of labour, blood loss volume at the birth of the placenta and 1 hour after birth ($P<0.05$) (see Table 16). No statistical differences were found in the duration of first stage of labour, blood loss volume at 2 hours after birth, Apgar scores (at 1 minute, 5 minutes and 10 minutes after birth) or cord blood pH values ($P>0.05$) (see Table 16).

When divided by parity into nulliparous women and multiparous women, differences were detected between the intervention and comparison groups. Multiparous women in the spontaneous pushing group had three minutes longer duration of second stage of labour ($P=0.002$), less blood loss at the birth of the placenta ($P=0.010$) and less blood loss 2 hours after birth ($P=0.015$) compared to women form the comparison group (see Table 16).

**Table 16 Differences in outcomes between groups (Intention-to-Treat Populations) (continuous variables)**

| Outcomes | Intervention group (n=112) Mean (SD) | Comparison group (n=112) Mean (SD) | p-Value [a] |
|---|---|---|---|
| Duration of the first stage of labour (minute) | 235.22 (123.110) | 245.80 (165.622) | 0.645 |
| *Nulliparity* | 194.12 (85.120) | 264.94 (146.332) | 0.228 |
| *Multiparity* | 242.58 (127.686) | 242.38 (169.318) | 0.314 |
| Duration of the second stage of labour (minute) | 19.47 (16.491) | 16.37 (15.724) | **0.002** |
| *Nulliparity* | 35.59 (28.531) | 32.65 (23.819) | 0.535 |
| *Multiparity* | 16.59 (11.278) | 13.45 (11.784) | **0.002** |
| Blood loss volume at the birth of the placenta (ml) | 164.77 (35.235) | 173.04 (38.081) | **0.046** |
| *Nulliparity* | 183.13 (36.096) | 173.53 (41.675) | 0.534 |
| *Multiparity* | 161.68 (34.322) | 172.95 (37.640) | **0.010** |
| Blood loss volume 1 hour after birth (ml) | 268.47 (60.366) | 273.39 (39.900) | **0.033** |
| Nulliparity | 276.25 (36.309) | 275.88 (48.226) | 0.912 |
| *Multiparity* | 267.16 (63.575) | 272.95 (38.506) | **0.015** |
| Blood loss volume 2 hours after birth (ml) | 308.29 (61.169) | 309.64 (44.498) | 0.400 |
| *Nulliparity* | 322.50 (39.749) | 314.71 (50.512) | 0.446 |
| *Multiparity* | 305.89 (63.293) | 308.74 (43.570) | 0.206 |
| Apgar score at 1 minute | 10.00 (0.000) | 9.99 (0.094) | 0.317 |
| Apgar score at 5 minutes | 10.00 (0.000) | 10.00 (0.000) | --[b] |
| Apgar score at 10 minutes | 10.00 (0.000) | 10.00 (0.000) | --[b] |
| Cord blood pH value | 7.35 (0.061) | 7.35 (0.069) | 0.681 |
| *Nulliparity* | 7.34 (0.065) | 7.31 (0.067) | 0.302 |
| *Multiparity* | 7.35(0.060) | 7.36 (0.068) | 0.458 |

Note: a: Mann-Whitney U test; b: test was not conducted as the SD in the group was 0.

No differences were found in the rates of episiotomy, perineal trauma, cervical laceration, mode of birth, newborn resuscitation at birth, the rates of transfer to Neonatal Intensive Care Units at birth (see Table 17). Similarly, upon further analysis for parity no difference was observed between the two groups regarding the incidence of episiotomy, cervical laceration, assisted vaginal birth, or transfer to Neonatal Intensive Care Units at birth (see Appendix 12 Table 6).

**Table 17 Differences in outcomes between groups (Intention-to-Treat Populations) (categorial variables)**

| Outcomes | Intervention group (n=112) | | Comparison group (n=112) | | Total | | Risk Ratio (95% CI) | p-Value |
|---|---|---|---|---|---|---|---|---|
| | N | % | N | % | N | % | | |
| Episiotomy | | | | | | | | |
| *No* | 110 | 98 | 107 | 96 | 217 | 97 | 0.39 (0.07,2.05) | 0.446 [d] |
| *Yes* [a] | 2 | 2 | 5 | 5 | 7 | 3 | | |
| Perineal trauma [b] | | | | | | | | |
| *Intact and I degree laceration* | 58 | 53 | 67 | 63 | 125 | 58 | 1.50 (0.87,2.58) | 0.170 [e] |
| *II and III degree laceration* | 52 | 47 | 40 | 37 | 92 | 42 | | |
| Cervical laceration | | | | | | | | |
| *No* | 110 | 98 | 108 | 96 | 218 | 97 | 0.49 (0.09, 2.74) | 0.683 [d] |
| *Yes* | 2 | 2 | 4 | 4 | 6 | 3 | | |
| Mode of birth | | | | | | | | |
| *Normal vaginal birth* | 109 | 97 | 110 | 98 | 219 | 98 | 1.51 (0.29,9.24) | 0.999 [d] |
| *Forceps extraction or Caesarean section* | 3 | 3 | 2 | 2 | 5 | 2 | | |
| Newborn resuscitation at birth | | | | | | | | |
| *No* | 112 | 100 | 112 | 100 | 224 | 100 | -- | -- |
| *Yes* | 0 | 0 | 0 | 0 | 0 | 0 | | |
| Transfer to NICU at birth [c] | | | | | | | | |
| *No* | 110 | 98 | 109 | 97 | 219 | 98 | 0.66 (0.11, 4.03) | 0.999 [d] |
| *Yes* | 2 | 2 | 3 | 3 | 5 | 2 | | |

Note: a: All episiotomy in this study is mediolateral episiotomy; b: women who had episiotomy were not assessed for the degree of perineal laceration. c: NICU: Neonatal Intensive Care Unit; d: cells had an expected number less than 5 and Fisher's Exact Test was applied; e: Chi-square test.

### Free text content analysis

#### Women's satisfaction

Of the 102 women who completed the survey, the majority (85/102, 83%) expressed satisfaction with their experience and believed spontaneous pushing should be an option made available to all women. A total of 69 comments were collected from the survey, focusing on four key topics these included: 'Feeling empowered', 'Feeling the process', 'Feeling the power of their body' and 'Experiencing enhanced efficacy' (see Appendix 12, Table 7). Participation in this study did not restrict woman's access to epidural analgesia during labour; however, one respondent reported high levels of labour pain and suggested the use of epidural analgesia would have been a more suitable option for them.

#### Women's suggestions

Most of the women commented that they were satisfied with their experience, or they had no further comments to add. A total of 21 individual comments were collected. Women suggested the provision of prenatal education on spontaneous pushing, and sharing the experiences from women who pushed spontaneously via social media and education sessions would be useful (see Appendix 12, Table 7).

## 5.7 Discussion

This study tested the feasibility and preliminary effectiveness of supporting spontaneous pushing during the second stage of labour. The procedures and intervention were generally feasible and effective. The comparison of maternal and neonatal outcomes indicted that spontaneous pushing reduced women's blood loss, without increasing risks despite a three minute longer second stage of labour duration. Overall, the results suggest that with some minor modification, the protocol warrants a full-scale trial in the future.

Recruiting pregnant or labouring women into a research study can be challenging and have been previously acknowledged (Goldstein et al., 2021). Although the current study achieved a successful recruitment rate of 43%, the challenges encountered in this study need to be considered and acknowledged when considering a future trial. Women in China similar to many other countries have a strong desire to use epidural analgesia during their labour for pain relief. It is accepted that the use of epidural analgesia may impede a woman's urge to push spontaneously (Anim-Somuah et al., 2018) and therefore were not included in this study. Many women approached during the antenatal period to participate in the study already held a strong desire to use an epidural for analgesia during their labour. This was particularly evident with nulliparous women, thereby explaining the small proportion of nulliparous women recruited into this study. Almost all the women approached showed an initial interest in the study but nearly half of the women approached to participate declined as they wanted to be able to use an epidural during their labour which is consistent with a previous study by Indira et al. (Indira et al., 2018).

The research team adopted effective strategies to improve recruitment, which could be important for future studies. One strategy provided the provision of pain relief options to women prenatally. For example, instead of starting a conversation by discussing the study first, they asked women about their ideas and expectations regarding pain relief during labour. Most women stated that they planned to request an epidural. However, it became quickly evident that many women were unaware of the alternative forms of pain relief available to them. Suggesting that women's education and knowledge regarding pain relief options especially non- pharmacological are insufficient (Hakala et al., 2022). Indicating the need to discuss alternative pain relief options with women early in their prenatal education, which could help to improve a woman's willingness to participate in the study in the future. A flowchart was used as a visual aid to illustrate women's pain relief options during labour and birth, including non-pharmacological and pharmacological methods. This flowchart helped women to

understand that there were other pain relief options available to them should they wish to use them.

Most of the women who participated in the study indicated they would advocate for spontaneous pushing, as well as discuss the benefits of this method of pushing with their peers, friends and family. They also stated they would adopt this in future births. Women felt empowered and appeared to have an enhanced birth experience and outcomes.

The benefits of improved outcomes for themselves and their baby is one of the most important reasons why women decide to participate in clinical trials, aligning with conclusions from previous studies (van Delft et al., 2013). The study also collected data on women's preferred timepoint during their pregnancy to discuss and engage them in a study. This included identifying the most appropriate time to discuss the research, seek consent and determine if whether asking them to complete a survey during the postnatal period was considered appropriate. Women's preferences were consistent with the timepoints used in this study and those for postpartum surveys in prior research (Neta et al., 2022), which was reassuring.

The results from this study demonstrate no increased risks for women who pushed spontaneously during labour compared with directed pushing. Spontaneous pushing led to a three minute longer second stage, but this statistical difference is not clinically significant and poses no risk for prolonged second stage. This small cohort also showed some potential benefits including reduced blood loss in multiparous women's during the birth of the placenta and one hour after post-birth. No other outcome differences were noted. These findings suggest a future full-scale trial is safe and potentially effective. Although this feasibility study was not designed to detect between-group differences as primary objective, statistically significant results were still observed. The benefits of spontaneous pushing in lowering episiotomy rates were previously reported in research team's systematic review previously (Yao et al., 2022) as well as in a retrospective cross-sectional study (Lee et al., 2019), however, this

study did not observe such benefits, indicating a need for further exploration in future full-scale trials. Episiotomy, which is a medical incision of the vagina and perineum, can result in perineal pain, increased blood loss, and long-term urinary incontinence (Jiang et al., 2017). In spontaneous pushing, women are encouraged to push by their own urges, to breathe with their own natural breathing pattern (Lemos et al., 2017) while long breath holding is discouraged. Compared to routine directed pushing practice and breath holding practices, spontaneous pushing has been shown to be protective of women from episiotomy (Ahmadi et al., 2017).

The postnatal survey's free text analysis revealed women who pushed spontaneously reported a high satisfaction with their pushing experience. To the best of our knowledge, this is the first published findings to explore women's satisfaction with spontaneous pushing during labour. Previous studies have shown several benefits of spontaneous pushing, such as lower rates of extended episiotomy (Yao et al., 2022), and shorter labour duration (Jahdi et al., 2011) which are related to measurable labour and birth variables., Therefore, this finding on subjective satisfaction would be a crucial supplement to the advocacy of spontaneous pushing in the future.

**Strengths and limitations**

The findings in this study contribute to the body of knowledge on supporting spontaneous pushing during labour. This is the first study to test the feasibility of supporting spontaneous pushing during labour and it provides meaningful and valuable recommendations for future trials. Notably, it illustrates the strategies to recruit pregnant women for research during childbirth, and strategies to enhance participation of women who did not use epidural analgesia during labour. Importantly, this study highlights the importance for future trials to challenge the routine practice of directed pushing and to advocate for a more physiological approach to childbirth. We also acknowledge several limitations of the current study and identify improvements for future trails. Firstly, the study was undertaken at only one maternal

hospital in China, mainland. The feasibility outcomes could vary across different facilities, due to factors such as the number of women accessible, the provision and options for pain relief (both pharmacological and non-pharmacological) available, and midwives' willingness to participate. These conditions could impact upon recruitment and retention rates and should be considered in a future trial. Secondly, this study included a small number of nulliparous women compared to multiparous women, which may render the effectiveness results indicative rather than conclusive. Another limitation of the study was the potential of crossover between the spontaneous pushing group and the routine directed pushing group, as midwives may facilitate spontaneous pushing when taking care for women in the routine directed pushing group.

## 5.8 Conclusions

Midwives value the physiological process of labour and birth. Women's natural pushing efforts during the second stage of labour is crucial for newborn well-being. The usual routine practice of directed pushing has been associated with potential harm both the woman and their newborn, while spontaneous pushing does not increase risks for the woman or the newborn and may offer some potential benefits which include less maternal blood loss as well as a high level of maternal satisfaction. This supports a full-scale clinical trial in the future with some necessary modifications.

## 5.9 Summary of Chapter

This chapter demonstrates the feasibility of implementing spontaneous pushing in the Chinese context, showing its preliminary effectiveness for women. The next chapter will discuss women's postnatal survey responses about their experience and acceptability of the study.

# Chapter Six: The experience of spontaneous pushing during labour among Chinese women: a cross-sectional questionnaire survey

## 6.1 Chapter preface

Chapter Five presented the feasibility results of implementing spontaneous pushing in the Chinese context. Chapter Six explores another aspect of the findings, focusing on women's acceptability and experiences of participating in the study. This chapter includes the fifth of the six manuscripts published or prepared for this thesis. The submitted paper addresses Research Aim 2: testing the feasibility of a future RCT comparing the effects of spontaneous and directed pushing during the second stage of labour on maternal and neonatal outcomes.

## 6.2 Publication details

This paper was published in the journal *Women and Children Nursing*, an open access, peer reviewed journal in December 2024. The manuscript is reproduced in this chapter with permission under the Creative Commons Attribution Non-Commercial license. The two appendices included in the publication are attached at the end of this thesis (Appendix 13 and 14).

**Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Huijuan Rong, Kathleen Baird. (2024). The experience of spontaneous pushing during labour among Chinese women: a cross-sectional questionnaire survey, *Women and Children Nursing*, https://doi.org/10.1016/j.wcn.2024.12.001

## 6.3 Abstract

*Objectives:* To explore Chinese women's experience of spontaneous pushing during the second stage of labour.

*Methods:* Women were recruited antenatally in late pregnancy to push spontaneously when in labour. A postnatal survey was conducted to explore women's experience of spontaneous pushing.

*Results:* The study recruited 112 women and 102 of them completed the postnatal survey, including 14 primiparous women and 88 multiparous women. Multiparous women stated that they had different pushing experience in this birth compared with previous directed pushing and that they were able to follow their own body urges and felt in control of their body and the overall process. Results of Childbirth Experience Questionnaire (Chinese version) revealed the average score of women's childbirth experience was high, with the mean score of 61.22 (SD=7.863). Multiparous women had higher total scores ($P<0.05$, $d=0.736$) as well as the score of dimension 1 'Professional support' ($P<0.05$, $d=1.068$). Primiparous women reported higher level of pain during spontaneous pushing ($P<0.05$, $d=0.636$). There is no statistical difference in pushing experience between primiparous women and multiparous women ($P>0.05$).

*Conclusions:* Women reported an overall positive childbirth experience of spontaneous pushing during labour. Additional attention should be paid to primiparous women to improve their perceived professional support during second stage compared with multiparous women.

**Keywords**

Second labour stage; Childbirth; Childbirth experience; Pushing; Spontaneous pushing

## 6.4 Introduction

Physiological process of childbirth is highly valued by midwives (Sandall et al., 2016). The second stage of labour, defined as full cervical dilation to the birth of the baby, is a physiological process (Cunningham et al., 2014). Maternal pushing during this period plays a vital role in the progress of labour (Cunningham et al., 2014) and is closely associated with a series of maternal and neonatal outcomes (Lemos et al., 2017). With the fetus descending, labouring women feel the urge to push or bear down, which is usually reflexive and spontaneous (Hanson, 2008). Combined with uterine contractions, maternal pushing efforts expel the baby and the placenta (Cunningham et al., 2014).

Currently, directing a woman to push during the second stage of labour is a common practice observed globally, often termed as directed pushing (Lemos et al., 2017). In this context, healthcare providers often ask a woman to take a deep breath, and to push strenuously with a closed glottis for as long as the uterine contraction persists, this is referred to as the Valsalva manoeuvre (Lemos et al., 2017). However, evidence has revealed that the long, repeated strenuous pushing may bring harm to the woman and newborn, such as an increased risk of perineal trauma (Ahmadi et al., 2017), reduction in venous blood returning to the woman's heart (Roberts, 2002), fetal heart rate changes (Lemos et al., 2017), and low umbilical cord pH and $PO_2$ values (Yildirim & Beji, 2008).

To achieve improved health outcomes for women and newborns as well as support a more positive childbirth experience, the World Health Organization (WHO) recommends that women in the second stage of labour should be encouraged and supported to follow their own urge to push (2018). This is referred to as spontaneous pushing (Lemos et al., 2017). Spontaneous pushing supports women to push, following their own bodily urges and at their own pace (Lemos et al., 2017). When pushing spontaneously, women use both open and closed glottis and do not

instinctively take a deep breath (Ann, 1995). Women push when a uterine contraction is at its peak rather than at the commencement of the contraction, which is more common with directed pushing (Ann, 1995). The effects of spontaneous pushing on a woman and newborn have been evaluated in several studies (Araujo et al., 2022; Bloom et al., 2006; Koyucu & Demirci, 2017; Vaziri et al., 2016). A recent systematic review and meta-analysis confirmed spontaneous pushing overall does not increase the risk to the mother (Yao et al., 2022). Instead, it lowers a woman's risk of extended episiotomy and caesarean birth, and it does not increase the risk to the newborn (Yao et al., 2022). Consequently, spontaneous pushing is shown to be both safe and beneficial and is currently recommended by professional organisations globally.

In Chinese context, increasing attention is being paid to facilitate evidence-based, woman-centred maternity care and spontaneous pushing is recommended by Chinese guidelines (Chinese Medical Association, 2020). Nevertheless, this strategy is only partially adopted in some facilities while the routine practice is still directed pushing in most regions. A study from a northeast province in China investigated 61 hospitals and confirmed that directed pushing was routinely implemented in 66% and partially implemented in 33% of the investigated hospitals (Yan et al., 2021).

Hence, limited evidence explored Chinese women's experience of spontaneous pushing during labour, and more evidence is urgently needed to find out effective strategies for the promotion of spontaneous pushing and a change of practice. Hence, the aim of this study is to explore Chinese women's experience, including pushing experience and childbirth experience, in their spontaneous pushing in the study, thus, to provide evidence for improvement of clinical practice. This study is part of a larger feasibility study conducted in China exploring the feasibility of implementing spontaneous pushing during the second stage of labour in large-scale trial in the future. As part of the feasibility study, recruited women who were supported to spontaneous push during second stage of labour, were asked to complete a postnatal survey regarding their experience. The results of the feasibility study are presently

undergoing review for publication. This paper will focus on the lived experience of women during the pushing stage of labour.

## 6.5 Materials and methods

### 6.5.1 Study design and setting

This study was conducted as part of a non-randomised feasibility study, which occurred in a large public maternal hospital in Hebei Province, situated in the middle region of China. Convenient sampling method was used to select this site-specific hospital for the larger feasibility study. The research protocol has been published and can be accessed online for further details (Yao et al., 2024). This study was a questionnaire survey, conducted as part of the feasibility study.

### 6.5.2 Participants

Eligible participants included pregnant women attending maternity care at the study site. Pregnant women were invited to participate in the study if they were in the third trimester of pregnancy, 18 years and older, had a singleton pregnancy with a healthy fetus presenting in the cephalic presentation. Participants who provided consent but subsequently experienced preterm labour and birth before 37 gestation weeks, received epidural analgesia during labour, encountered medical or obstetric complications affecting second stage management, or underwent a Caesarean birth during labour were subsequently excluded from the study.

Sample size was calculated using statistical power analysis in PASS 15.0 software with statistical power at 90%, α at 0.05, dropout rate at 20%. As this was part of the feasibility study comparing the two groups, namely spontaneous pushing and directed pushing, the duration of the second stage of labour was set as the primary outcome for sample size calculation based on previous study (Lemos et al., 2017). For

each group, sample size was calculated to be n=105. The calculation process could be found in the published research protocol (Yao et al., 2024).

### 6.5.3 Recruitment

Posters and information leaflets were used to advertise the study in the antenatal clinic of the site hospital. The researcher approached women while they were in the antenatal clinic waiting room and discussed the study, assessing their willingness to receive further information about the study and/or participate. Verbal information and a written information sheet outlining the study were provided. Written consent was obtained before the study.

### 6.5.4 Implementation of spontaneous pushing

Upon admission to the birth suite in labour, participating women were supported to pushing spontaneously by midwives. Before the commencement of the study, a specific group of midwives had undergone an education program, regarding the strategies to support participating women to push spontaneously during labour. Comprehensive and evidence-based practice information on the management of pushing with a focus on the management of spontaneous pushing was provided. Detailed information regarding the education program has been included in the published study protocol (Yao et al., 2024).

### 6.5.5 Data collection

Women who took part in the study and experienced spontaneous pushing were accessed during their stay on the postnatal ward for the completion of a postnatal survey. The survey was comprised of three parts. The first part was baseline information, including age, parity, education level, previous mode of birth if applicable. The second part a total of six self-developed questions assessing women's pushing experience, current and previous if applicable, scored using a 5-point Likert

scale ranging from 1 (disagree) to 5 (agree). The third part was women's childbirth experience. This was facilitated by the Childbirth Experience Questionnaire (Chinese version) (CEQ-C) (Zhu et al., 2019) (Appendix 13). The CEQ-C is a validated tool that has been published in English and validated in Chinese by Zhu et al (2019). The content validity of CEQ-C was 0.96 and Cronbach's alpha was 0.802 (Zhu et al., 2022). It contains a total of 19 items in four dimensions. Each item is scored using a 4-point Likert scale ranging from 1 (totally disagree) to 4 (totally agree), with the maximum score of 76. As part of CEQ-C, three additional items were listed at the end of the questionnaire to explore women's experience of pain, control and feeling of safety with a visual analog scale (VAS) from 0 to 100 (Zhu et al., 2019).

### 6.5.6 Data analysis

Data was analysed using the software SPSS for MacBook, Version 27 (IBM Corp. Armonk, NY, USA). Differences were tested using independent group *t* tests and effect size for continuous variables and chi-squared tests and risk ratios for categorical variables. Cohen's *d* was selected to describe effect size and was classified as small (d =0.2), medium (d =0.5) and large (d≥0.8) (Larner, 2014).The significance level for the comparison was set at 0.05. Statistical description and evaluation were conducted using mean value, standard deviation, number of cases, and proportions (in percent).

### 6.5.7 Ethical considerations

Ethical approval was obtained from the Health Research Committee from The Fourth Hospital of Shijiazhuang, China on 14th February 2023 (Reference number: 20230064) and University of Technology Sydney Research Ethics Committee, Australia on 3rd May 2023 (Reference number: ETH22-7072). All participants were recruited antenatally, provided with written and oral information of the study and

signed the consent forms. They were allowed to quit the study as well as the survey at any time.

## 6.6 Results

A total of n=112 women were supported to spontaneously pushing and n=102 of these (91%) proceeded to complete the postnatal survey. Ten women did not respond to the survey for the following reasons: scanned the code for survey but did not submit the survey (n=5), declined to answer the survey (n=2), left the hospital before completion of the survey (n=3).

For the 102 women who completed the survey, 88 were multiparous and 14 were primiparous. The mean age was 32 years, and ten women were 35 years old and above. The majority of women had postgraduate qualification (73%) and most of the multiparous women experienced a previous spontaneous vaginal birth, and two women experienced a previous vacuum extraction and one woman required a forceps extraction (Table 18).

**Table 18 Demographics of participants**

| Variable | | N | % | | Variable | N | % |
|---|---|---|---|---|---|---|---|
| Age | 18 to 35 | 92 | 90% | | Middle school and below | 10 | 10% |
| | More than 35 | 10 | 10% | | High school | 7 | 7% |
| Parity | Primiparous | 14 | 14% | Education level | Technical diploma | 11 | 11% |
| | Multiparous | 88 | 86% | | Diploma | 42 | 41% |
| Number of children before current childbirth | 0 | 14 | 14% | | Bachelor | 31 | 30% |
| | 1 | 70 | 69% | | Master and above | 1 | 1% |
| | 2 | 17 | 17% | | Normal vaginal birth | 85 | 97% |
| | 3 | 1 | 1% | Previous mode of birth | Vacuum extraction | 2 | 2% |
| | | | | | Forceps extraction | 1 | 1% |
| | | | | | Caesarean birth | 0 | 0% |

### 6.6.1 Women's pushing experience

Most of the women reported a high level of midwifery support (Mean=4.72, SD=0.736) and feelings of safety (Mean=4.58, SD=0.801). More than three quarters of women felt capable of the pushing spontaneously when supported by the midwife (Mean=3.93, SD=1.101). Meanwhile, women scored relatively lower for their experience in having a say in how to push during labour (Mean=3.55, SD=1.354) (Table 19).

**Table 19 Women's pushing experience**

| Item | N | Range | Mean | SD | Agree or mostly agree (n (%)) |
|---|---|---|---|---|---|
| I felt I could have a say in how to push during my labour | 102 | 1-5 | 3.55 | 1.354 | 63 (62%) |
| I felt I was capable of pushing during labour | 102 | 1-5 | 3.93 | 1.101 | 77 (76%) |
| I believe my midwife provided me enough professional support during pushing | 102 | 1-5 | 4.72 | 0.736 | 95 (93%) |
| I felt safe pushing during the second stage of labour | 102 | 1-5 | 4.58 | 0.801 | 92 (90%) |

When multiparous women were asked about their previous birthing experience, most of them (78%) reported that they were directed to push during the second stage of labour. Some (10%) were provided with direction on pushing but were not made to adhere to the instruction. Only seven (8%) of this group has been supported to push spontaneously in a previous birth confirming directed pushing as the more commonly used practice (Figure 9). Comparing their previous pushing experience (mostly directed pushing) with the current one (spontaneous pushing), women reported that

the biggest difference was midwives' encouraging them to follow their own body urges to push (64%). The women also highlighted that they felt more in control of the pushing process (33%) (Figure 10).

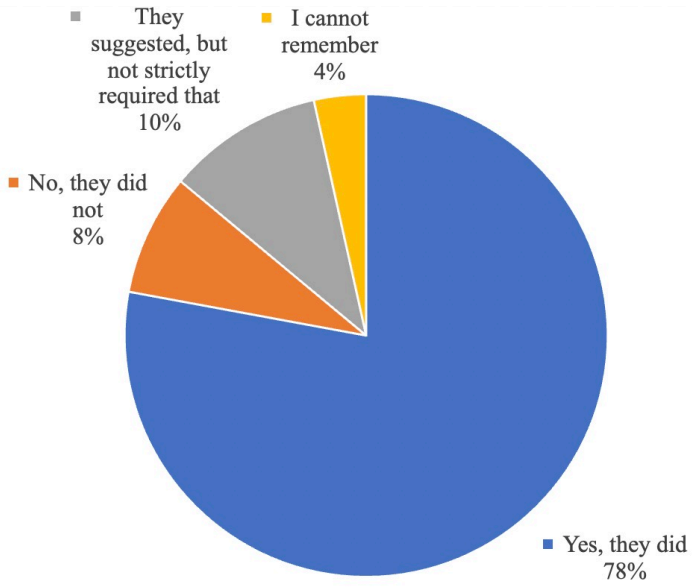


**Figure 9. Primiparous women's responses to question "During your previous birth(s), did doctors or midwives direct you on how to push?"**

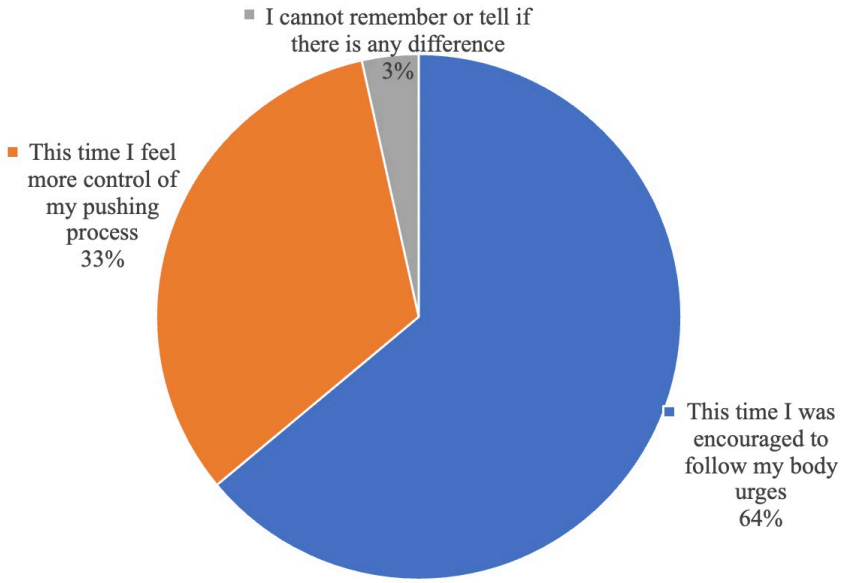


**Figure 10. Primiparous women's responses to question "What do you think is the difference between your pushing experience during this birth with your previous birth(s)?"**

### 6.6.2 Women's childbirth experience

Results using the CEQ-C showed that the average score of women's childbirth experience was 61.22 (SD=7.863), ranging from 34 to 75. The quartiles were 56 (25%), 62 (50%), and 67 (75%).

Four dimensions were assessed. *Dimension 1: 'Professional support'* ranked the highest (Mean=3.69, SD=0.489) and *Dimension 3 'Perceived safety'* ranked the lowest (Mean=2.74, SD=0.651). For each item, 16 of the total 19 items scored three and above, for which the response 'I felt secure' ranked the highest. Three items scored three and less belonged to *Dimension 3 'Perceived safety'* and *Dimension 4 'Participation'* (Table 20).

**Table 20: Women's childbirth experience (using the CEQ-C)**

| Dimension | Item content | Mean | SD |
|---|---|---|---|
| 1 Professional support | | **3.69** | **0.489** |
| | 13 My midwife devoted enough time to me. | 3.70 | 0.523 |
| | 14 My midwife devoted enough time to my partner. | 3.66 | 0.572 |
| | 15 I was kept informed. | 3.68 | 0.548 |
| | 16 My midwife understood my needs. | 3.66 | 0.536 |
| | 17 I felt very well taken care of by the midwife. | 3.71 | 0.537 |
| | 18 I felt secure. | 3.73 | 0.510 |
| 2. Own capacity | | 3.23 | 0.566 |
| | 1 Labor progress went as I had expected. | 3.47 | 0.671 |
| | 2 I felt strong. | 3.38 | 0.676 |
| | 4 I felt capable. | 3.25 | 0.727 |
| | 6 I felt happy. | 3.01 | 0.814 |
| | 7 I have many positive memories. | 3.03 | 0.917 |
| | 19 The situation was well handled. | 3.25 | 0.740 |
| 3. Perceived safety | | **2.74** | **0.651** |
| | 3 I felt scared. [R] | 2.47 | 0.930 |
| | 5 I felt tired. [R] | 2.10 | 0.802 |
| | 8 I have many negative memories. [R] | 3.14 | 0.845 |
| | 9 I felt depressed. [R] | 3.25 | 0.852 |
| 4. Participation | | 2.91 | 0.765 |
| | 10 I could choose whether to be up and moving or lying down. | 3.05 | 0.894 |
| | 11 I could choose the delivery position. | 2.61 | 1.016 |
| | 12 I could choose the pain relief method. | 3.08 | 0.864 |

*R: Ratings of negatively worded statements are reversed.

Responses to three questions at the end of CEQ-C indicate that women felt secure during their birth with the average score being as high as 88 (range 0-100). Some women reported a high level of pain (Mean=80, range 0-100) and relatively low control of childbirth (Mean=70, range 0-100) (Appendix 14, Table 1).

### 6.6.3 Comparison of women's experience

We compared women's pushing experience and childbirth experience between their first and subsequent labour/birth. Results from this study indicate multiparous women appeared to have had an enhanced childbirth experience than primiparous women. Multiparous women received a higher total score from the CEQ-C ($P<0.05$, $d=0.736$) as well as higher scores for *Dimension 1 'Professional support'* ($P<0.05$, $d=1.068$). Primiparous women reported a higher level of pain during spontaneous pushing ($P<0.05$, $d=0.636$) and lower control during their pushing experience than multiparous women however, the difference was not statistically significant ($P=0.160$, $d=0.596$). There is no statistical difference in the results comparing the pushing experience between primiparous and multiparous women ($P>0.05$) (Table 21).

**Table 21: Comparison of women's pushing experience and childbirth experience between parity**

| Outcomes | Primiparous N=14 | | Multiparous N=88 | | p-Value | Effect size (Cohen's *d*) |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Pushing experience | | | | | | |
| Average score | 4.16 | 0.836 | 4.20 | 0.745 | 0.861 | 0.050 |
| Have a say | 3.86 | 1.027 | 3.50 | 1.398 | 0.362 | 0.263 |
| Feel capable | 4.29 | 0.611 | 3.88 | 1.153 | 0.196 | 0.374 |
| Enough professional support | 4.21 | 1.188 | 4.80 | 0.609 | 0.094 | 0.816 |
| Feel safe | 4.29 | 1.204 | 4.63 | 0.716 | 0.322 | 0.426 |
| Childbirth Experience Questionnaire | | | | | | |
| Total score* | 56.36 | 9.787 | 61.99 | 7.285 | **0.012** | **0.736** |
| Dimension 1 Professional support | 19.57 | 4.863 | 22.52 | 2.289 | **0.043** | **1.068** |
| Dimension 2 Own capacity | 17.86 | 3.255 | 19.65 | 3.373 | 0.067 | 0.533 |
| Dimension 3 Self-perception | 10.14 | 2.070 | 11.09 | 2.668 | 0.208 | 0.365 |
| Dimension 4 Participation | 8.79 | 2.424 | 8.73 | 2.288 | 0.930 | 0.025 |
| Painful | 89.86 | 8.761 | 78.70 | 18.512 | **0.001** | **0.636** |
| Control | 58.85 | 29.091 | 71.24 | 19.294 | 0.160 | 0.596 |
| Secure | 85.00 | 15.028 | 88.33 | 14.448 | 0.445 | 0.229 |

Note: *: Total score of CEQ-C is calculated by adding the scores of 19 items from four dimensions, except the three items scored by VAS from 1 to 100.

We also compared women's pushing experience and childbirth experience according to the midwives who supported them. Six midwives with more than 10 years of experience were placed into group 1 and considered senior midwives. The

other three midwives who had clinical experience for less than 10 years were placed into group 2. There was no statistical difference in women's pushing experience and childbirth experience between the two groups (Appendix 14, Table 2).

## 6.7 Discussion

In this study, we assessed Chinese women's experience of spontaneous pushing and childbirth experience in a feasibility study conducted in a large hospital in China. Both primiparous and multiparous women's childbirth experience were assessed using the CEQ-C and was shown to be an overall positive experience for most of the women. However, primiparous, and multiparous women had different levels of perception of their pushing and overall childbirth experience.

### 6.7.1 Transiting from routine practice to spontaneous pushing

The transition to spontaneous pushing during labour was found to be acceptable change in practice. When multiparous women compared their previous pushing experience (predominantly directed pushing) with their current experience of spontaneous pushing, they reported receiving more encouragement this time to follow their natural body urges and felt they had more control of the pushing process.

In many countries around the world, including China, directed pushing is common practice during second stage (Lemos et al., 2017). This practice was firstly advocated and promoted to reduce the rate of forceps, which was routinely used in 1950s (Simkin et al., 2017). Increasingly, more recently researchers have begun to challenge this routine practice, and commented it as directive instead of supportive (Roberts et al., 2007). In recent years, several trials have tested the effects of spontaneous pushing and results confirmed that spontaneous pushing is a safe strategy (Araujo et al., 2022) and that women are very capable of giving birth without instructions (Koyucu & Demirci, 2017). Spontaneous pushing brings additional

benefits, such as shorter duration of second stage of labour (Jahdi et al., 2011), lower risk of postpartum urinary incontinence (Low et al., 2013), less extended episiotomy and Caesarean birth (Yao et al., 2022).

Findings in this study add to the existing body of literature about the positive outcomes of spontaneous pushing during the second stage of labour, further advocating for the implementation and promotion of spontaneous pushing during labour.

### 6.7.2 Enhancing women's pushing and childbirth experience

Women's ratings of their childbirth experience in this study were generally high, indicating that they balanced positively with fatigue and anxiety. The average score using the CEQ-C was higher than in similar studies conducted elsewhere in China (Zhu et al., 2019). Consistent with a previous study (Zhu et al., 2019), the *Dimension 1 "Professional support"* scored highest among all four dimensions in this study. The item 'I felt secure' and VAS item of security both ranked the highest among others (Zhu et al., 2019). Hence, it is confirming that in spontaneous pushing, high quality midwifery support is acknowledged as a positive element by women.

However, despite this, women still feel a low level of perceived safety, including their perceived feeling of tiredness and fear. This may suggest that regardless of the pushing strategy (spontaneous or directed pushing), women perceive the effort they need to exert during second stage of labour quite intensive. Furthermore, a woman's perception of fear of labour was prevalent among both primiparous and multiparous women (Nilsson et al., 2018). The fear may be associated with a lack of professional information during the antenatal period, of what to expect during second stage of labour and their concern for their baby (Kananikandeh et al., 2022).

Overall, despite women's overall positive experience when pushing spontaneously, maternal fear during labour calls for further attention. Results from this study suggest

that the fear may be reduced by the provision of enhanced professional support and reassurance antenatally and during labour.

### 6.7.3 Acknowledging difference between parity

A difference of childbirth experience between parity was observed in this study, with multiparous women of better experience and more control. Multiparous women's experience was significantly higher than primiparous women in their overall score from the CEQ-C as well as *"Professional support"* dimension scores. This finding was consistent with previous studies from other countries (Mukamurigo et al., 2021; Place et al., 2022; Soriano-Vidal et al., 2016). One possible explanation for primiparous women's low ratings pertaining to their childbirth experience may be the high level of labour pain they perceived. Evidence suggests labour pain can be one of the most painful experiences during a woman's life and can be a key factor related to the experience of childbirth (Donate-Manzanares et al., 2021). Another explanation could be the mismatch between primiparous women's expectation and experiences of childbirth (Webb et al., 2021). It has been suggested that some primiparous women may have 'idealistic' or 'romanticised' expectations of childbirth (Diezi et al., 2023).

Furthermore, in this study, primiparous women reported lower control of their labour than multiparous women. Previous studies highlighted woman's control during labour includes internal control of their feelings and body and external control of decision making (Diezi et al., 2023; Green & Baston, 2003). Women with more control of their childbirth are inclined to report a better experience (Meyer, 2013). Similarly, in a qualitative study by Donate-Manzanares et al. (2021), women reported a better birth experience when they had control of the pain relief rather than the type of pain relief they used.

The findings of this study indicated that multiparous women, having experienced directed pushing in previous labour(s), may rate professional support higher due to the contrast with past experience. For primiparous women, a lack of prior comparison

might result in different perceptions of support, suggesting that further strategies to improve a primiparous woman's childbirth experience need to be considered. These include prenatal education to help women establish an appropriate expectation of childbirth, including labour pain as well as options available to them for pain relief, and other initiatives including midwifery support to encourage and facilitate a woman's sense of control and decision making regarding their labour and birth before and during labour.

### 6.7.4 Implications for research and clinical practice

The positive findings in this study provided several implications for future clinical practice. Firstly, a change of practice is in urgent need. Directed pushing is still common practice in maternity care in most regions of China as well as some other regions, and the negative effect of this routine practice is being increasingly reported. The findings in this study demonstrate spontaneous pushing is well accepted by women and facilitated positive pushing and childbirth experience. Spontaneous pushing during labour appears to be an acceptable alternative to current routine practices in clinical settings. Future studies could use qualitative research designs to explore women's experiences, particularly those of primiparous women with spontaneous pushing. These insights could help identify the types of support needed during labour and provide valuable guidance for clinical practice.

## 6.9 Conclusion

The findings from this study suggest that spontaneous pushing during labour was well received, with women reporting an overall positive experience, indicating that spontaneous pushing is an acceptable change of practice in the Chinese context. However, primiparous women reported higher levels of perceived pain, resulting in lower ratings of their childbirth experiences. Providing additional professional

information and support, and empowering women to control their birth process and decision making may enhance the childbirth experience for primiparous women.

## 6.10 Strengths and limitations

To our knowledge, this study is the first to explore women's experience of pushing in the Chinese context. The favourable outcomes from this study offer direction and guidance for adopting and the implementing of spontaneous pushing, especially as directed pushing continues to be common practice in many regions in China as well as other countries globally. The use of the CEQ-C to assess women's childbirth experience, is widely used in many countries, allowing for a comparison globally. Several questions were included in the survey with the purpose to explore women's individual experiences of pushing, yielding valuable insights for the future implementation of spontaneous pushing.

However, there are some limitations of the study which need to be acknowledged. Firstly, although equal numbers of primiparous and multiparous women were recruited to the study, many primiparous women were excluded after the onset of labour due to the high rate of epidural analgesia. This limited the number of primiparous participants in this study may not provide comprehensive information on their experience of spontaneous pushing. Secondly, the women's experiences were assessed using quantitative data from the survey, which limits the ability to fully explore their experiences.

## 6.11 Summary of Chapter

This chapter presented the results of the women's postnatal survey, including their acceptability of the study and the spontaneous pushing strategy. The following chapter will explore the qualitative findings drawing on the interviews with midwives about their experiences participating in the study.

# Chapter Seven: Midwives' perspectives on facilitating spontaneous pushing during the second stage of labour: a qualitative study

## 7.1 Chapter preface

Chapter Six presented the women's survey quantitative results. This chapter concludes the study results by discussing the qualitative findings from the midwives' interviews about their experiences and spontaneous pushing. It also presents the final manuscript prepared for publication and addresses Research Aim 2.1: assessing the feasibility of a future RCT comparing spontaneous and directed pushing during the second stage of labour on maternal and neonatal outcomes.

## 7.2 Publication details

This paper was submitted to the peer-reviewed journal *Birth* on 6th June 2025, which focuses on pregnancy and childbirth research. As the paper was recently submitted, no peer review feedback was available at the time of thesis submission. The manuscript is included in this chapter under a Creative Commons Attribution Non-Commercial license with the required permission. Two appendices are included in this publication and are provided at the end of this thesis (Appendix 15 and 16).

**Jiasi Yao**, Heike Roth, Debra Anderson, Hong Lu, Huijuan Rong, Kathleen Baird. Midwives' perspectives on facilitating spontaneous pushing during the second stage of labour: a qualitative study (submitted to *Birth* and is incorporated as Chapter Seven).

## 7.3 Abstract

Background: Maternal pushing during labour plays a crucial role in the progression of labour and significantly impacts outcomes for both the woman and their newborn. Guidelines recommend facilitating a natural way of pushing during labour, which is 'spontaneous pushing'. Midwives are crucial to this approach, but there's a lack of evidence on their views.

Question/Aim: To explore midwives' perceptions on facilitating women's spontaneous pushing during labour.

Methods: A descriptive qualitative approach was undertaken encompassing individual interviews. A semi-structured interview schedule was developed to guide the interviews. Data were analysed using thematic analysis.

Findings: Nine midwives from a feasibility study were interviewed. Findings from the midwives' interviews identified three themes: '*Returning to a physiological process of childbirth*', '*Creating a win-win situation by spontaneous pushing'*, and *'Reframing the approach to physiological labour and birth'*.

Discussion: Midwives acknowledged supporting spontaneous pushing is considered a relatively 'new approach', but it represents a return to a traditional practice, which aligns with midwifery ethics. They also identified a gap between current evidence and routine midwifery practice.

Conclusions: To support an evidence-based woman-centred approach to spontaneous pushing, collaboration among all stakeholders is essential. Prenatal education for women and professional training for healthcare providers can help achieve this goal.

**Key words**

Midwifery; Childbirth; Physiological birth; Spontaneous pushing; Qualitative Research.

**Statement of significance**

- *Problem or issue*

Spontaneous pushing during labour is a recommended pushing strategy, however midwives' perceptions on this practice is not well understood.

- *What is already known*

Evidence confirms spontaneous pushing is beneficial to women, yet it is not widely acknowledged or adopted in most parts of the world.

- *What this paper adds*

Midwives recognise spontaneous pushing aligns with midwifery principles, and is an attempt to restore childbirth as a natural process. To promote the adoption of spontaneous pushing, collaborative efforts are required to shift the mindset of all stakeholders. Prenatal education and professional training could help in achieving this.

## 7.4 Introduction

A woman's effort to push during labour is vital for its continued progress and for the health and wellbeing of both mother and baby (Lemos et al., 2017). As labour progresses naturally, the baby's descent prompts the woman to feel an urge to push or bear down (Jane, 1996) which is often automatic, reflexive and spontaneous action (Roberts, 2002), contributing to birth without the need for intervention (Sutton, 2000).

Directed pushing by healthcare providers during the second stage of labour is a globally practised approach, with the purpose to actively guide the process of pushing (Lemos et al., 2017). This strategy of directed pushing involves the woman following specific instructions including pushing strenuously with a closed glottis and repeating this action a number of times during uterine contractions (Lemos et al., 2017). Evidence has demonstrated that this may negatively impact upon the woman as well as the newborn. The possible related risks include higher intrapartum caesarean section rate, higher rates of perineal trauma (Yao et al., 2022), reduced venous blood returning to the woman's heart (Roberts, 2002), and negative fetal heart rate changes (Lemos et al., 2017).

Increasing evidence is now challenging the strategy of directed pushing and is calling for attention to be paid to protect and support women's physiological way of pushing (Barasinski et al., 2023; Reed, 2015; Tooke-Marchant, 2022). In a series of studies, women were encouraged and supported to follow their bodily urges and to breathe and push at their preferred pace (Chang et al., 2011; Jahdi et al., 2011; Lam & Mcdonald, 2010; Low et al., 2013; Vaziri et al., 2016; Yildirim & Beji, 2008). This pushing strategy is termed as spontaneous pushing (Lemos et al., 2017). In this context, women are supported to commence pushing whenever they feel a strong urge to so and to breathe and push according to their preference, and also encouraged to change position if and when they would like to do so and push with either an open or closed glottis (Ahmadi et al., 2017; Bloom et al., 2006).

Evidence confirms spontaneous pushing does not increase a risk to the mother and baby and reduces the incidence of a woman's risk of an extended episiotomy and caesarean birth (Shinozaki et al., 2022; Yao et al., 2022). The World Health Organization (WHO) (2018) recommends supporting woman during labour to facilitate a positive childbirth experience. Nonetheless, directed pushing remains common in many countries, including China, despite professional guidelines advising otherwise. (Lemos et al., 2017). The continued use of this routine practice remains

unclear and under researched. Midwives play a crucial role in guiding and supporting women through all stages of labour and are key stakeholders in implementing spontaneous pushing in clinical practice. However, there remains a lack of evidence on midwives' perceptions of supporting women in labour to push spontaneously during the second stage of labour.

This paper presents an opportunity to explore midwives' perceptions of supporting women with spontaneous pushing and to provide evidence that promotes spontaneous pushing in a broader context.

This study was conducted in China, with the aim of exploring the feasibility of implementing a practice of spontaneous pushing during labour as well as gaining an insight into any facilitators and barriers to conduct a future randomised controlled trial (RCT) in this setting. This paper reports on the qualitative findings from interviews conducted with the midwives. The aim of this study was to explore midwives' experience of supporting spontaneous pushing during labour and to provide recommendations for a future RCT in this setting.

## 7.5 Methods

### Study design

A descriptive qualitative approach was undertaken (Carmel et al., 2017), using semi-structured, individual, face-to-face interviews, exploring midwives' perceptions of supporting spontaneous pushing.

### Setting and sample

As part of the wider feasibility study, this qualitative study was conducted at a public maternal hospital in Hebei Province, China. Participation in the study was open

to qualified midwives with at least one year of post registration practice and who were employed at this hospital.

**Recruitment**

Recruitment of the midwives occurred at the commencement of the feasibility study. With the support of the birth centre manager, the researcher provided an overview of the study during a monthly staff meeting attended by 16 hospital midwives. Participant information sheets and consent form were made available for those interested in taking part. Nine of the 16 midwives who attended the meeting, agreed to participate in the study. All nine midwives were interviewed at the conclusion of the study.

**Data collection**

Data collection involved individual, face-to-face, semi-structured interviews at a time convenient for the participants. All interviews were conducted by the researcher (JY). All interviews were conducted in a private room at the research site. All interviews were all conducted in Chinese and took place between September and October 2023.

During the interviews, midwives were asked about their experience of and participation in the study. They were also asked about their involvement with and their perception towards facilitating spontaneous pushing. Prior to the interviews commencing, they were provided with the opportunity to ask questions about the study and consent items. An interview schedule was used to collect data (Appendix 15). The preliminary interview schedule was formulated in a flexible format, allowing for a free-flowing dialogue during the interview. With permission all the interviews were digitally recorded.

All nine interviews were digitally audio recorded with consent, transcribed verbatim, and translated from Chinese to English by a National Accreditation Authority for Translators and Interpreters (NAATI), which is an approved translating service. All transcripts were de-identified, all names were removed from the transcripts, and each midwife was given a serial number. All transcripts were stored on a password protected laptop, only accessible to research team.

**Data analysis**

The data were analysed using thematic analysis developed by Braun and Clarke (2022). The first author (JY) familiarised herself with the data by reading and re-reading the transcripts, aiming to identify patterns in the data and develop initial codes. After the coding of three transcripts, the first author (JY) discussed findings with two co-authors (HR and KB) and debated the codes noted, coming to an agreement on a set of codes applied to all the subsequent transcripts. The research team then collaboratively refined the resulting themes and subthemes.

A matrix in Microsoft Excel software (Version 16.78.3 for MacBook) was used to allocate codes into categories (Appendix 17). Subthemes and themes were identified using a descriptive, inductive approach (Braun & Clarke, 2022).

**Trustworthiness**

The researcher conducted interviews, with the midwife participants in a private and quiet office within the hospital at times convenient to each participant, ensuring privacy and comfort. Using a flexible semi-structured interview guide, the researcher employed techniques such as prompting, questioning, repetition, and summarisation to achieve a clear understanding of participants' responses. To minimise bias, the researcher also maintained a reflexive attitude and documented any personal assumptions during the interviews to avoid self-bias. After transcribing the interview with each midwife, each midwife participant was invited to review their transcript and

identify or remove any content she preferred not to include in the analysis; none of the participants requested any changes. During the coding process, peer debriefing sessions with supervisors were held to critically review emerging codes and subthemes. All authors participated in reviewing, discussing and approving the final analysis from the interviews and overall findings.

## 7.6 Results

Nine midwives participated in the study and all midwives and were employed by the site hospital at the time of the interviews. The demographic information of nine midwives is shown in Table 22. The interviews averaged 29 minutes, ranging in duration from 25 to 40 minutes.

**Table 22: Demographics of participating midwives**

| No. | Age (years) | Educational level | Years of midwifery work experience | Professional titles* |
|---|---|---|---|---|
| M1 | 44 | Bachelor of nursing | 24 | Nurse-in-charge |
| M2 | 37 | Bachelor of nursing | 11 | Nurse-in-charge |
| M3 | 39 | Bachelor of nursing | 16 | Nurse-in-charge |
| M4 | 34 | Bachelor of nursing | 11 | Nurse-in-charge |
| M5 | 36 | Bachelor of nursing | 12 | Nurse-in-charge |
| M6 | 34 | Bachelor of nursing | 11 | Nurse-in-charge |
| M7 | 33 | Bachelor of nursing | 9 | Nurse-in-charge |
| M8 | 26 | Bachelor of nursing | 4 | Nurse practitioner |
| M9 | 25 | Bachelor of nursing | 3 | Nurse practitioner |

*Note: The professional titles for midwives and nurses in China include five levels (from low to high): Nurse, Nurse practitioner, Nurse-in-charge, Associate professor of Nursing, and Professor of Nursing.

Three themes emerged from the data analysis: '*Returning to a physiological process of childbirth*', '*Creating a win-win situation by spontaneous pushing'*, and *'Reframing the approach to physiological labour and birth'*.

**Theme 1: Returning to a physiological process of childbirth**

Midwives were positive regarding their involvement and experience in this study. Their responses depicted spontaneous pushing as returning to a physiological process of childbirth and being in alignment with midwifery philosophy. Midwives were in favour of facilitating spontaneous pushing where the woman takes the lead and the midwife offers support and is with woman.

**Subtheme 1.1: Alignment with midwifery philosophy**

All the midwives were attracted to the intervention of supporting women to push spontaneously during the second stage of labour. This philosophy highly aligns with midwifery ethics in facilitating a natural process of childbirth:

> *"It is more akin to a natural birthing process, which is better in my opinion. And it resonates with midwives' core belief, which is to facilitate a natural birth experience for women." (M4)*

Several of the midwives held the view that midwives have the skill and abilities to empower a woman to listen to her own body and not to depend on midwives telling them when and how to push:

> *"... the most important thing a midwife should do is 'keep your hands to yourself and open your mouth', right? It's about supporting her with your words, advising her on how to cope and helping her to adapt, rather than immediately resorting to giving (pushing) instructions, where midwives intervene physically rather than verbally." (M2)*

**Subtheme 1.2: Women taking the lead**

Midwives reported they highly valued the woman taking the lead during childbirth including the pushing process. Midwives expressed their belief in a woman's ability to give birth with emotional support and encouragement by the midwife. Several of the midwives acknowledged the woman's ability to be in tune with their own bodies during labour:

> *"To be honest, the pushing effort essentially comes from the labouring woman herself. She is the one who takes the lead in the birthing process." (M8)*

Midwives also expressed a strong belief in supporting women's autonomy, particularly in supporting them to make their own decisions about their bodies, including how they choose to push during the second stage of labour:

> *"Spontaneous pushing primarily centres on the woman's will and readiness. It's all about her own decision." (M4)*

**Subtheme 1.3: Supporting and being 'with woman'**

Midwives felt strongly that their role was one of support, taking the lead from the woman during their labour and birth, rather than instructing the woman. They saw their roles as being 'with woman', as the term 'midwife' implies, accompanying the woman through the childbirth journey in a supportive way:

> *"My role isn't to dictate to women in labour what to do in a rigid manner. This isn't like carrying out a mission. It is centred on communication and integrating your experience as a midwife into this process." (M1)*

Many of the midwives recognised the importance of their role in assessing a woman's wellbeing as well as monitoring the progress of labour, and learning the lessons from each birth they attend and supporting women to follow their natural bodily instincts:

*"You can't just let go of your hands without paying attention because the labour requires continuous monitoring." (M5)*

**Theme 2: Creating a win-win situation by spontaneous pushing**

During the interviews, several of the midwives suggested supporting spontaneous pushing creates a mutually beneficial situation for both the woman, her baby and the midwife. Women experienced positive outcomes and empowerment when supported to push spontaneously. Equally, the midwives involved in this study also experienced positivity from supporting spontaneous pushing. For instance, they reported that it enhanced their proficiency and provided a sense of self-fulfilment in their role. One midwife described this experience as a win-win situation:

*"I think spontaneous pushing is an advanced approach to labour. It benefits both sides, creating a win-win situation." (M1)*

**Subtheme 2.1: Benefits for the woman and baby**

Several of the midwives suggested supporting women push spontaneously was a safe practice with any potential 'risks' manageable, as opposed to the current routine practice of directed pushing:

*"The risks are generally manageable, because we are with them throughout the second stage of labour, providing continuous support every step of the way." (M3)*

Furthermore, all nine midwives perceived pushing spontaneously presented a positive experience and assures a more fulfilling birthing experience for labouring women. Midwives described women who were supported to push in a spontaneous way as being empowered and confident:

*"It signifies an improvement of our state of civilisation. A civilising influence. A far cry from the previous 'barbaric' practice of shouting all over the maternity*

*ward, don't you think? I think it marks the progress and sophistication across the entire spectrum." (M1)*

*"With your support and prompting, a woman may feel more comfortable and empowered to push effectively." (M2)*

Rather than instructing women to push, midwives encouraged spontaneous pushing, acting as a supportive presence by affirming the woman's natural efforts. They emphasised empowering women to make their own decisions and maintain control of their own bodies and childbirth experience:

*"Empowered by this remarkable sense of self-direction, the woman in labour will come to the realisation: 'I have given birth to my baby, guided by my own feelings'." (M1)*

Midwives witnessed effective pushing from women when they were supported to push in their own way, compared with routine directed pushing. Midwives described this as follows:

*"She can push very effectively, because she does know where the 'right point' is." (M1)*

However, as evidenced in the quote below, some midwives still held on to the belief that midwives 'allowed' women to spontaneously push in labour.

*"Letting them push gradually by following their own instincts results in less injuries for them." (M6)*

**Subtheme 2.2: Experience positivity for midwives**

Apart from the benefits for both the woman and her baby, spontaneous pushing also benefits midwives involved. Some midwives believed their own midwifery skills had improved due to supporting women to push spontaneously:

*"Being able to support women in labour to push effectively on their own is an indication that you are a skilled and competent midwife." (M1)*

Midwives denoted implementing and supporting spontaneous pushing as a 'smooth process', and described it as being more conducive to midwifery practice. Moreover, midwives considered this practice as easy to implement, without the need of any extra equipment, staff, or midwifery effort. Midwives felt this practice reduced their workload:

*"I am quite willing to participate in this study. For us, it doesn't pose any burden. It's not about learning any new technology. There's no pressure or anything like that." (M5)*

*"It really reduces our intervention. This way, the workload for midwives is also lessened." (M4)*

Furthermore, supporting spontaneous pushing contributes to a better atmosphere in the maternity ward, creating a place of harmony, rather than midwives raising their voices instructing women to push:

*"The entire maternity ward should be a place of harmony, shouldn't it? Rather than being filled with screaming and shouting, the ward becomes a peaceful and cozy atmosphere that everyone can enjoy." (M1)*

**Theme 3: Reframing the approach to physiological labour and birth**

Although the midwives acknowledged spontaneous pushing is a positive step towards a physiological childbirth, and collective efforts from all stakeholders are essential to foster a collective mindset to further advance this philosophy. As most of the participants noted, supporting spontaneous pushing is not technically challenging or complex, however a change in practitioners' mindset and practice is necessary for wider adoption:

*"The challenge would be the limitation on giving directions and instructions, which is the inherent work habit of midwives. So, it is still about shifting mindset. Does it actually entail doing more work? Not really." (M2)*

This theme identified several challenges of the routine practice of directed pushing, and misinterpretation and pre-conceived concerns of spontaneous pushing. Importantly, midwives planned to continue to adopt spontaneous pushing in their future practice.

**Subtheme 3.1: Challenging the routine practice of directed pushing**

Midwives commented on the importance of ensuring a collective effort from all stakeholders as spontaneous pushing is a change from the normalised practice of directed pushing. Participants in this study felt that the experience of supporting spontaneous pushing was a positive one, with some midwives sharing their reflections regarding the current routine practice of directed pushing, which they had taken for norm previously:

*"Deep-rooted belief among midwives is that they must instruct labouring women to push during the second stage of labour, regardless of whether they feel the urge to push or not." (M2)*

*"I just took it for granted that the current approach (directed pushing) was the norm." (M9)*

All the midwives who participated in the interviews described the previous practice of directed pushing as 'rigid', 'aggressive' and 'a bit rude' referring to the command-like instructions given to labouring women:

*"I find that kind of purely command-based directed pushing a bit rude." (M6)*

Some of the midwives observed that in directed pushing, women often became fatigued more quickly and experienced feelings of frustration and self-doubt when they struggled to push effectively:

*"Women who use directed pushing may get tired more quickly. I think it drains their physical strength." (M9)*

*"… Some women might find directed pushing to be aggressive, leading to feelings of frustration and self-doubt. They might think, 'Why can't I seem to push properly?' or 'Oh no, I can't seem to push; I don't know how to push properly.' 'It was my own problem'." (M9)*

**Subtheme 3.2: Misinterpretation and pre-conceived concerns**

Midwives identified that some of their colleagues held the misinterpretation that spontaneous pushing means withholding midwifery experience and expertise and simply letting women to push on their own:

*"I'm fine, but I think for other midwives, you [researcher] need to clarify that encouraging spontaneous pushing doesn't mean letting the labouring woman push blindly without any guidance." (M3)*

Some of the midwives were concerned that some women may mis-interpret spontaneous pushing as being left alone to push by themselves without any midwifery advice or care. Suggesting that a woman's pre-conceived feeling of receiving more care when midwives instructed women in a commanding way:

*"I repeatedly yell out the same commands, such as 'Now, push hard, come on, tighten your abdomen towards your bottom. Push hard. Push. Push. Again.' This initially creates a sense of support for the labouring woman. In other words, it strengthens her perception of being attended to and assisted." (M1)*

While midwives encouraged women to push spontaneously when they felt a natural bodily urge, they did express some concern and the importance of excluding the urge to push prematurely when the fetus was positioned in a posterior fetal position:

*"The primary concern arises when a labouring woman tries to push before her cervix is fully dilated. If she feels like pushing and you allow her to do it when her cervix has not fully opened yet, it will easily lead to cervical laceration and oedema, which are not conducive to the progress of labour." (M2)*

Midwives also expressed some concern that spontaneous pushing may also lead to a longer labour, creating a false impression that instructing women to push may help labour progress quicker:

*"I think a challenging aspect is that people often believe that if they provide guidance, the labour will progress faster and better. It's easy to think this way." (M5)*

*"Because everyone feels uncertain, they believe that providing guidance keeps everything within their control, right?" (M5)*

**Subtheme 3.3: Intention to adopt spontaneous pushing with necessary guidance**

Midwives expressed their intention to continue to implement spontaneous pushing into their future clinical practice. They valued the positivity of spontaneous pushing in facilitating a woman's natural birth and maximising women's engagement:

*"We hope this project will continue, enabling all of us to better understand and support labouring women's perspectives and ultimately facilitate smoother natural delivery." (M2)*

When asked about their future preference of managing the second stage of labour i.e. supporting spontaneous pushing or directed pushing, several of the midwives intended to adopt a combination of the two strategies. Explaining further this would mean supporting women to take the lead during their birth and supporting spontaneous pushing, but also being prepared to provide targeted advice and guidance, when necessary, to help women to find their most effective way of pushing:

*"Personally, I am very much in favour of spontaneous pushing. However, I would still provide some guidance. (M6)*

Several of the midwives stated it would be necessary to give instructions due to maternal exhaustion, comprised fetal wellbeing, or obstetric complications:

*"If there's a genuine concern about the baby's well-being, or if she [the woman] experiences any complications that necessitate a shorter labour, we need to make a careful assessment, where it might be more appropriate for midwives to instruct her based on her specific circumstances." (M4)*

**Subtheme 3.4: Involving all stakeholders to promote spontaneous pushing**

The strategy of spontaneous pushing requires the involvement and commitment of all stakeholders. Women's prenatal preparation regarding pain relief options, and training for midwives and obstetricians could help to promote spontaneous pushing.

Midwives observed that women with a higher level of understanding or education were more likely to accept and grasp the concept of spontaneous pushing with minimal additional explanation:

*"As the educational backgrounds of women in labour are diverse, the acceptance of spontaneous pushing varies across different cities as well." (M1)*

Midwives believed a woman also plays a key role in achieving spontaneous pushing during childbirth. One important step is to prepare women prenatally by helping them to understand the available options for pain relief, both medical and non-medical. Midwives intimated that medical pain relief methods can interfere with the natural pathway of spontaneous pushing. In cases where women rely solely on medical pain relief, midwives may find it more difficult to support spontaneous pushing effectively:

*"If you want to implement it in the future, I think the biggest obstacle you will face would be the epidural, because nowadays, most people opt for it. It's being promoted nationwide. Some women are very sensitive to pain and don't want to feel any pain at all, which will definitely affect their ability to feel the urge to push. They won't have any sensation in their legs or abdomen, making it impossible for them to push spontaneously." (M6)*

Furthermore, midwives highlighted the importance of training and were satisfied with and felt they had benefited greatly from the training offered before this study commenced. They felt the training has prepared and exposed them to the practice of spontaneous pushing. Participants also stressed the importance of receiving further training in real world scenarios, and requested more discussion time in the training sessions:

*"I think it's also possible to try real world scenario simulations, on-site drills, and communication training." (M4)*

*"Since it is quite easy to communicate among peers, we could have everyone sit together to discuss and share their thoughts on how to handle it." (M9)*

Meanwhile, midwives noted that the training should involve obstetricians in as well for this practice to be successfully implemented and normalised. Knowledge about childbirth in the Chinese context is guarded collaboratively by midwives and obstetricians. The practice of spontaneous pushing requires midwives and obstetricians to both endorse the concept.

*"In cases involving abnormalities or unexpected circumstances, we still rely on obstetricians to deal with them and collaborate with us to provide care together. If they don't agree with our philosophy, midwives can't insist on their own judgment." (M2)*

## 7.7 Discussion

To our knowledge, this is the first qualitative study exploring e midwives' perceptions on facilitating spontaneous pushing during labour, providing foundational insights on the topic.

Midwives believed that pushing spontaneously is a welcome return to the physiological process of childbirth. This approach is consistent with the International Confederation of Midwives (ICM) position statement (2014) which states women begin, continue, and complete labour and birth spontaneously during normal childbirth.

This indicates that midwives believe a woman's ability to labour and push spontaneously and effectively when following their body's instincts (Andrea & Josette, 2006). Whereas, the routine practice of directed pushing involves midwives giving commands to women, instructing them on how to and when to push (Lemos et al., 2017). Evidence suggests that such directional commands interfere with a woman's physiological childbirth process (Roberts, 2002). In recent decades, researchers have been strongly advocated for an end to this commanding approach of pushing to cease (Andrea & Josette, 2006; Lee et al., 2019; Perez-Botella & Downe, 2006). Directed pushing has become so standard that that many midwives now see it as the only proper way to facilitate the second stage of labour. Supporting spontaneous pushing during labour is often viewed as a novel approach, but it actually revives a traditional midwifery practice.

Midwives in this study found spontaneous pushing highly acceptable and welcomed the revised management approach, believing it aligned with their identity and philosophy as midwives. It is worth noting that the 'midwife' means "being with woman" (International Confederation of Midwives, 2023).

Midwives are always seeking to maximise the natural process of labour and birth, and advocating for labour care with minimal intervention (International Confederation of Midwives, 2021). In this study, facilitating spontaneous pushing was found to align

with the ICM midwifery philosophy. All midwives viewed it as acceptable and considered it as an intervention free strategy. They also found it easy to implement and though they expressed interest in receiving additional training. Moreover, the midwives' positive feedback supports the feasibility of implementing spontaneous pushing during labour. Overall, spontaneous pushing was positively received and seen as consistent with midwifery philosophy. This finding, not previously reported, highlights the need for further research on this topic.

Findings from this study identified a gap between evidence and midwifery practice. The Cochrane systematic review (Lemos et al., 2017) and a recent systematic review (Yao et al., 2022) confirmed that spontaneous pushing when compared with directed pushing brings no extra risk and furthermore reduces the incidence of extended episiotomy and Caesarean section. However, despite this evidence, directed pushing during labour is commonly observed (Lemos et al., 2017). One study from one northeast province in China showed that directed pushing was routinely implemented in 66% and partially implemented in 33% of the 66 investigated birthing facilities (Yan et al., 2021). One potential reason for the gap between evidence and practice may be that midwives viewed directed pushing as routine and normal practice. In China, as in some other countries, 'spontaneous pushing' may be misunderstood as leaving women to push without any midwifery support. These preconceptions suggest a need for prenatal education for women as well as scenario-based training for midwives and obstetricians. Such efforts could help shift mindsets and, to further promote the adoption of spontaneous pushing.

Some midwives in this study, appeared to assume that they should be in control of the childbirth process as reflected in phases such as 'allow women to…' Additionally, there was concern that women, particularly those giving birth for the first time, may not know how to push effectively. This stems from a belief some midwives that their expertise grants them responsibility over childbirth safety. It is

crucial for midwives and other healthcare providers to respect women's autonomy during childbirth (van der Pijl et al., 2021).

The global use of epidural analgesia (Anim-Somuah et al., 2018) is viewed by midwives as a major obstacle to spontaneous pushing, since it blocks nerve impulses, which can suppress the natural urge reflex to push (Anim-Somuah et al., 2018). Research indicates that epidurals may lead to a more medicalised approach to childbirth rather than preserving the natural process of natural labour (Aune et al., 2021). Midwives are committed to supporting women's decision making by providing comprehensive information on the risks and benefits of both medical and non-medical pain relief methods (McCauley et al., 2018). This should include discussing the potential challenges of spontaneous pushing for women with epidural analgesia.

**Strengths and limitations of the study**

A strength of the study is its contribution to the lack of literature exploring midwives' knowledge of implementing and facilitating spontaneous pushing during labour. The limitation of the study was that the data was collected from one single site-specific hospital and as such generalisation across a broader context need take specific information into consideration. The study offered two recommendations for implementing spontaneous pushing in clinical practice. First, prenatal education for women should include the benefits and risks of both medical and non-medical pain relief options to prepare them for spontaneous pushing and childbirth. Second, hands on training for all maternity healthcare providers in real world scenarios would be essential and beneficial.

## 7.8 Conclusion

Midwives support spontaneous pushing during labour, viewing it as a return to the natural physiological process of childbirth. They view birth as a woman led

experience, with their role focused on supporting the woman and safeguarding the well-being of both the woman and baby. By challenging routine practices and adopting an evidence-based, woman-centred approach to spontaneous pushing, midwives aim to improve outcomes for both women and the midwife. Prenatal education and professional training are recommended to support the effective use of spontaneous pushing during the second stage of labour.

## 7.9 Summary of Chapter

This chapter presented the qualitative findings from the midwives' interviews exploring their perceptions on facilitating spontaneous pushing. Overall, the midwives perceived spontaneous pushing as a natural process and one that aligns with their philosophy of midwifery practice. The following chapter will provide an overview of the quantitative and qualitative findings, relate them to the current research and offer conclusion and recommendations for future studies.

# Chapter Eight: Discussion and Conclusion

## 8.1 Chapter preface

At the start of the study, a systematic review and meta-analysis was undertaken to critically evaluate the benefits and risks of spontaneous pushing versus directed pushing during the second stage of labour. A scoping review then examined existing spontaneous pushing practices and the strategies to support them, highlighting gaps in evidence and practice. To assess the practical applicability of the intervention, a feasibility study was designed using a mix-methods approach. The feasibility study combined quantitative data on the effectiveness and outcomes of spontaneous pushing with qualitative insights from midwife interviews. This chapter will combine the findings, relate them to the contextual evidence and together inform the development and refinement of the future study, education and clinical practice.

## 8.2 Overview of the findings

Supporting spontaneous pushing during labour may be a beneficial, evidence-based alternative to the current routine use of directed pushing in China. Research has shown that spontaneous pushing can reduce maternal blood loss without prolonging the duration of labour. It is important to critically reflect on the rationale behind routine use of directed pushing, which is often used to accelerate labour progress. Some healthcare providers remain concerned that supporting spontaneous pushing could lengthen labour. However, the findings of this study offer further evidence and confidence to question and potentially shift away from routine directed pushing practices.

Supporting women to push spontaneously may be an effective way to promote woman-centred, respectful maternity care in the Chinese context. A key finding from the scoping review in this study was the synthesis of evidence on women's behaviours when supported to push spontaneously during labour. Unfortunately, routine practice and policy often contradict these natural behaviours. Directed pushing not only disrupts the physiological process of labour but can also undermine women's confidence in their own bodily sensations and diminish their own autonomy during

birth. In contrast, supporting spontaneous pushing is a clear expression of respectful maternity care. Findings from this study showed that women welcomed this approach, reporting a greater sense of control during labour and expressing willingness to recommend it to others. These results highlight the importance of recognising and responding to women's preference to advance woman-centred, respectful maternity care in China.

In summary, this study confirms spontaneous pushing is safe, effective, and well-received by women, offering a viable option to improve maternity care in China.

## 8.3 Contextualising the research findings to existing evidence

Chapter Two and Chapter Three of this thesis presented the published systematic review and meta-analysis and submitted scoping review focusing on spontaneous pushing and directed pushing during the stage of labour. Chapter Four outlined the study protocol. Chapters Five to Seven presented the study findings with each paper discussing and linking the results to the existing literature. Chapter 8 provides an overarching discussion of the combined findings.

### 8.3.1 Facilitating the physiological childbirth

The International Confederation of Midwives (ICM) (2014) supports normal childbirth and believes that for the majority of women, pregnancy and childbirth are physiological life events. According to the ICM, normal childbirth occurs without surgical, medical or pharmaceutical intervention (International Confederation of Midwives, 2014). Findings from this study suggest that supporting spontaneous pushing can help to re-establish and reframe practices in a way that promotes and enhances physiological childbirth.

The widespread use of epidural analgesia during labour is a key contributor to the medicalisation of childbirth, turning what is typically a physiological process into a highly managed and intervention driven medicalised event (Aune et al., 2021). Previous studies exploring the medicalisation of childbirth have shown that higher rates of medical intervention are associated with lower levels of maternal satisfaction (Diane et al., 2020; Westergren et al., 2021). These findings suggest reconsidering the use of routine interventions, especially for healthy, low-risk birthing women for

whom normal physiological birth should be standard of care (Westergren et al., 2021). Additionally, the decision to use epidural analgesia is influenced by a range of factors, such as parity, induction or augmentation of labour, previous experiences of epidurals and cultural attitudes toward pain management in childbirth (Diane et al., 2020). These factors underscore the need to examine how institutional norms and clinical practices may affect women's choices and potentially undermine their autonomy during the birthing process.

It is particularly evident in nulliparous women that they were more likely to use pharmacological pain relief during labour than they intended prior to going into labour (Westergren et al., 2021). In this study, a high proportion of primiparous women recruited prenatally were subsequently excluded due to the use of epidural analgesia during labour. This created a significant challenge in achieving adequate recruitment numbers, particularly among nulliparous women, necessitating the recruitment of a sufficient number of participants. Midwives participating in this study identified epidural analgesia as the primary barrier to supporting spontaneous pushing, as it reduces or even eliminates a woman's natural urge to push (Aune et al., 2021). Considering the possibility of a substantial number of women utilising epidural analgesia during labour, future research aimed at promoting spontaneous pushing may need to concentrate on recruiting nulliparous women. Evidence indicates that dedicating time to discuss both pharmacological and non-pharmacological pain relief options with women and their birth partners antenatally can facilitate informed decision-making and help women select the most appropriate approach for their needs (Hakala et al., 2022).

It is recommended to inquire about the coping strategies or pain relief methods women are considering for use during labour and birth in the second or third trimester of pregnancy (Buchanan et al., 2023). This timeframe allows women sufficient opportunity to research various options, visualise them and consult their healthcare provider with questions to make their informed decision (Zohreh et al., 2023).

### 8.3.2 Enhancing women's empowerment and autonomy during childbirth

Women's experience of physiological birth often generates a profound sense of empowerment, reinforcing their belief in their own ability to birth (Olza et al., 2018). Women feeling empowered during labour and birth has been associated with

improved psychological wellbeing, greater satisfaction with the birth experience, and positive impacts on family relationships and maternal-infant bonding (Lopes et al., 2024). Although this study lacked qualitative insights from women, quantitative survey data revealed that spontaneous pushing led to positive experiences due to a sense of bodily autonomy and control. This aligns with existing evidence that links respectful, woman-centred care to increased maternal confidence and satisfaction (Butler et al., 2020). Midwives in this study reported that supporting spontaneous pushing leads to higher levels of empowerment among women. These observations underline the significance of midwifery-led models of care that promote physiological birth and support women's autonomy. Encouraging spontaneous pushing facilitates a natural birthing process and contributes to a shift away from medicalised, directive practices. This has implications for maternity care, indicating that midwifery-led, relationship-based models can improve women's confidence, reduce unnecessary interventions, and promote positive birth outcomes.

A study conducted by Nieuwenhuijze (2019) reviewed 97 research articles and presented a concept analysis of women's empowerment in childbirth. The findings illustrated that self-efficacy and ability to make decisions during childbirth were linked significantly to women's feeling of empowerment (Nieuwenhuijze & Leahy, 2019). Hence, supporting women through their intuitive needs and actions during labour and birth, including spontaneous pushing, could be an important strategy to enhance women's childbirth experiences and feelings of empowerment.

Autonomy is crucial for women during their labour and birth (Faktor et al., 2024). Women wish to be seen and heard, and value autonomous decision- making which enhances their sense of being in control of their birth (Henshall et al., 2024). During physiological childbirth, neural pathways stimulates the release of oxytocin, which in turn enhances uterine contractions (Tony & Anthony, 2015). Neuroscientific evidence further illustrates that oxytocin secreted within the brain influences maternal physiology and behaviour during labour and birth (Uvnäs-Moberg et al., 2019). This suggests that environments which facilitate women's neurophysiological responses can positively influence the labour process (Weckend et al., 2025). Such insights may explain, from a neuroscience perspective, why various midwifery strategies contribute to more effective and positive physiological labour outcomes. Evidence supports that midwifery-led models of care (Sriram et al., 2024), continuous midwifery support

during labour (Sandall et al., 2024) benefit women in giving birth in a familiar and safe setting , such as the home (Olsen & Clausen, 2023), and providing time for women to discuss their birth preferences during the prenatal period (Watkins et al., 2022).

These findings highlight the importance of aligning maternity care with women's physiological needs and suggest that integrating neuroscientific understanding into practice could strengthen the case for woman-centred midwifery care. Such approaches have shown to enhance positive outcomes and improve women's experiences of childbirth.

Overall, strategies that reduce women's fear and stress during labour, enhance engagement and empowerment, and uphold women's autonomy, may contribute to facilitating physiological childbirth. In this context, promoting and supporting spontaneous pushing is identified as an effective approach to achieve these outcomes.

### 8.3.3 Relating study findings to the context of maternity care in China

In China, 99% of births occur within a hospital (National Health Commission of the People's Republic of China, 2025). Maternity care is therefore predominantly hospital-based and obstetrician-led (Jing et al., 2020). Evidence suggests that midwife-led models of care help to avoid unnecessary intervention or medicalisation of childbirth compared to other models of care, such as obstetric-led models (Sandall et al., 2024). With significant decrease of maternal mortality ratio in China from 30 cases per 100,000 live births in 2010 to 15.7 in 2022 (National Bureau of Statistics of China, 2023), the Chinese government plans to ensure that women not only 'survive' but also 'thrive' during childbirth (Qiao et al., 2021). A series of strategies were initiated to enhance maternity satisfaction and to facilitate a positive childbirth experience amongst women (National Health Commission of the People's Republic of China, 2021). As a response to this, supporting women's spontaneous pushing has been recommended by the Chinese national guidelines pertaining to physiological birth (Chinese Medical Association, 2020).

One significant challenge in supporting physiological labour and birth is the high rate of epidural analgesia during labour (Newnham et al., 2021). In China, a recent study investigating intrapartum interventions in 1209 women showed that 53% of women used epidural analgesia during labour (Gu et al., 2020). Similarly, another

cross-sectional survey exploring 4192 Chinese women's experience of maternity care indicated that the rate of epidural was 76% (Liu et al., 2021). Women often choose epidurals as their first option without sufficient information on pain relief options (Westergren et al., 2021). Antenatal education by midwives in the second and third trimester during pregnancy, can enhance decision-making regarding pain relief (Aune et al., 2021; Liu et al., 2021; Sara et al., 2020; Westergren et al., 2021). Continuous support from midwives during early labour reduces the likelihood of using epidural analgesia (Kobayashi et al., 2017).

Women may benefit from prenatal education on pain relief options, provided to them by midwives in an unbiased and balanced manner (Sara et al., 2020). Future studies in China, where currently many women opt for epidural analgesia, should include prenatal education by midwives. This education could result in a wider range of pain management options being utilised, allowing women to stay mobile and enhance spontaneous pushing, facilitating physiological childbirth. It would also align with the Chinese government's goal to reduce medical interventions during labour and improve outcomes for mothers and babies.

An additional important factor in the facilitation of physiological labour and birth is the potentially detrimental impact that dominant voices may have in the birthing space. As previously discussed, in China maternity units are predominantly led by obstetricians (Ning et al., 2022). Compared to woman-centred midwifery-led models of care, medically-led care is associated with higher rates of interventions, such as episiotomy, and epidural analgesia use (Henshall et al., 2024). In contrast, continuity of midwifery care, through caseload or team-based models, has consistently been shown to improve women's experiences, increase spontaneous vaginal births, reduce unnecessary interventions, and enhance maternal satisfaction (Sandall et al., 2024). By fostering trusting relationships and providing consistent, individualised support, these models empower women to make informed choices, feel confident in their bodies, and engage actively in the birth process (Lunda et al., 2024). Hence, supporting spontaneous pushing within such frameworks through joint efforts from obstetricians and midwives, not only aligns with evidence-based practice but also promotes a broader shift toward respectful, empowering, and humanised maternity care in the Chinese context.

Overall, facilitating spontaneous pushing during the second stage of labour, contributed valuable insights to the existing body of knowledge on physiological childbirth. It was effectively integrated into the midwifery model of care, supporting women's autonomy and empowerment during labour. The findings also offer relevant evidence for maternity care within the Chinese context, where further efforts are required to promote shared decision making, support physiological labour and birth, and enhance women's childbirth experiences. However, while the study reinforces the importance of these principles, it also highlights ongoing challenges in translating evidence into practice, particularly within systems where medicalised models of care remain dominant.

## 8.4 Recommendations from the study

Based on the overall findings of this feasibility study, a set of recommendations have been developed to inform future research, clinical practice and education.

### 8.4.1 Recommendations for future research

At the start of this study, the research aimed to explore the feasibility of a future RCT comparing spontaneous pushing and the routine directed pushing during labour, but following the feasibility study, a large-scale study to implement the spontaneous pushing strategy should be recommended instead of an RCT. The rationale was that spontaneous pushing was proved to be effective, well received and highly valued by women and midwives in this study. It may be unfair to recruit women into a control group when findings in this study and other studies indicated that spontaneous pushing leads to better outcomes. Hence, recommending a large-scale study involving multiple sites to implement spontaneous pushing in the wider context may be the way forward. The following recommendations were concluded to inform future studies.

**Recommendation 1: Enhancing recruitment strategies for pregnant women**

The recruitment of women for the study presented several challenges. This section outlines the strategies that proved effective and offers recommendations for future research.

*1) Selecting optimal timepoints to access women.* The findings of this study suggest women were highly receptive to participating during the antenatal and early

postnatal periods of maternity care. In this study, recruitment occurred in the third trimester of pregnancy, with informed consent obtained at the same time. Future studies might consider recruiting women earlier to allow more time for them to explore and consider alternative pain relief options other than epidural analgesia. The postnatal survey was conducted while participants were still in the postnatal ward prior to hospital discharge. These time points are recommended for future research though adjustments may be required depending on the specific context (Thesis Chapter Six).

2) *Providing prenatal information on pain relief options.* The primary reason women declined to participate in the study was their preference for epidural analgesia during labour and birth. However, most were not aware of, or did not consider, other available pain relief methods during the prenatal period. Providing antenatal, balanced information on both medical and non-medical pain relief methods during labour and birth may help to improve recruitment rates of women in future studies (Thesis Chapters Five & Six).

3) *Exploring various ways of introducing the study to participants.* The prenatal club where pregnant women and their families were required to attend some prenatal education lectures was proved to be an effective setting for introducing the study. Sharing videos of women who had previously used spontaneous pushing could be engaging for both expectant mothers and families (Thesis Chapters Five & Six).

4) *Measuring recruitment burden.* The recruitment rate observed in this study provides valuable data for staffing requirements in similar settings. In this study, a full-time researcher was present at the clinic five mornings per week over a five-month period overseeing all aspects of participant recruitment. For future studies involving multiple part-time researchers, proper training will be essential to maintain consistency and uphold recruitment standards (Thesis Chapter Five).

**Recommendation 2: Avoiding potential of crossover/contamination between groups**

Facilitating spontaneous pushing in the second stage of labour, is not about introducing a new intervention, but rather about returning to a more natural approach that minimises unnecessary interventions. In future studies, it will be important to prevent potential crossover or contamination between the spontaneous pushing group

and the control group. In this study, recruited midwives were trained to support spontaneous pushing for women in the intervention group. However, it cannot be excluded that crossover may have occurred when these same midwives unintentionally supported spontaneous pushing while assisting women in the control group. To address this issue in future studies, researchers could consider using a sequential design, in which the same midwives support both groups at different times, reducing the risk of contamination (Thesis Chapters Two, Three & Four).

**Recommendation 3: Exploring women's experiences through qualitative approaches**

In this study, women's experiences with spontaneous pushing were assessed through a postnatal survey, providing quantitative data. However, a qualitative approach such as in-depth interviews could offer richer insights into women's experience with spontaneous pushing, including perceived benefits, and support needs. One challenge, however, is identifying an appropriate time to conduct postnatal interviews without disturbing women's rest or bonding with their newborns (Thesis Chapters Four & Six).

**Recommendation 4: Synthesising evidence to inform implementation guidelines**

Midwives, particularly those with less experience, often prefer structured step-by-step procedures when facilitating spontaneous pushing. In contrast, more experienced midwives tend to align more naturally with the underlying philosophy of spontaneous pushing. Providing clear and practical guidelines can help less experienced midwives build confidence as they adopt what may be a relatively new practice for them (Thesis Chapters Two, Four, Six & Seven).

### 8.4.2 Recommendations for clinical practice in China

Directed pushing remains routine practice and is often perceived as standard practice by some midwives, highlighting the need for collective efforts to challenge entrenched norms. Urgent dialogue is also needed on strategies to shift mindset and reform clinical practices related to pushing management in the Chinese context.

**Recommendation 1: Facilitating evidence-based maternity care**

As previously discussed, there is currently a lack of synthesised evidence, such as clinical practice guidelines, on how to facilitate spontaneous pushing during labour.

Nonetheless, a growing body of evidence supports the benefits of spontaneous pushing and highlights the risks associated with routine directed pushing. Despite this, midwives reported limited access to up-to-date, synthesised evidence, including guidance on pushing techniques, which contributed to the continued use of outdated practices. Some midwives acknowledged that they rarely questioned the routine approach, instead accepting it as standard practice. This study highlights the critical need to advance evidence-based maternity care in China and emphasises the importance of midwives remaining engaged with current research, integrating both empirical evidence and clinical expertise into their practice. One recommended strategy involves implementing regular discussion and reflection sessions, enabling midwives to share experiences, explore challenges and critically evaluate their current practices. These sessions should be followed by targeted evidence searches, practical application of relevant findings in practice, and continuous evaluation of their impact on care quality and outcomes (Thesis Chapters Two and Seven).

**Recommendation 2: Enhancing woman-centred maternity care**

To improve maternity care, Chinese authorities and healthcare facilities have been enhancing childbirth experiences. Encouraging spontaneous pushing empowers women and gives them greater control of their birth. Midwives should discuss the second stage pushing options and management with women, promote trust in their natural abilities and support them in leading their own labour. This woman-centred approach enhances women's autonomy and overall childbirth experience (Thesis Chapter Seven).

### 8.4.3 Recommendations for midwifery education in China

**Recommendation 1: Refining the midwives' preparation education program**

The preparation program for midwives in future studies should be enhanced to align more closely with midwives' needs and ensure their competency in facilitating spontaneous pushing. Key improvements include:

1) *Adjusting the program content to better cater to midwives' needs.* Midwives emphasised that a solid theoretical foundation knowledge base is crucial for facilitating the spontaneous pushing strategy. They also identified several key areas where additional preparation is required:

- Awareness of current research findings in this area
- Understanding women's experiences of the strategy from previous studies
- A clear, concise, and easy-to-follow step-by-step implementation procedure
- More experiential learning sessions to enhance practical skills for real-world application (Thesis Chapter Seven)

2) *Flexible and interactive delivery of the program.* Delivery of the preparation program should be flexible and incorporate ongoing dialogue and discussion with midwives. They expressed a preference for a program that includes workshops, instructional videos, thought shower/mind mapping, and case studies, all supported by a robust discussion (Thesis Chapter Seven).

3) *Ensuring midwives' competency.* To ensure participating midwives have sufficient knowledge and confidence to facilitate spontaneous pushing strategy, pre- and post- program tests should be introduced (Thesis Chapters Four & Seven).

**Recommendation 2: Normalising spontaneous pushing through childbirth education**

Findings from this study identified a lack of information on supporting women during the second stage of labour in midwifery textbooks and educational curricula for student midwives in China. Integrating evidence-based strategies such as spontaneous pushing, into Chinese midwifery curricula, would enhance midwives' competencies in facilitating physiological childbirth and better prepare student midwives for clinical practice (Thesis Chapter Seven).

These recommendations aim to address the gaps identified in this feasibility study and contribute to the development of high-quality evidence, improved clinical practices, and enhanced midwifery education in China.

## 8.5 Evolving the research approach: critical reflections on methodology

### 8.5.1 Reflections on the recruitment of women

Although the study achieved a successful recruitment rate, several challenges emerged during the recruitment process. These issues were discussed with the

supervision team and local midwifery staff and addressed through reflective journaling. A key challenge involved the recruitment of women, particularly nulliparous women who preferred epidural analgesia for labour pain relief during labour. In response, several strategies were implemented to support the recruitment process.

At the start of the recruitment process, almost all women showed interest in the study and asked for information about participation. However, some declined participation due to concerns that signing the consent form might limit their access to epidural analgesia during labour. To address this, the PhD candidate, discussed pain relief expectations by exploring women's expectations regarding pain relief during childbirth, discovering that most women preferred epidural analgesia and were unaware of other alternative pain relief options available during labour and birth.

Another recruitment strategy involved the use of a flowchart to visually explain pain relief options during labour, including non-pharmacological and pharmacological methods. This tool helped women to understand their choices better, especially if they considered alternatives to epidural analgesia. Both this strategy and the earlier conversational approach improved study participation and increased the PhD researcher's confidence in initiating conversations and engaging with women during the recruitment.

### 8.5.2 Reflections on the retention of women

Completing the women's postnatal survey presented minor challenges, particularly in identifying the appropriate time to approach the study participants to complete the survey. In accordance with the hospital discharge policy, most women who have a vaginal birth usually remain in hospital for up to the first three days postpartum. Therefore, the survey needed to be completed prior to discharge from the hospital. Approaching women in the morning proved to be challenging due to the busy ward activity and the priortisation of postnatal care. To address this, women were approached just before midday, when most were awake, and morning activities had been concluded. If a woman was breastfeeding, they were not interrupted; instead, the PhD researcher would wait approximately 20 minutes before returning. This approach helped facilitate smoother data collection while demonstrating respect for women's needs and comfort.

## 8.6 Strengths and limitations of the study

The study on the feasibility of an RCT comparing spontaneous pushing with directed pushing in China is pioneering in the Chinese context, making it a ground-breaking contribution to maternal health research. Firstly, it is built on a comprehensive systematic review, ensuring the study is evidence-informed and aligned with the current state of global research. Secondly, a targeted training program for midwives is a practical and impactful strength, directly supporting changes in clinical practice and promoting confidence and skill-building among care providers. Thirdly, the detailed evaluation of recruitment, retention, and feasibility is a strong methodological feature, helping to identify potential barriers and solutions for conducting future studies. This study also provides valuable insights into recruiting approaches where women not planning to use epidural analgesia are eligible. The findings go beyond feasibility and offer concrete recommendations for designing future trials, making the study applicable and useful for other researchers and clinicians. Finally, another strength is the inclusion of a qualitative component that explore midwives' experiences in this study, providing valuable insights into how spontaneous pushing during labour can be facilitated. This is the first study to present such qualitative findings, thereby enriching the existing body of knowledge on this topic.

This study has several limitations. Firstly, there was potential crossover between study groups in the clinical setting, as midwives may have supported spontaneous pushing even among women in the routine care group. This introduces a risk of bias due to an inability to blind the pushing strategy. Secondly, the study was conducted in a single maternity hospital in China, which may limit the generalisability of the findings. Contextual factors, such as participant numbers, availability of pain relief options, and midwives' willingness to participate, may differ across various maternity care facilities and should be considered in future trials. Thirdly, although equal numbers of primiparous and multiparous women were recruited, fewer primiparous women completed the study due to their use of epidural analgesia during labour. Consequently, findings related to spontaneous pushing in primiparous women are suggestive rather than definitive. Another limitation pertains to outcome measurement. The internationally recognised CEQ-C was employed to assess women's childbirth and pushing experiences, due to the practical constraints of

conducting a PhD study. However, the quantitative nature of this tool may restrict the depth of insight into women's lived experiences with spontaneous pushing. Therefore, future research could incorporate qualitative methods to provide a more nuanced perspective and further explore women's perspectives.

## 8.7 Researcher personal reflections

The inspiration for this PhD study stems from a deeply personal experience during my own birth. During the second stage of labour, I was criticised by the attending midwife, who told me, *"You're pushing wrong."* The words from the midwife were overwhelmingly negative and offered me no support or encouragement. These harsh words left me feeling doubtful of myself and filled with self-blame and disconnected from my body. That experience became the catalyst for my future academic exploration into the dynamics of care during childbirth, particularly the emotional and psychological aspects surrounding spontaneous pushing during labour. I am so proud for undertaking this study, as it has offered me a valuable opportunity to engage with both women and midwives on an important topic, that has been under-recognised, particularly in China.

In many settings, spontaneous pushing is not treated as a serious subject of research or practice. Through this research, I have gained profound insights into the challenges faced by women in China during childbirth, especially regarding informed choice and bodily autonomy. It became clear that many pregnant women in China are not aware of their rights during the birthing process. They often follow medical instructions passively, without realising they have the right to make decisions about their own bodies and birth experiences, sometimes at the expense of their own agency and dignity. This realisation has further deepened my commitment to advocating for more respectful, evidence-based and empowering maternity care that priortise women's voices and autonomy.

Through this research, I have come to recognise and understand that changing current practice of directed pushing presents an immense challenge. Meaningful change requires more than individual shifts in perspectives, it also demands systemic transformation. This includes building a stronger evidence base, updating midwifery curricula and improving prenatal education for women, and engaging policymakers to support the introduction of respectful and evidence-based care. Within the scope of

my research, I have focused on spontaneous pushing as a starting point to empower women during childbirth. By highlighting this approach, I hope to continue to contribute to the broader effort of promoting women's autonomy and ensuring respectful, woman-centred care during one of the most transformative experiences of their lives.

On reflection, the journey of completing this PhD study has been both humbling and empowering. It has strengthened and reinforced my belief in the importance of research that addresses knowledge gaps in practice. This research holds the potential to create tangible and positive change for women and contribute positively to women's respectful maternity care. Moving forward I am committed to using my voice, knowledge and research to advocate for a more compassionate and respectful approach to maternity care.

## 8.8 Conclusion

This feasibility study demonstrates that implementing spontaneous pushing during labour is practicable, achievable, and effective within the Chinese maternity care context. Women reported satisfactory and positive experiences and midwives endorsed the approach as advantageous for intrapartum care, consistent with their professional values and the needs of the women. The study successfully identified and applied practical strategies for recruiting pregnant women, training midwives and facilitating spontaneous pushing, while also evaluating suitable outcome measures. These findings provide a solid foundation for designing future large-scale studies. Despite the initial aim to explore the feasibility of a future RCT, findings in this study suggest a large-scale implementation study may be suitable.

Although the single site study design may limit generalisability, the study still makes a valuable contribution to both clinical practice and research methodology. Future studies, particularly engaging women earlier in pregnancy to better understand the physiological process of normal childbirth, are warranted to compare maternal and newborn outcomes between directed and spontaneous pushing. Ultimately, these findings have important implications for maternity care policy and practice, supporting alignment with WHO recommendations to preserve normal physiological processes during labour and improve the overall childbirth experience.

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# Appendices

## Appendix 1: Research Integrity Modules completion

### Quality through Integrity Quiz from 03/03/2025

**Due** No due date **Points** 10 **Questions** 10 **Time limit** None **Allowed attempts** Unlimited

**Last attempt details:**

| | |
|---|---|
| **Time:** | 6 minutes |
| **Current score:** | 10 out of 10 |
| **Kept score:** | 10 out of 10 |

Unlimited attempts

Take the quiz again

(Will keep the highest of all your scores)

#### Instructions

Completion of this module is a requirement for HDR students (PhD and Masters by Research).

In order to complete Stage 1 of your candidature, you are required to achieve 100% score on the following quiz. Successful completion of this course is automatically recorded by the Graduate Research School.

It is not a requirement to provide proof of completion to GRS. If you are asked by your Faculty to provide this proof, please take a screen shot of your results. GRS does not issue certificates of completion for this module.

Take the quiz again

#### Attempt history

| | Attempt | Time | Score |
|---|---|---|---|
| LATEST | Attempt 1 | 6 minutes | 10 out of 10 |

Correct answers are hidden.

Score for this attempt: **10** out of 10
Submitted 24 Jul at 13:45
This attempt took 6 minutes.

### International Collaboration quiz

**Due** No due date **Points** 6 **Questions** 6 **Time limit** None **Allowed attempts** Unlimited

**Last attempt details:**

| | |
|---|---|
| **Time:** | 1 minute |
| **Current score:** | 6 out of 6 |
| **Kept score:** | 6 out of 6 |

2 Attempts so far
View previous attempts
Unlimited attempts

Take the quiz again

(Will keep the highest of all your scores)

#### Instructions

Completion of this module is a requirement for HDR students (PhD and Masters by Research).

You are required to achieve 100% score on the following quiz. Successful completion of this course is automatically recorded by the Graduate Research School.

Please take a screenshot of your quiz results as a proof of completion if your Faculty asks for it.

Any questions, please contact grs_rd@uts.edu.au.

Take the quiz again

#### Attempt history

| | Attempt | Time | Score |
|---|---|---|---|
| KEPT | Attempt 2 | 1 minute | 6 out of 6 |
| LATEST | Attempt 2 | 1 minute | 6 out of 6 |
| | Attempt 1 | 2 minutes | 5 out of 6 |

Score for this attempt: **6** out of 6
Submitted 24 Jul at 13:33
This attempt took 1 minute.

# Overseas Travel quiz

**Due** No due date **Points** 5 **Questions** 5 **Time limit** None **Allowed attempts** Unlimited

## Instructions

Completion of this module is a requirement for HDR students (PhD and Masters by Research).

You are required to achieve 100% score on the following quiz. Successful completion of this course is automatically recorded by the Graduate Research School.

Please take a screenshot of your quiz results as a proof of completion if your Faculty asks for it.

Any questions, please contact grs_rd@uts.edu.au.

Take the quiz again

## Attempt history

| | Attempt | Time | Score |
|---|---|---|---|
| LATEST | Attempt 1 | 2 minutes | 5 out of 5 |

Score for this attempt: **5** out of 5
Submitted 8 Aug 2024 at 10:25
This attempt took 2 minutes.

**Last attempt details:**

| | |
|---|---|
| **Time:** | 2 minutes |
| **Current score:** | 5 out of 5 |
| **Kept score:** | 5 out of 5 |

Unlimited attempts

Take the quiz again

(Will keep the highest of all your scores)

## Appendix 2: Research Data Management Plan

UTS Stash

# A feasibility study of spontaneous pushing during labour

**Description**

Globally, the image of a midwife and/or birth attendant, directing the labouring woman to push can commonly be observed in the hospital setting (Lemos, 2017). The origin of this common practice, usually called 'directed pushing', can be traced back to the beginning of the last century when labouring women, mostly in developed countries, were required to follow specific instructions on how to push during the second stage of labour (Galabin, 1904). However, the physiological mechanisms of this practice were insufficiently researched (Joyce et al., 1987) and inclined to be accompanied by undesirable birth outcomes (Joyce, 2002; Lemos, 2017).
Subsequent research findings have challenged the mode of directed pushing. In directed pushing, usually with closed glottis, a woman's thoracic cavity pressure increases because of the strong and persistent pushing. This causes an unfavourable reduction of venous blood return to the maternal heart and results in reduced oxygenation of the uterus, placenta, and fetus (Joyce, 2002).
In view of a more positive childbirth experience and improved health outcomes for women and newborns, evidence-based practice and recommendations should be implemented. They address the facilitation of normal birth and include practice recommendations for the second stage of labour concerning maternal pushing methods. Several studies explored the way midwifery care support women to follow their bodily desire to push during the second stage of labour, called 'spontaneous pushing' (Araujo et al., 2021; Koyucu & Demirci, 2017; Low et al., 2013; Schaffer et al., 2005). Spontaneous pushing, as part of the management of the second stage of labour, contributes to a reasonable chance to achieve complete normality for each woman (Beynon, 1957).
The World Health Organization (WHO) (2018) recommends that women in the expulsive phase of the second stage of labour should be encouraged and supported to push spontaneously. In Chinese context, spontaneous pushing has been recommended by national guideline. In "Clinical Practice Guideline for Normal Birth" by China Maternal and Child Health Association, it is recommended that 'women are allowed to push (spontaneously) during a uterine contraction' (China Maternal and Child Health Association, 2020). Hence, recommendations to favour physiological labour and pushing are featured in the national guideline in Chinese context.
The results from systematic reviews confirmed that spontaneous pushing during the second stage of labour does not increase the risks for the woman and/or their baby. On the contrary, women who pushed spontaneously experienced lower rates of extended episiotomy and lower Caesarean section rates (Yao et al., 2022).
Based on findings from literature, our team plans to conduct a feasibility study, including a preparation program for midwives and the re-introduction of spontaneous pushing for women to allow for the comparison of spontaneous pushing with directed pushing. Conducting the feasibility study will allow for the research team to assess and evaluate the feasibility of conducting a full-scale RCT in the future and explore potential facilitators and barriers of implementing a RCT. A future RCT will aim to identify maternal and newborn outcomes between directed pushing and spontaneous pushing in women during the second stage of labour in China.

- Project

# Project overview

**Project name**

A feasibility study of spontaneous pushing during labour

**Research Master Project Code / Student ID**

14172148

☑ **HDR student project**

**Project description**

Globally, the image of a midwife and/or birth attendant, directing the labouring woman to push can commonly be observed in the hospital setting (Lemos, 2017). The origin of this common practice, usually called 'directed pushing', can be traced back to the beginning of the last century when labouring women, mostly in developed countries, were required to follow specific instructions on how to push during the second stage of labour (Galabin, 1904). However, the physiological mechanisms of this practice were insufficiently researched (Joyce et al., 1987) and inclined to be accompanied by undesirable birth outcomes (Joyce, 2002; Lemos, 2017).

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- Ethics and security

# Ethics and Security

**Initially your research data is classifed as UTS Internal. To improve the accuracy of this classification, please answer the following**

**Information Security Classification**

UTS: Confidential

**Does the research involve:**

Human participant data
Clinical trials

**Will the data you collect from individuals include personal information?**

Yes

**Will the data you collect from individuals include sensitive personal information other than health information?**

No

**Will the data you collect from individuals include health information?**

Yes

**Will any data or information be individually identifiable or potentially re-identifiable (i.e. include codes) at any stage of the research?**

Yes

**Outline any potential risk to participants from accidental disclosure of the data and any strategies for minimising those risks**

Accidental disclosure may result in identity theft of participants' personal information. This may lead to inappropriate use of personal information, health information, and lead to reputation harm for research group and institution. In this study, we use a code list to record participants' name initials and their code number used in this study. The code list will be kept separately from the data documents and will be destroyed when data clear is completed.

**If you are collecting data from residents of countries other than Australia, which countries?**

China

**Is Ethics approval required for your project?**

Yes

# Data collection and storage

**Please provide a brief description of your data collection methodology**

The primary objective of this study is to test the feasibility of a future RCT to compare the effects of spontaneous pushing and directed pushing for maternal and neonatal outcomes. These objectives will be measured by the following outcomes:
1) Feasibility outcomes: recruitment rates, retention rates, attendance of participants;
2) Acceptability outcomes: women's and midwives' perspectives and acceptability of the intervention.

The secondary objective is to explore the effectiveness of spontaneous pushing and directed pushing for women without an epidural during the second stage of labour.
These objectives will be measured by the following outcomes:
1) Efficacy outcomes: duration of second stage of labour, mode of birth, perineal laceration, episiotomy rates, Apgar score, admission to neonatal intensive care unit and neonatal resuscitation.
The above domains of outcomes will be measured using a combination of qualitative and quantitative methods, including surveys with closed-ended and open-ended questions, focus group interviews as well as information extracted from medical notes. Three tools will be used to collect the above data: case report form; survey for women; focus group interview for midwives.

**Predominant file type(s), e.g. textual, tabular, image or recording. Give file format if known**

Data will be textual and tabular, collected by using the case report form.
Data will be sound recording, collected in the interviews.
Data will be exported and stored in Microsoft Office.
Double data entry will be conducted to ensure ensure data quality. Multiple imputation will be conducted before data analysis to ensure data quality.

**Data storage location**

UTS provided survey platform (e.g Qualtrics, REDCap, etc)
UTS provided collaboration space (e.g. CloudStor, OneDrive etc)

**If other, provide further details: (Including access arrangements for the minimum retention period)**

1) For the collection of quantitative data: several statistical methods will be used in statistical description and evaluation, such as the statistical description of mean value, standard deviation, number of cases, percentage, t test, P value, and chi-square test. Subgroup analysis will be conducted to explore the difference in primiparous women and multiparous women.
2) For qualitative data: After a verbatim transcription of the audio recording, the Framework Method will be involved in the data analysis process.

**Describe the form(s) of the identifiable or re-identifiable data**

When extracting data from medical records, each participant will have a code number used in this study. Researcher will record participants' name initials and the code in a code list. This list will help to trace back when data in case report form is not complete or with error.

**What platforms or tools will you use to collect or import identifiable or re-identifiable data?**

OneDrive
RedCap

- Data retention and disposal

## Data retention and disposal

**Minimum retention period**
15 years (clinical trials or research with potential long term effects on human subjects)

**The data steward is:**
Kathleen Baird

**Have you made commitments to destroy part of the data prior to end of retention period (e.g original recordings, linking/code files)?**
Yes

**Which data?**
The code list (it links the identifiable information and pariticpants' code number used in this study)

**When should it be destroyed?**
01/10/2025

- Access and rights

## Access and rights

**Copyright and intellectual property owners of data created in project**
University of Technology Sydney

**Please list any other owners:**

**Access after the project will be**
Mediated, by permission from the data manager

**Are you using any secondary or third-party data?**
No

**Licences or Agreements:**

- Research Workspace

## Research Workspace

### Associated workspaces

| Name | Description | Location | Type |
|---|---|---|---|

# Appendix 3: Ethical approvals

Ethical approval from UTS

ResearchMaster

## Ethics Application

| | |
|---|---|
| Application ID : | ETH22-7072 |
| Application Title : | A single-centre feasibility study, measuring the outcomes of spontaneous pushing and directed pushing on maternal and neonatal outcomes among women without epidural analgesia during the second stage of labour |
| Date of Submission : | 14/11/2022 |
| Primary Investigator : | Prof Kathleen Marion Baird (Chief Investigator) |
| Other Personnel : | Ms Jiasi Yao (5Research Student)<br>Dr Heike Roth (Co-Supervisor)<br>Prof Hong Lu (Co-Supervisor)<br>Prof Debra Jane Anderson (Co-Supervisor)<br>Rong Huijuan (3c Overseas Investigator) |

| | | |
|---|---|---|
| 1 | Primary | No |
| | ID | PER0126280 |
| | Surname | Lu |
| | Given Name | Hong |
| | Full Name | Prof Hong Lu |
| | Position | Co-Supervisor |
| | Type | External |
| | AOU | |
| | Managing Unit | |
| | Email Address | |
| | Work Number | |
| 2 | Primary | |
| | ID | PER0173761 |
| | Surname | Huijuan |
| | Given Name | Rong |
| | Full Name | Rong Huijuan |
| | Position | 3c Overseas Investigator |
| | Type | External |
| | AOU | |
| | Managing Unit | |
| | Email Address | |
| | Work Number | |

Date of LRO review

14/11/2022

**Declaration:**

- I am aware that this research is being conducted within this Faculty/School/Centre.
- I am satisfied that the researchers have met all Faculty/School/Centre requirements in relation to this research
- This research will be undertaken in compliance with the UTS Research Ethics and Integrity Policy or any replacement or amendment thereof
- This research will be undertaken in compliance with the Australian Code for the Responsible Conduct of Research and National Statement on Ethical Conduct in Human Research

*

- (●) Yes
- ( ) No

Comments

*This question is not answered.*

## Research Office use only

**Research Office use only**

Application Status

Approved

Approval Purpose

Research (staff project)

Current Committee

0Health and Medical Research Ethics Committee (Human)

TRIM number

RES22/1795

Ethical approval from site specific hospital

# 石家庄市第四医院科研项目伦理审批件

序号：20230064

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 项目名称 | 初产妇第二产程自主用力与指导用力的比较：一项单中心、可行性分析研究 | | | | | | |
| 项目依托单位 | 河北医科大学 | | | 项目起止时间 | | 2023 年 3 月-12 月 | |
| 项目类别 | □药物临床试验 □医疗器械临床试验 √临床科研项目<br>□学术论文 □其他： | | | | | | |
| 申请人（项目负责人）简要信息 | | | | | | | |
| 姓 名 | 戎惠娟 | 性别 | 女 | 科室 | 护理部 | 电话 | 13171587887 |
| 职 务 | 主任 | 职称 | 副主任护师 | 学历 | 本科 | 邮箱 | 13171587887@163.com |
| 项目简介 | 请见附页 | | | | | | |
| 审查方式 | 会议审查 | | | | | | |
| 审查时间 | 2023.02.14 | | 审查地点 | 石家庄市第四医院 | | | |

医学伦理委员会审批意见：

您提交的研究项目经石家庄市第四医院医学伦理委员会会议审查，同意开展该项研究。请严格按照项目研究方案进行，如有修改，须报我院伦理委员会审查。

石家庄市第四医院
医学伦理委员会
（盖章）

备注：

1. 本批件将在医学伦理委员会备案。
2. 已批准项目需遵循本伦理委员会批准的方案执行。
3. 医学伦理委员会有权对研究过程进行跟踪评价。
4. 项目内容变更、暂定，请及时报告医学伦理委员会。
5. 发生严重不良事件及影响研究风险收益比的非预期事件，请及时报告伦理委员会。

## Appendix 4: Search strategy in systematic review of Chapter Two

| Database | | Search strategy |
|---|---|---|
| Pubmed | #1 | ((labor [Title/Abstract]) OR (labour[Title/Abstract])) OR (birth[Title/Abstract])) OR (childbirth[Title/Abstract])) OR (deliver*[Title/Abstract])) OR (parturition[Title/Abstract])) OR (intrapartum[Title/Abstract])) OR (labor, obstetric[MeSH Terms])) OR (deliveries, obstetric[MeSH Terms])) OR (labor stage, second[MeSH Terms])) OR (parturition[MeSH Terms]) |
| | #2 | ((randomisedcontrolled trial [Publication Type]) OR (controlled clinical trial [Publication Type])) OR (clinical trial [Publication Type])) OR (randomisedcontrolled trial[MeSH Terms])) OR (allocation, random[MeSH Terms])) OR (double blind method[MeSH Terms])) OR (single blind method[MeSH Terms])) OR (clinical trial[MeSH Terms])) OR (placebos[MeSH Terms]) |
| | #3 | ((spontaneous pushing [Title/Abstract]) OR (physiologic pushing[Title/Abstract])) OR (passive descent[Title/Abstract])) OR (involuntary pushing[Title/Abstract])) OR (directed pushing[Title/Abstract])) OR (coached pushing[Title/Abstract])) OR (Valsalva[Title/Abstract]) |
| | #4 | #1 AND #2 AND #3 |
| CINAHL | #1 | MH childbirth OR MH labor OR MH labor stage, second OR MH intrapartum care OR MH delivery, obstetric |
| | #2 | AB labor OR AB labour OR AB birth OR AB childbirth OR AB deliver* OR AB intrapartum OR AB parturition |
| | #3 | (MH "Pushing (Childbirth)") |
| | #4 | MH "Pushing (Childbirth)" OR AB push* |
| | #5 | #1 OR #2 |
| | #6 | #4 AND #5 |
| | #7 | MH randomised controlled trials OR AB randomised controlled trials OR PT randomised controlled trials |
| | #8 | #6 AND #7 |
| MEDLINE | #1 | (MH "Delivery, Obstetric") OR (MH "Labor, Obstetric") OR (MH "Labor Stage, Second") OR (MH "Parturition") OR AB labor OR AB labour OR AB birth OR AB childbirth OR AB deliver* OR AB intrapartum OR AB parturition |
| | #2 | AB push OR AB pushing OR AB bear down OR AB bear* |
| | #3 | AB spontaneous OR AB passive OR AB physiologic OR AB coach* OR AB direct* OR AB Valsalva |
| | #4 | #1 AND #2 AND #3 |
| | #5 | MH randomisedcontrolled trials OR MH clinical trials OR PT randomisedcontrolled trials OR PT clinical trials OR AB randomised OR AB randomized |
| | #6 | #5 AND #6 |

| | | |
|---|---|---|
| Web of Science | #1 | AB=(labor OR labour OR birth OR childbirth OR deliver* OR intrapartum OR parturition) |
| | #2 | TS= (labor OR labour OR birth OR childbirth OR deliver* OR intrapartum OR parturition) |
| | #3 | TS= (spontaneous pushing OR physiologic pushing OR passive descent OR involuntary pushing OR directed pushing OR coached pushing OR valsalva) |
| | #4 | #1 AND #2 AND #3 |
| Scopus | #1 | TITLE-ABS-KEY (labor OR labour OR birth OR childbirth OR deliver* OR intrapartum OR parturition) |
| | #2 | TITLE-ABS-KEY ("spontaneous pushing" OR "physiologic pushing" OR "passive descent" OR "involuntary pushing" OR "directed pushing" OR "coached pushing" OR valsalva ) |
| | #3 | TITLE-ABS-KEY (randomised OR randomisedOR "random allocation" OR single-blinded OR double-blinded OR "clinical trials") |
| | #4 | #1 AND #2 AND #3 |
| Embase | #1 | labor stage 2/ or labor/ or labor management/ |
| | #2 | (labor or labour or birth or childbirth or deliver* or intrapartum or parturition).ab. |
| | #3 | #1 OR #2 |
| | #4 | (spontaneous pushing or physiologic pushing or passive descent or involuntary pushing or directed pushing or coached pushing or Valsalva).ab. |
| | #5 | randomisedcontrolled trials.sh. or randomisedcontrolled trials.pt. or randomised.ab. or randomized.ab. |
| | #6 | #3 AND #4 AND #5 |
| | #7 | (push* or bear* or passive descent or labor down).ab. |
| | #8 | #3 AND #7 AND #5 |
| Cochrane Library | #1 | (labor):ti,ab,kw OR (labour):ti,ab,kw OR (deliver*):ti,ab,kw OR (birth):ti,ab,kw OR (childbirth):ti,ab,kw |
| | #2 | (intrapartum):ti,ab,kw OR (parturition):ti,ab,kw |
| | #3 | MeSH descriptor: [Parturition] explode all trees |
| | #4 | MeSH descriptor: [Labor Stage, Second] explode all trees |
| | #5 | (spontaneous pushing):ti,ab,kw OR (physiologic pushing):ti,ab,kw OR (passive descent):ti,ab,kw OR (involuntary pushing):ti,ab,kw |
| | #6 | (directed pushing):ti,ab,kw OR (coached pushing):ti,ab,kw OR (Valsalva):ti,ab,kw |
| | #7 | ("randomised controlled trials"):ti,ab,kw OR ("randomised clinical trials"):ti,ab,kw OR ("randomised clinical trials"):pt OR ("randomised controlled trials"):pt OR (randomised):ti,ab,kw |
| | #8 | #1 OR #2 OR #3 OR #4 |
| | #9 | #5 OR #6 |

| | | |
|---|---|---|
| | #10 | #7 AND #8 AND #9 |
| PsycINFO | #1 | MA Delivery, Obstetric OR MA Labor, Obstetric OR MA Labor Stage, Second OR MA Parturition OR AB labor OR AB labour OR AB birth OR AB childbirth OR AB deliver* OR AB intrapartum OR AB parturition |
| | #2 | AB spontaneous pushing OR AB physiologic pushing OR AB passive descent OR AB involuntary pushing OR AB direct* pushing OR AB coach* pushing OR AB Valsalva |
| | #3 | MA randomised clinical trials OR MA randomised controlled trials OR AB random* OR MA random allocation |
| | #4 | S1 AND S2 AND S3 |
| | #5 | S1 AND S2 |
| CNKI | | (SU=分娩 OR SU=产程 OR SU=产中 OR SU=产时 OR SU=产妇) AND (TKA=自主用力 OR TKA=指导用力 OR TKA=屏气用力) |
| VIP | | (R=分娩 OR R=产程 OR R=产中 OR R=产时 OR R=产妇) AND (R=自主用力 OR R=屏气用力 OR R=指导用力) NOT (K=系统综述 OR K=系统评价 OR K=meta 分析 OR K=荟萃分析) |
| | | (R=分娩 OR R=产程 OR R=产中 OR R=产时 OR R=产妇) AND (R=自主用力 OR R=屏气用力 OR R=指导用力) |
| WANFANG | | (AB=分娩 OR AB=产程 OR AB=产中 OR AB=产时 OR AB=产妇) AND (AB=自主用力 OR AB=屏气用力 OR AB=指导用力) |
| | | (AB=分娩 OR AB=产程 OR AB=产中 OR AB=产时 OR AB=产妇) AND (TI=自主用力 OR TI=屏气用力 OR TI=指导用力) |
| | | (AB=分娩 OR AB=产程 OR AB=产中 OR AB=产时 OR AB=产妇) AND (AB=自主用力 OR AB=屏气用力 OR AB=指导用力) AND (TI=用力) |
| SINOMED | #1 | "产妇"[摘要:智能] OR "产程"[摘要:智能] OR "分娩"[摘要:智能] OR "产中"[摘要:智能] OR "产时"[摘要:智能] |
| | #2 | "自主用力"[摘要:智能] OR "屏气用力"[摘要:智能] OR "指导用力"[摘要:智能] |
| | #3 | "用力"[标题:智能] |
| | #4 | #1 AND #2 |
| | #5 | #1 AND #2 AND #3 |

## Appendix 5: Summary of included studies in systematic review of Chapter Two

| No. | Author (Year) | Title | Country of study | Language | Setting | Type of study | Inclusion criteria | Numbers of participants | Intervention | Comparators | Outcomes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Parnell (1993) | Pushing method in the expulsive phase of labor: A randomized trial | Denmark | English | An obstetric labor ward | Prospective, randomized controlled study | Danish speaking primiparae over the age of 18 years (and secundiparae after a previous cesarean section), with a singleton pregnancy and a gestation of 37 completed weeks, presenting by the vertex and where vaginal delivery was expected, were asked to participate. | 306(151/155) | With the spontaneous method, the woman was encouraged to use her own urge to push, so long and so many times during each contraction as she felt necessary | With the forced method, the woman was encour aged to push using the Valsalva maneuver, i.e. to take a deep breath, hold it and push for as longtational age at birth, birth weight and fetal head circumference between the spontaneous and forced group. | 1.The duration of labor;<br>2.the time from rupture of membranes until delivery;<br>3.The second stage of labor and the expulsive phase;<br>4.Delivery by vacuum extraction;<br>5.episiotomy;<br>6.The mean of arterial pH and Apgar;<br>7.The degree and localization of the lacerations. |
| 2 | Thomson (1993) | Pushing techniques in the second stage of labour | U.K | English | Not mentioned | A randomized controlled trial | willing to take part; aged 18 or over; primiparous; singleton pregnancy; >37 weeks gestation; cephalic presentation; no epidural analgesia; no maternal condition (obstetric or medical) which would affect the management of the second stage; no fetal condition which would affect the management of the second stage. | 32(15/17) | The instructions for the subjects in the experimental group were that the woman was to be encouraged only in spontaneous pushing activity. | The women in the control group were to be told to 'take a deep breath, hold it and push for as long as possible'. Should the push run out before the contraction ceased, the woman was to repeat the exercise. | 1.Duration of second stage(min)<br>2.Mode of delivery (n)<br>3.Estimated blood loss (ml)<br>4.Perineal trauma<br>5.Condition of baby at delivery<br>6.Cord venous blood gas values at delivery: pH;<br>7.Scores on visual analogue scales of views of the second stage of labour |

| No. | Author (Year) | Title | Country of study | Language | Setting | Type of study | Inclusion criteria | Numbers of participants | Intervention | Comparators | Outcomes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 3 | Bloom (2006) | A randomized trial of coached versus uncoached maternal pushing during the second stage of labor | U.S.A | English | A public hospital | A randomized trial | Nulliparous women in spontaneous active labor with uncomplicated pregnancies between 36 and 41 weeks' gestation. Eligible women were those with a singleton fetus in cephalic presentation and regular uterine contractions with cervical dilatation of at least 4 cm. | 320(157/163) | 1. Head of bed up 30 degrees; 2.Position as she desires, on her back or either side; 3.Simply to do what comes naturally or whatever the patient feels the urge to do. | 1.First two steps same with intervention group; 3.Coach patient to pull back on both knees and tuck her chin while the provider supports the legs; 4.Take a deep breath and hold during the peak of a contraction then bear down and push for 10 seconds; repeat this as long as the contraction continues. | Materal outcomes: 1.Length of second stage; 2.Route of delivery; 3.Episiotomy; 4.Perineal laceration; Neonatal outcomes: 1.5-min Apgar score; 2.Umbilical artery pH; 3.Meconium-stained fluid; 4.Delivery room resuscitation; 5.Sepsis workup; 6.NICU admission; |
| 4 | Yildirim (2008) | Effects of Pushing Techniques in Birth on Mother and Fetus: A randomized study | Turkey | English | A teaching hospital | A randomized study | low-risk (without chronic disease, premature rupture of membranes, or other pregnancy complications) primiparous women between 38 and 42 weeks ' gestation who volunteered to participate in this study | 100(50/50) | Women in the spontaneous pushing group were encouraged and supported to push spontaneously , bearing down in response to contractions. | Women in the Valsalva pushing group were encouraged and supported in using Valsalva-type pushing in the second stage of labor. | second stage (min), expulsion phase(min), perineaul and cervical tears, Apgar score 1 min and 5 min Cord venous blood gas values: pH Level, pCO2 Level, PO2 Level |

| No. | Author (Year) | Title | Country of study | Language | Setting | Type of study | Inclusion criteria | Numbers of participants | Intervention | Comparators | Outcomes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | Lam (2010) | Comparison of pushing techniques used in the second stage of labour for their effect on maternal perception of fatigue in the early postpartum period among Chinese women | Hong Kong, China | English | A public hospital | A randomised controlled trial | Nulliparas; Aged between 18 and 40 years; Healthy singleton fetus with cephalic presentation; Gestational age ≥37 weeks; Anticipating a vaginal birth; Had either a spontaneous onset of labour or induction; Were able to read Chinese or English | 73(35/38) | When women were assessed as having full dilatation of the cervix and a fetal head plus 1, the midwives suggested they commenced pushing only when they felt the urge to do so and gave no specific instructions. | When it was confirmed that the cervix was fully dilated and the fetal head station was assessed as being plus 1, the midwife suggested she commenced pushing using the directed pushing technique regardless of whether she felt an urge to push or not. | 1. The Apgar score at 1 and 5 minutes after birth.<br>2. The numbers of babies admitted to the neonatal intensive care unit.<br>3. The mean length of the first stage of labour<br>4. The mean length of the second stage of labour<br>5. Total labour mean length<br>6. The mode of birth<br>7. The fatigue score<br>8. The energy score |
| 6 | Jahdi (2011) | A randomized controlled trial comparing the physiological and directed pushing on the duration of the second stage of labor, the mode of delivery and Apgar score | Iran | English | A birth center | A randomized controlled trial | Low risk pregnancies; singleton and live fetus; estimated birth weight of 2500 to 4000g, vertex presentation, 37 and 42 gestational weeks, parity between 1 and 5;age between 18 and 40, at the labor pain stage who were anticipating a vaginal birth with the spontaneous onset of labor or induction | 191(100/91) | Women were assessed as having full dilatation of the cervix and a fetal head plus 1, the midwives suggested they commenced pushing only when they felt the urge to do so and gave no specific instructions. | Women were coached by the midwife to use closed-glottis pushing 3 to 4 times during each contraction immediately when cervical dilation reached 10 cm and a fetal head plus 1 and to repeat this. | Length of the 2nd stage of labor;<br>Mode of birth;<br>Apgar score |

| No. | Author (Year) | Title | Country of study | Language | Setting | Type of study | Inclusion criteria | Numbers of participants | Intervention | Comparators | Outcomes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | Low (2013) | Spontaneous pushing to prevent postpartum urinary incontinence: a randomized, controlled trial | U.S.A | English | A women's hospital | A prospective randomized controlled trial | At least 18 years of age, no history of genitourinary pathology, continent during first 20 weeks of pregnancy by self-report,and continent at 20 weeks' gestation by negative standing stress test. | 152(83/69) | Spontaneous pushing, with instruction provided prena tally via a standardized training video. This method included instructing the woman to follow her bodily sensations and push as she felt the urge. | Directed pushing, or coached pushing using a closed glottis Valsalva maneuver, which was routine care provided at the recruitment hospital. | Second-stage length (minutes);<br>Delivery method;<br>Leakage Index:<br>Baseline; 12 months;<br>Change(final, baseline) |
| 8 | Ahmadi (2017) | Effect of Breathing Technique of Blowing on the Extent of Damage to the Perineum at the Moment of Delivery: A Randomized Clinical Trial | Iran | English | A public hospital | A randomized clinical trial | Iranian woman, 18 ≤ age ≤ 35 years,primiparous, singleton pregnancy with cephalic presentations at term, candidate for vaginal delivery,low-risk pregnancy, having 3–5 cm dilatation, normal body mass index (BMI) (19.8–20) | 166(83/83) | Women were asked to take two deep abdominal breaths during the onset of pain, then take another deep breath, and push for 4–5 seconds with the open mouth, while controlling exhalation and then resume the process for the next push as trained. | Same strategy with intervention group but the pushing continued until the baby was delivered. From the crowning stage onward, the women were directed to control their pushing and perform the blowing technique as previously trained. | 1.Perineum statue: No trauma; Posterior laceration; Anterior laceration; Episiotomy.<br>2.Length of episiotomy (cm)<br>3.Depth of episiotomy (mm)<br>4.Neonatal characteristics: Head circumference (cm); Chest circumference (cm); Birth weight (gr) |

| No. | Author (Year) | Title | Country of study | Language | Setting | Type of study | Inclusion criteria | Numbers of participants | Intervention | Comparators | Outcomes |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | Koyucu (2017) | Effects of pushing techniques during the second stage of labor: A randomized controlled trial | Turkey | English | A tertiary maternity clinic | Randomized prospective study | Nulliparous;Aged range:18-40; Gestation week:38-40; Expecting vaginal delivery; Cephalic presentation; Single, healthy fetus; First stage of labor; Estimated fetal weight:2500-4000g | 108(55/53) | Women were assessed as having full dilatation of the cervix, miwife suggested they commenced pushing only when they felt the urge to do so and gave no specific instructions . | Women were coached to use closed-glottis pushing 3 to 4 times for 10s during each contraction immediately when cervical dilation reached 10 cm and to continue pushing using this method with each contraction until birth. | Meconium stained amniotic fluid rates; Fetal heart rate results; APGAR scores; Newborn resuscitation and intensive care; Newborn trauma;Duration of the second stage of labor; Perineal and cervical lacerations; Pelvic-perineal pain scores; Amount of blood loss ; POP-Q examination; Q-tip test scores |
| 10 | Araujo (2021) | Efficacy of spontaneous pushing with pursed lips breathing compared with directed pushing in maternal and neonatal outcomes | Brazil | English | A maternity hospital | A quasi-randomised controlled clinical trial | low- and high-risk parturients in the second stage of labour, between 19 and 45 years old and 37 to 42 gestational weeks. | 62(31/31) | Received guidance about the breathing pattern associated with expulsive efforts, based on the spontaneous pushing physiology | The use of directed pushing, regardless of maternal desire, initiated right after uterine contraction, by guiding the woman to perform a deep inspiration, initiatingthe effort with closed glottis for 10 seconds or more. | Duration of the second stage of labour, Duration of maternal pushing, Episiotomy, Perineal laceration, Vaginal delivery, Instrumental delivery, Caesarean section, Postpartum haemorrhage, Maternal blood pressure, Oxytocin, Vas pain score, Maternal fatigue score, Maternal satisfaction score |

## Appendix 6: Figures featured in systematic review of Chapter Two

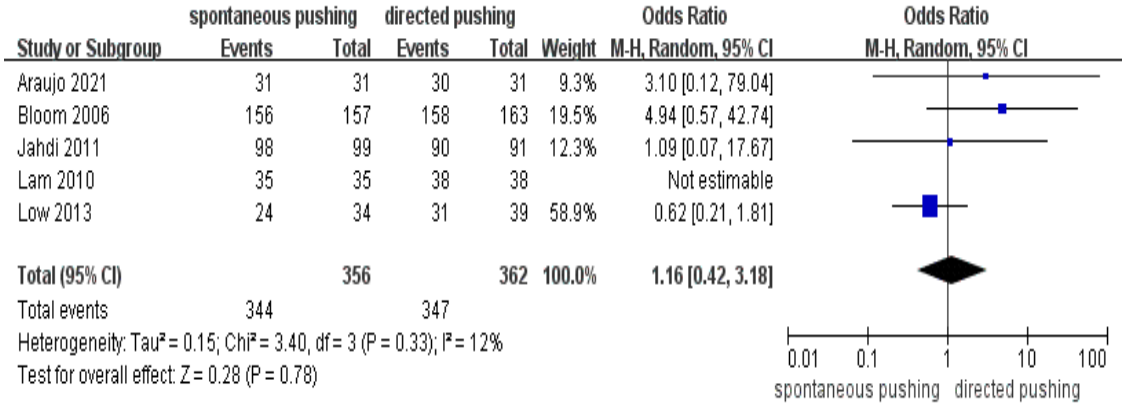



**Figure 1: Forest plot of mode of birth between different pushing groups (Vaginal birth)**

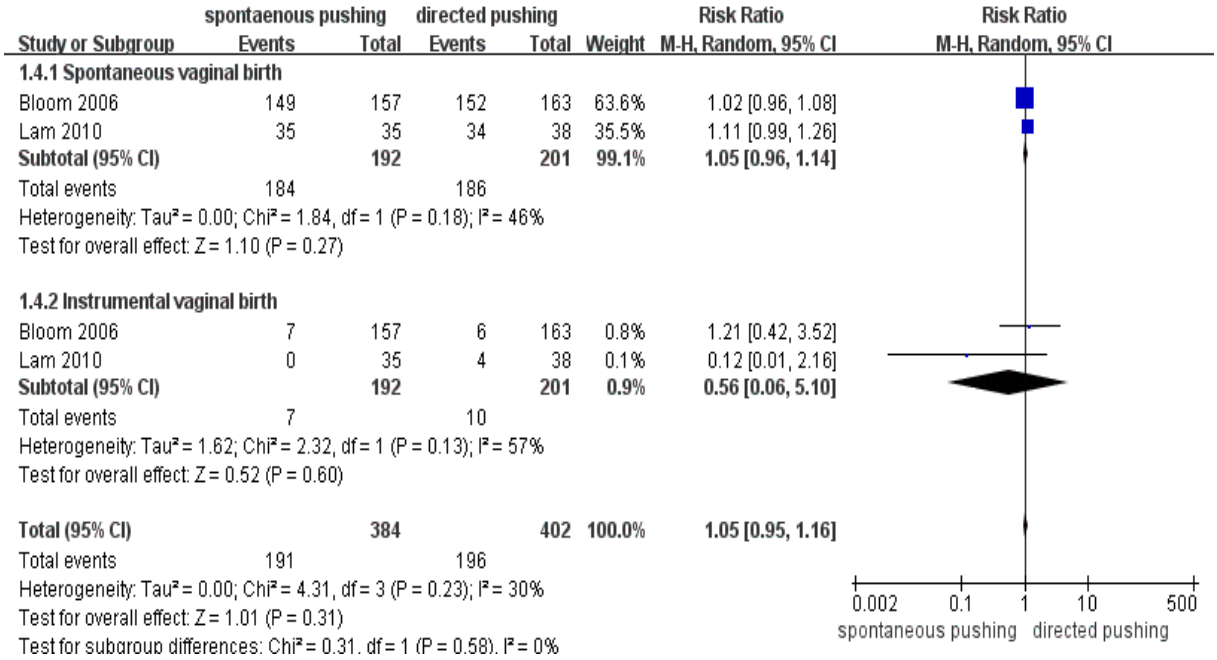



**Figure 2: Forest plot of mode of birth between different pushing groups (spontaneous vaginal birth versus instrumental vaginal birth subgroups)**

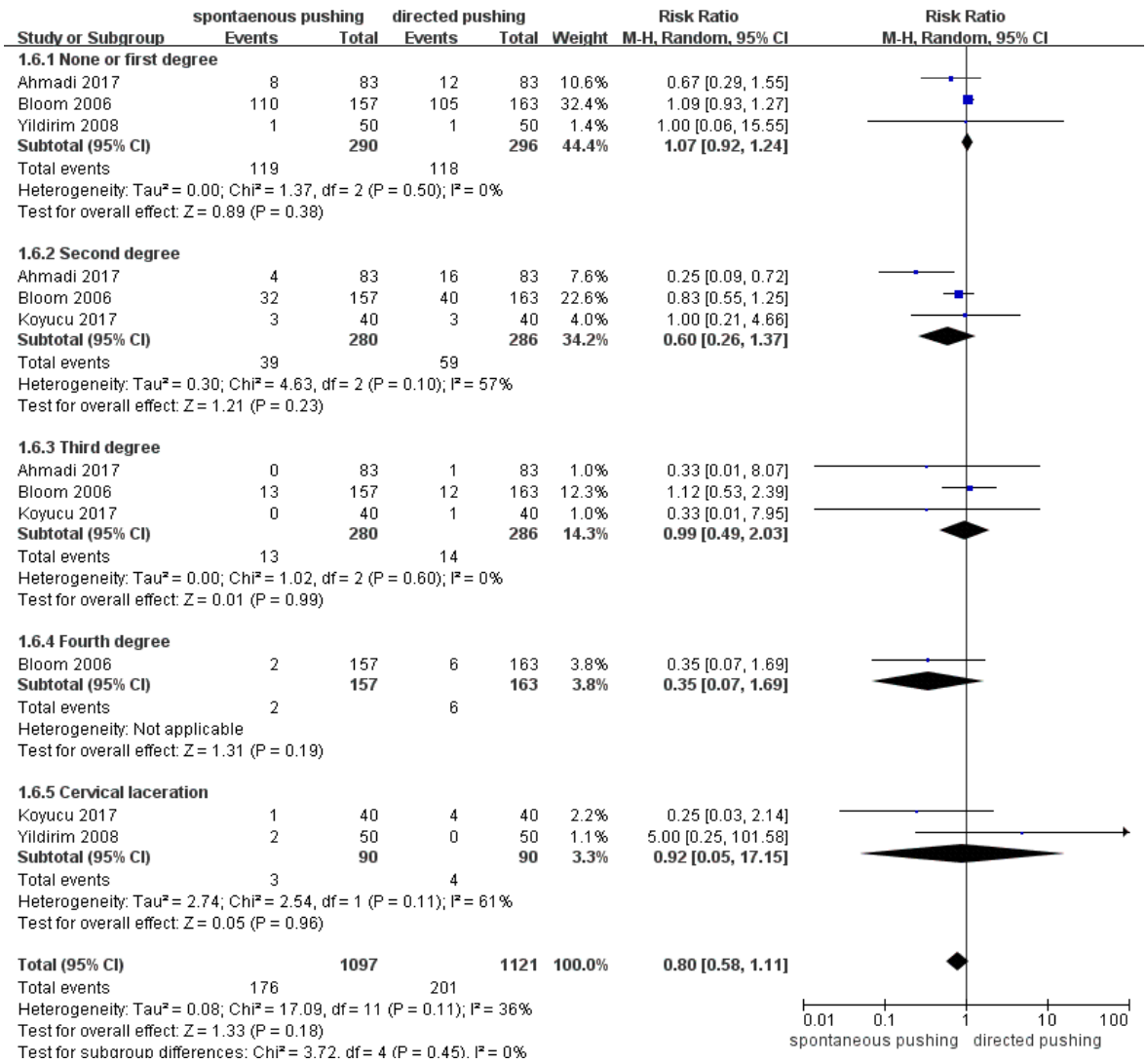



**Figure 3: Forest plot of type of laceration between different pushing groups**

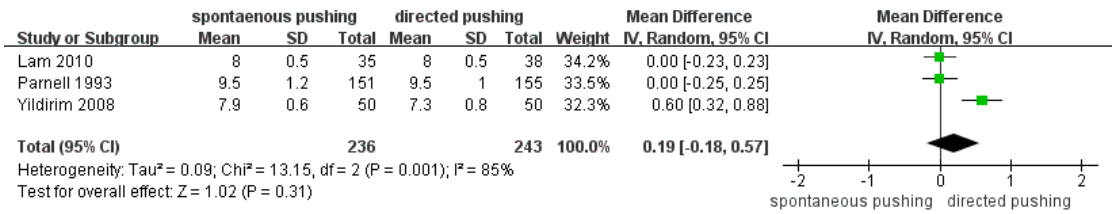



**Figure 4a: Forest plot of Apgar score at 1 minute between different pushing groups**

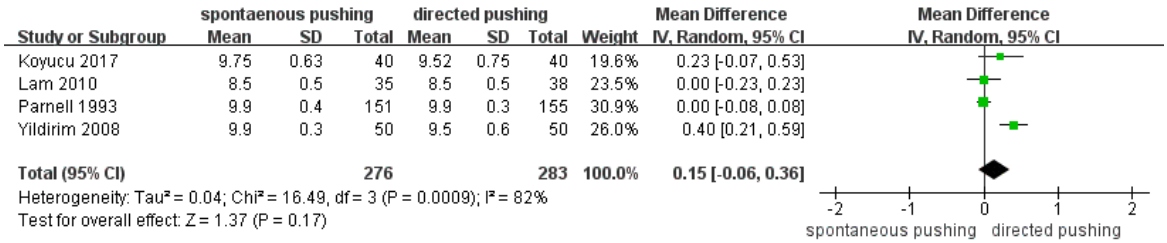



**Figure 4b: Forest plot of Apgar score at 5 minutes between different pushing groups**

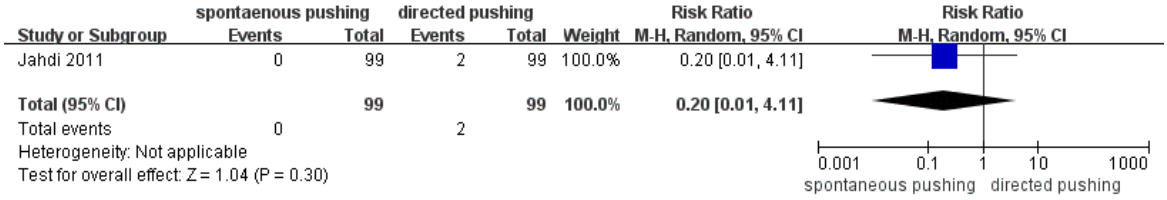



**Figure 4c: Forest plot of Apgar score at 1 minute ≤7 between different pushing groups**

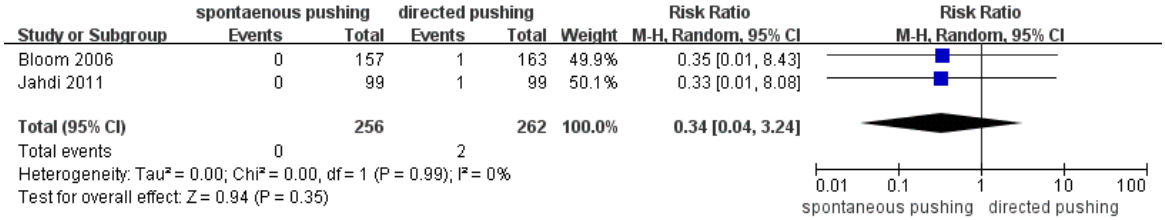



**Figure 4d: Forest plot of Apgar score at 5 minutes ≤7 between different pushing groups**

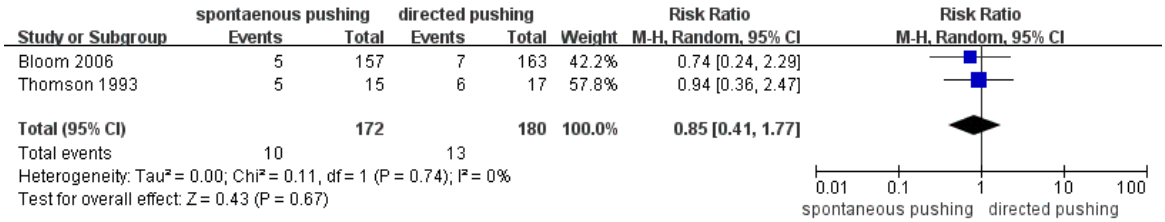



**Figure 5a: Forest plot of the resuscitation at birth between different pushing groups**

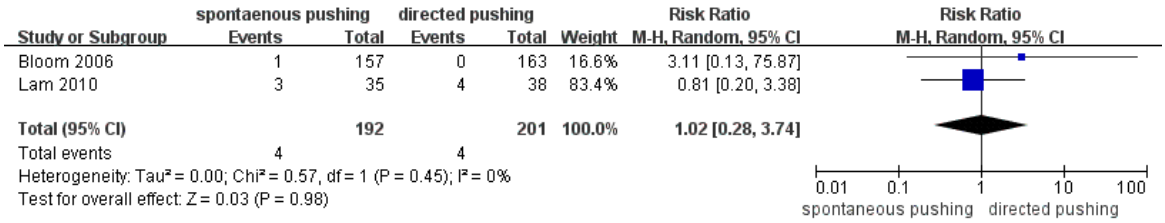



**Figure 5b: Forest plot of the admission to Neonatal Intensive Care Unit between different pushing groups**

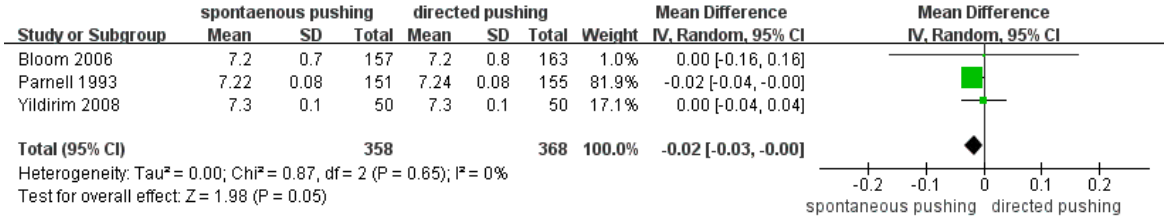



**Figure 6: Forest plot of the cord blood pH between different pushing groups**

## Appendix 7: Risk of bias assessment of included studies in systematic review of Chapter Two

| No. | First Author (Year of publication) | Random Sequence Generation | Allocation Concealment | Performance Bias | Attrition Bias | Detection Bias | Reporting Bias | Other Bias | Overall Bias |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Parnell (1993) | High | Unclear | Unclear | Low | Low | Low | Low | Unclear |
| 2 | Thomson (1993) | Unclear | Low | Unclear | Low | Unclear | Low | Low | Unclear |
| 3 | Bloom (2006) | High | Low | Unclear | Low | Unclear | Low | Low | Unclear |
| 4 | Yildirim (2008) | High | Unclear | Unclear | Low | Low | Low | Low | Unclear |
| 5 | Lam (2010) | Low | Unclear | Unclear | Low | Unclear | Low | Low | Unclear |
| 6 | Jahdi (2011) | Low | Unclear | Unclear | High | Low | Low | Low | Unclear |
| 7 | Low (2013) | Low | Low | High | High | Low | Low | Low | Low |
| 8 | Ahmadi (2017) | High | Unclear | Unclear | Low | Low | Low | Low | Unclear |
| 9 | Koyucu (2017) | High | Low | Unclear | Low | Low | Low | Low | Low |
| 10 | Araujo (2021) | Low | Low | Unclear | High | Low | Low | Low | Unclear |

## Appendix 8: Quality of the studies included in systematic review of Chapter Two

| No. | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| First Author (Year of publication) | | Parnell 1993 | Thomson 1993 | Bloom 2006 | Yildirim 2008 | Lam 2010 | Jahdi 2011 | Low 2013 | Ahmadi 2017 | Koyucu 2017 | Araujo 2021 |
| Section A: Is the basic study design valid for a randomised controlled trial? | 1. Did the study address a clearly focused research question? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | 2. Was the assignment of participants to interventions randomised? | Can't tell | Can't tell | Yes | Can't tell | Can't tell | Can't tell | Yes | Can't tell | Can't tell | Yes |
| | 3. Were all participants who entered the study accounted for at its conclusion? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Section B: Was the study methodologically sound? | 4.1Were the participants 'blind' to intervention they were given? | Can't tell | Yes | No | Can't tell | Can't tell | Can't tell | No | Can't tell | Can't tell | Can't tell |
| | 4.2Were the investigators 'blind' to the intervention they were giving to participants? | No | No | No | No | No | No | No | No | No | No |

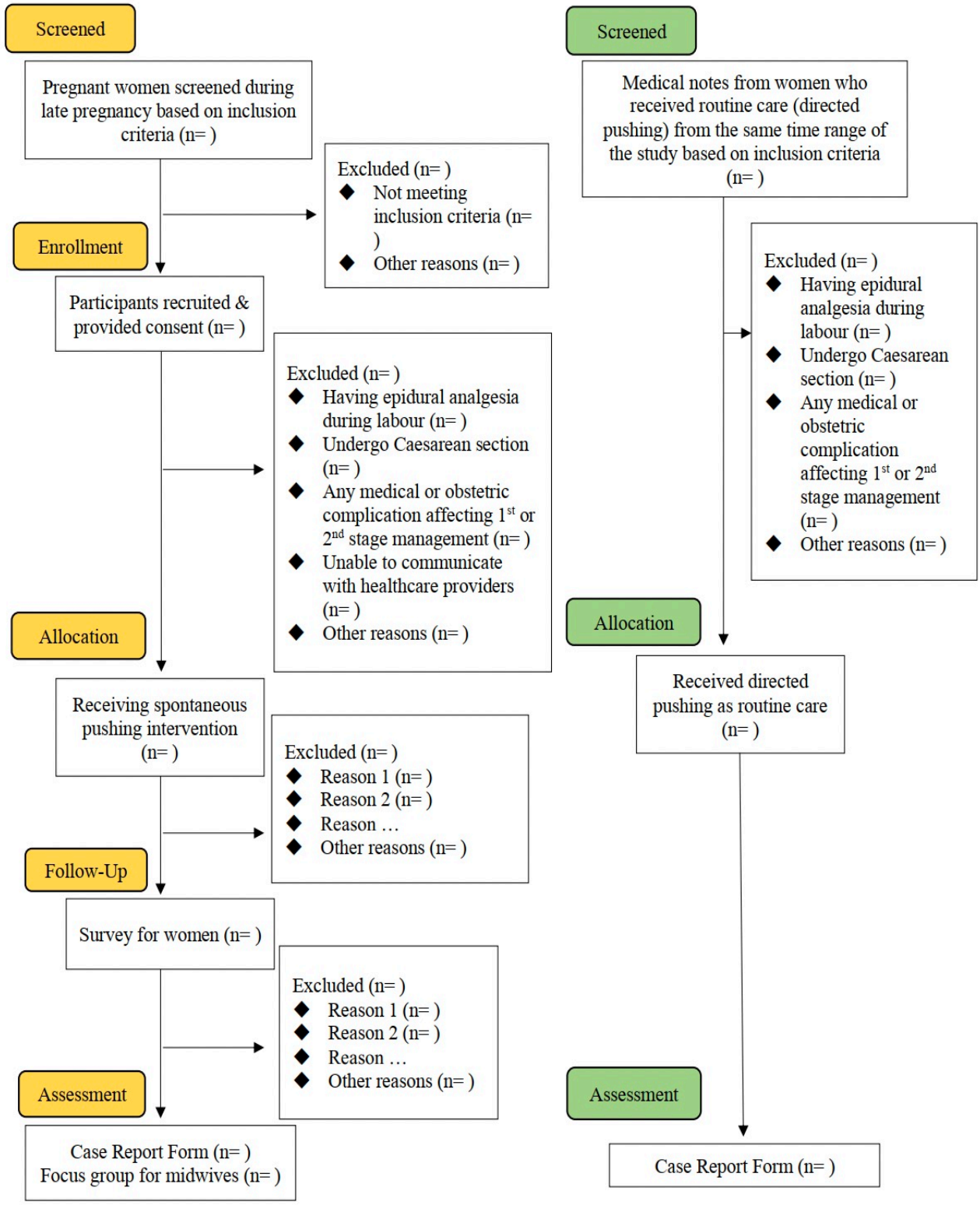
| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 4.3Were the people assessing/analysing outcome/s 'blinded'? | Can't tell | Can't tell | Can't tell | Can't tell | Can't tell | Can't tell | Yes | Can't tell | Can't tell | Can't tell |
| | 5. Were the study groups similar at the start of the randomised controlled trial? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | 6. Apart from the experimental intervention, did each study group receive the same level of care (that is, were they treated equally)? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Section C: What are the results? | 7. Were the effects of intervention reported comprehensively? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | 8. Was the precision of the estimate of the intervention or treatment effect reported? | No | Yes | No | No | No | No | No | No | No | Yes |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 9. Do the benefits of the experimental intervention outweigh the harms and costs? | Yes | Yes | Yes | Can't tell | Can't tell | Yes | Yes | Yes | Yes | Yes |
| Section D: Will the results help locally? | 10. Can the results be applied to your local population/in your context? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| | 11. Would the experimental intervention provide greater value to the people in your care than any of the existing interventions? | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

## Appendix 9: Search strategy in scoping review in Chapter Three

| Search strategy for evidence on spontaneous pushing | | |
|---|---|---|
| Database | Search strategy | Results |
| PubMed | #1 (((birth[Title/Abstract]) OR (childbirth[Title/Abstract])) OR (deliver*[Title/Abstract])) OR (parturition[Title/Abstract])) OR (labor[Title/Abstract])) OR (labour[Title/Abstract])) OR (intrapartum[Title/Abstract])) OR (delivery, obstetric[MeSH Terms])) OR (labor, obstetric[MeSH Terms])) OR (parturition[MeSH Terms]) | 1,350,407 |
| | #2 "spontaneous"[Title/Abstract] OR "involuntary"[Title/Abstract] OR "uncoached"[Title/Abstract] OR "undirected"[Title/Abstract] OR "physiological"[Title/Abstract] OR "normal"[Title/Abstract] OR "supportive"[Title/Abstract] OR "open-glottis"[Title/Abstract] OR "breathing"[Title/Abstract] | 2,874,502 |
| | #3"push"[Title/Abstract] OR "pushing"[Title/Abstract] OR "bear down"[Title/Abstract] OR "bearing down"[Title/Abstract] | 31,774 |
| | #4 #1 AND #2 AND #3 | 390 |

## Appendix 10: Flow diagram in Chapter Four



## Appendix 11: Information Sheet and Consent Form for Women

### INFORMATION AND CONSENT FORM FOR WOMEN

**[ETH 22-7072] – A single-centre feasibility study, measuring the outcomes of spontaneous pushing and directed pushing on maternal and neonatal outcomes among women without epidural analgesia during the second stage of labour**

Before you decide whether or not you wish to participate in this study, it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish.

#### WHO IS CONDUCTING THIS RESEARCH?

This study is conducted by researchers from the University of Technology, Sydney, Shijiazhuang Obstetrics and Gynaecology Hospital, and Peking University. The team members are as follows:

**Ms Jiasi Yao** – PhD Candidate, University of Technology Sydney, Australia.

**Professor Kathleen Baird** - Professor of Midwifery, Head of Midwifery Discipline, School of Nursing and Midwifery, Faculty of Health, University of Technology Sydney, Australia.

**Professor Debra Anderson** – Professor, Dean of Faculty of Health, University of Technology Sydney, Australia.

**Dr Heike Roth** – Lecturer, School of Nursing and Midwifery, Faculty of Health, University of Technology Sydney, Australia.

**Professor Hong Lu -** Professor of Midwifery, Secretary of the Party Committee & Professor, School of Nursing, Peking University, Beijing, China.

**Professor Huijuan Rong** – Professor, Nursing Department, Shijiazhuang Obstetrics and Gynecology Hospital, Shijiazhuang, Hebei Province, China.

#### WHAT IS THE RESEARCH ABOUT?

The purpose of this research is to conduct a feasibility study in order to explore the potential of a future randomised control trial of spontaneous pushing versus directed

pushing during the second stage of labour. This study will explore the enablers and barriers of the process of recruitment of women to the study, preparation for midwives to support women's spontaneous pushing, and the ease of implementing the study.

Research has shown that supporting women to push instinctively (spontaneous pushing), without instruction is likely to lead to at least to the same health outcomes, without any additional risk for the woman and baby. Currently in China, it is routine for midwives to direct women how to, and when to push during the second stage of labour (directed pushing). The latter practice is challenged. The mechanism of this practice as well as its effects on mothers and babies is challenged by current research. In light of the world Health Organization recommendations of positive childbirth experience and childbirth normality, this study aims to explore whether it is feasible to conduct a future RCT to implement spontaneous pushing and compare outcomes for mothers and babies to the current routine practice in China which is directed pushing, and identify the enablers and barriers of implementing the spontaneous pushing study.

## WHY HAVE I BEEN INVITED?

You have been invited to participate because you are 18+ years of age, and you are experiencing a 'low risk' pregnancy (you and your baby are well), you are currently 37 weeks or more pregnant with a baby in the 'head down' (cephalic) position and you are likely to experience a spontaneous vaginal birth without a plan to use epidural pain relief. Given your pregnancy and health history, you have the likelihood of a spontaneous onset of labour and a vaginal birth. In this study we are assessing the acceptability of our study process and the enablers and barriers of supporting women in the process of spontaneous pushing.

## WHAT DOES MY PARTICIPATION INVOLVE?

If you decide to participate, you give the research team the permission to:

- access your medical notes to extract relevant health information, includes demographic information, pregnancy, labour and birth information. The detailed information is listed below.
- support you during self-directed (spontaneous) pushing during the second stage of labour
- approach you postnatally with a brief questionnaire after your birth which would take around five (5) minutes to complete. In this questionnaire we will

ask you about your experience on participation in this study, pushing during labour and childbirth.

The information we will extract from your medical notes include age, level of education, marital status, number of pregnancy, gestational week, onset of the first stage of labour, date and time of onset of first and second stage of labour, second stage of labour (spontaneous or directed pushing), date and time of birth of the baby, intravenous infusion (yes/no), mode of pain relief during labour if any (mechanical or medical), episiotomy (yes/no), perineal trauma at birth, cervical laceration, mode of birth, postpartum haemorrhage, sex of the newborn, newborn weight, Apgar score at one minute, five minute and ten minute, cord blood pH value, newborn admission to special care or intensive care, maternal pushing position during the second stage of labour.

You will still have the choice to have epidural pain relief during labour or there may be events that occur during your labour that require more urgent attention (for example, a medical complication occurs whilst you are pushing, or you need medical intervention). If this is the case, we will support you in your choice and/or need and provide suitable and safe care.

## ARE THERE ANY RISKS/INCONVENIENCE?

Evidence shows that directed pushing (standard normal care) and spontaneous pushing during the second stage of labour has the same level of risks for women and their baby. There may be some perceived inconveniences which include:

- you might feel unsure about the different approach we are using to assist you whilst you are pushing because it may be different from your previous perceptions.
- you will be asked to answer a questionnaire regarding the pushing experience and whilst this will take no more than five minutes, you may feel that this is inconvenient.

There is slight tendency for you to experience the above inconvenience and we have developed several strategies to assist you when necessary:

- Whilst midwives are experts and highly trained to support women during labour and birth, we have developed preparatory sessions for midwives in order for them to positively assist you to ‘spontaneously push’ during the second stage of labour.

- Like with any labour and birth, whether a woman is spontaneously pushing or being directed to push in second stage of labour, there may be times where maternal or newborn vital signs, such as maternal blood pressure and fetal heart rate fall out of normal range. It may be decided that the study needs to be ceased and medical assistance called where relevant. We will discuss this with you should this arise.
- If there is any indication of concern for either you or your unborn baby during labour, the midwives will suggest that the study needs to be ceased and routine care will be continued. We will discuss this with you should this arise.
- If you feel that participation in the study makes you feel distressed, a senior member of the research team (Hong Lu from Peking University) who is a health professional will spend time with you and provide assistance, to discuss your concerns and support you. This is likely to only occur antenatally or postnatally.
- Your midwife and obstetrician may also be available for support you regarding any concerns whilst in labour and they can refer you to further support services postnatally to suitable counselling services if this is something you would like.
- You are also invited to contact, the PhD Candidate Jiasi Yao in order to answer any questions you may have.

It is not expected that there will be any other risks or costs associated with taking part in this study.

## DO I HAVE TO TAKE PART IN THIS RESEARCH PROJECT?

Participation in this study is voluntary. It is completely up to you whether or not you decide to take part.

If you decide not to participate, or to withdraw from the study, it will not affect your service or your relationship with the researchers, the Fourth Hospital of Shijiazhuang, Hebei Medical University or University of Technology Sydney.

## WHAT IF I WITHDRAW FROM THIS RESEARCH PROJECT?

If you wish to withdraw from the study, either because of your personal choice, or the use of epidural, or the need of a Caesarean section or any other situations of the exclusion criteria, the maternity service you receive will not be affected. The midwife

providing care during labour and birth will then proceed to provide you with the current, local, routine care which is directed pushing.

If you wish to withdraw from the study, you can do so at any time without having to give a reason, by contacting research coordinator Jiasi Yao on +86 13171587887.

If you decide to leave the research project, we will not collect any data regarding aspects of your care. The only information that will be retained, to ensure that the results of the research project can be measured properly and to comply with law, will be your reason (if any provided) and point of time at which withdrawal has occurred (e.g. during pregnancy, during labour, or after birth).

## WHAT WILL HAPPEN TO INFORMATION ABOUT ME?

By signing the consent form you consent to the research team collecting and using personal information about you for the research project. At all times, your information will be treated confidentially. Medical record forms will be kept in a locked cabinet by research coordinator during the data collection period. electronic data will be password protected and accessible only to the project team. Any paper forms will be destroyed as per hospital policy and legal requirements, once entered electronically.

Your information will only be used for the purpose of this research project and it will only be disclosed with your permission, except as required by law.

It is anticipated that the results of this research project will be published and/or presented in a variety of forums. In any publication and/or presentation, information will be provided in such a way that you cannot be identified.

In accordance with relevant privacy laws, you have the right to request access to the information about you that is collected and stored by the research team. You also have the right to request that any information with which you disagree be corrected. Please inform the research team member named at the end of this document if you would like to access your information.

The results of this research may also be shared through open access (public) scientific databases, including internet databases. This will enable other researchers to use the data to investigate other important research questions. Results shared in this way will always be de-identified by removing all personal information (e.g. name, date of birth etc.).

## WHAT IF I HAVE ANY QUERIES OR CONCERNS?

You will be given a copy of this form to keep. If you have queries or concerns about the research that you think we can help you with, please feel free to contact us:

* Ms Jiasi Yao, PhD candidate: phone +86 13171587887, email jiasi.yao@student.uts.edu.au. (proficiency in Chinese and English)

* Professor Hong Lu, supervisor: email luhong@bjmu.edu.cn (proficiency in Chinese and English)

**NOTE:**

This study has been approved in line with the University of Technology Sydney Human Research Ethics Committee [UTS HREC] guidelines. If you have any concerns or complaints about any aspect of the conduct of this research that you wish to raise independently of the research team, please contact the Ethics Secretariat on ph.: +61 2 9514 2478 or email: Research.Ethics@uts.edu.au], and quote the UTS HREC reference number. Any matter raised will be treated confidentially, investigated and you will be informed of the outcome.

**Thank you for taking the time to consider this study.**

**If you wish to take part in the study, please sign the attached consent form.**

**This information sheet is for you to keep.**

## CONSENT FORM

**[ETH 22-7072] – A single-centre feasibility study, measuring the outcomes of spontaneous pushing and directed pushing on maternal and neonatal outcomes among women without epidural analgesia during the second stage of labour**

I _____*[Participant's name]* agree to participate in the research project being conducted by Jiasi Yao, mobile phone +86 13171587887, #48 Donggang Road, Yuhua District, Shijiazhuang, Hebei Province, China.

I have read the Participant Information Sheet or someone has read it to me in a language that I understand. I understand the purposes, procedures and risks of the research as described in the Participant Information Sheet. I have had an opportunity to ask questions and I am satisfied with the answers I have received.

I freely agree to participate in this research project as described and understand that I am free to withdraw at any time without affecting my relationship with the researchers, the Fourth Hospital of Shijiazhuang, Hebei Medical University, or University of Technology Sydney.

I understand that I will be given a signed copy of this document to keep. I agree to participant in the feasibility study knowing that my health information will be recorded. I agree that the research data gathered from this study may be published in a form that does not identify me in any way. I am aware that I can contact Jiasi Yao if I have any concerns about the research.

Please sign this form and email/hand to Jiasi Yao.

_____ ____/____/____

Name and Signature [participant] Date

_____ ____/____/____

Name and Signature [researcher or delegate] Date

## Appendix 12: Supplementary tables in Chapter Five

**Supplementary Table 1: Instruction on supporting spontaneous pushing**

| Step | Instructions |
|---|---|
| 1 | Encourage woman to select the most comfortable position for her during the pushing phase. |
| 2 | Offer a woman information about progress of her labour and about any sensations she may feel |
| 3 | Affirm to the woman how well her body is working and encourage her to work with and listen to her bodily urges. |
| 4 | Support the woman to wait for the urge to push, instead of coaching her to push immediately when the contraction begins. |
| 5 | Support the woman to push with an open glottis, including sighing, moaning or even crying. |
| 6 | Support and allow the woman to give several short pushes (usually 4 to 6 seconds) instead of one long push (8 to 10 seconds or even longer). |

**Supplementary Table 2: Demographics of participating midwives**

| Midwives | Age | Educational level | Year of midwifery work experience | Professional titles* |
|---|---|---|---|---|
| Midwife 1 | 44 | Bachelor | 24 | Nurse-in-charge |
| Midwife 2 | 37 | Bachelor | 11 | Nurse-in-charge |
| Midwife 3 | 39 | Bachelor | 16 | Nurse-in-charge |
| Midwife 4 | 34 | Bachelor | 11 | Nurse-in-charge |
| Midwife 5 | 36 | Bachelor | 12 | Nurse-in-charge |
| Midwife 6 | 34 | Bachelor | 11 | Nurse-in-charge |
| Midwife 7 | 33 | Bachelor | 9 | Nurse-in-charge |
| Midwife 8 | 26 | Bachelor | 4 | Nurse practitioner |
| Midwife 9 | 25 | Bachelor | 3 | Nurse practitioner |

Note: The professional titles for midwives and nurses in China include five levels (from low to high): Nurse, Nurse practitioner, Nurse-in-charge, Associate professor of Nursing, and Professor of Nursing.

**Supplementary Table 3: Participating of midwives**

| Midwives | Data collection duration | | | | | |
|---|---|---|---|---|---|---|
| | May | June | July | August | September | October |
| Midwife 1 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Midwife 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Midwife 3 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Midwife 4 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Midwife 5 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| Midwife 6 | ✓ | On leave from 5th June to 3rdJuly | | ✓ | ✓ | ✓ |
| Midwife 7 | -- | ✓ | ✓ | ✓ | ✓ | ✓ |
| Midwife 8 | -- | ✓ | ✓ | ✓ | ✓ | ✓ |
| Midwife 9 | -- | -- | ✓ | ✓ | ✓ | ✓ |

**Supplementary Table 4: Women's responses to their acceptability of the study**

| | N | Range | Mean | SD | Agree or mostly agree (n (%)) |
|---|---|---|---|---|---|
| 1.I think this study interests me when researcher or midwives explained it to me. | 101 | 1-5 | 4.40 | 0.763 | 89 (88.1%) |
| 2.I felt comfortable when I was asked for my interest in joining this study. | 102 | 1-5 | 4.29 | 1.059 | 88 (86.3%) |
| 3.I think researcher or midwives explained the study to me clearly, including the objectives, the content, the risk and benefits, and answered my questions. | 101 | 1-5 | 4.35 | 0.877 | 89 (88.1%) |
| 4.I think researcher found an appropriate time to approach me for this survey and it did not affect my rest or bonding with my baby. | 102 | 1-5 | 4.53 | 0.767 | 95 (93.1%) |
| 5.I think midwives gave me enough support to spontaneous pushing. | 101 | 1-5 | 4.57 | 0.753 | 95 (94.1%) |
| 6.I felt taking part in this study did not affect the maternity care I received. | 102 | 1-5 | 4.35 | 0.886 | 89 (87.3%) |
| 7.I think the way midwives encouraged me to push spontaneously was easy to understand. | 102 | 1-5 | 4.56 | 0.752 | 96 (94.1%) |
| 8.The consent form and information sheet were easy to understand. | 102 | 1-5 | 4.44 | 0.791 | 93 (91.2%) |
| 9.I think this survey is acceptable in this length. | 102 | 1-5 | 4.11 | 0.866 | 78 (76.5%) |
| 10.If I have another opportunity to labour and birth in the future, I hope to use the new pushing method again. | 101 | 1-5 | 4.44 | 0.921 | 88 (87.1%) |
| 11.If my family or friends are going into labour and birth, I would like to recommend this new pushing method to them. | 101 | 1-5 | 4.43 | 0.876 | 87 (86.1%) |

| | | | | | |
|---|---|---|---|---|---|
| 12.In general, I think taking part in this study benefited my childbirth. | 102 | 1-5 | 4.48 | 0.793 | 93 (91.2%) |
| 13.In general, I think taking part in this study is meaningful. | 102 | 1-5 | 4.50 | 0.768 | 95 (93.1%) |
| 14.In general, I am satisfied with my experience in taking part in this study. | 102 | 1-5 | 4.49 | 0.767 | 95 (93.1%) |

**Supplementary Table 5: Women's preference on the timepoint for engagement**

| Question | N | Numbers and percentages of each option | | | | |
|---|---|---|---|---|---|---|
| Timepoint to ask for your interest in joining the study | 101 | A. During late pregnancy in the clinics | B. During prenatal education clubs | C. On admission to the prenatal ward | D. On admission to the birth center | E. Others |
| | | 49 (48.5%) | 37 (36.6%) | 21 (20.8%) | 18 (17.8%) | 20 (19.8%) |
| Timepoint to obtain your consent in joining the study | 101 | A. During late pregnancy in clinics | B. During prenatal education clubs | C. On admission to the prenatal ward | D. On admission to the birth center | E. Others |
| | | 45 (44.6%) | 25 (24.8%) | 34 (33.7%) | 17 (16.8%) | 17 (16.8%) |
| Timepoint to ask you to complete this survey | 101 | A. Two hours after birth in the birth center | B. After admission to postnatal wards | C. After discharge from hospital | D. Others | |
| | | 9 (8.9%) | 86 (85.2%) | 3 (3.00%) | 9 (8.9%) | |

**Supplementary Table 6: Comparison of cases of outcomes between intervention group and comparison group**

| Outcomes | Intervention group (n=112) | Comparison group (n=112) | Risk Ratio (95% CI) | $X^2$ | p-Value |
|---|---|---|---|---|---|
| Episiotomy (%) | | | | | |
| *Nulliparity (n=17)* | 2 (11.8%) | 3 (17.6%) | 1.071 (0.810,1.418) | 0.234 [c] | 0.628 |
| *Multiparity (n=95)* | 0 (0%) | 2 (2.1%) | 1.021 (0.992,1.051) | 1.979 [c] | 0.159 |
| Perineal trauma (%)[a] | | | | | |
| *Nulliparity (n=17)* | 2 (11.8%) | 3 (17.6%) | 1.071 (0.810,1.418) | 0.234 [c] | 0.628 |
| *Multiparity (n=95)* | 1 (1.1%) | 2 (2.1%) | 1.011 (0.975,1.047) | 0.328 [c] | 0.567 |
| Cervical laceration (%) | | | | | |
| *Nulliparity (n=17)* | 1 (5.9%) | 2 (11.8%) | 1.067 (0.864,1.316) | 0.366 [c] | 0.545 |
| *Multiparity (n=95)* | 1 (1.1%) | 2 (2.1%) | 1.011 (0.975,1.047) | 0.328 [c] | 0.567 |
| Assisted vaginal birth (%) | | | | | |
| *Nulliparity (n=17)* | 3 (17.6%) | 2 (11.8%) | 0.933 (0.705,1.235) | 0.234 [c] | 0.628 |
| *Multiparity (n=95)* | 0 (0%) | 0 (%) | -- | -- | -- |
| Transfer to NICU[b] at birth (%)[c] | | | | | |
| *Nulliparity (n=17)* | 0 (0%) | 1 (5.9%) | 1.063 (0.943,1.197) | 1.030 [c] | 0.310 |
| *Multiparity (n=95)* | 2 (2.1%) | 2 (2.1%) | -- | -- | -- |

Note: a: Perineal trauma: third degree laceration and episiotomy; b: NICU: Neonatal Intensive Care Unit; c: Cells had an expected number less than 5;

**Supplementary Table 7: Women's free-text comments from the survey**

| | |
|---|---|
| Question 1: Based on your experience, do you think the support of spontaneous pushing offered during the pushing phase of your labour is something all labouring women should have access to? This is a yes/no question. Please provide rationale to explain your answer. | |
| **Topic 1: Feeling empowered** | |
| 1 | *"... was women's innate ability"* (ID 051, a nulliparous woman) |
| 2 | *"...could feel the hardship to become a mother in real sense" (ID 089, a multiparous woman)* |
| **Topic *2:* Feeling the process** | |
| 1 | *"...could feel the extend of push you needed"* (ID 065, a multiparous woman) |
| 2 | *"...guided by own feeling, supported me through the whole process of birth"* (ID 060, a multiparous woman) |
| 3 | "*Spontaneous pushing gave me clear feeling of how baby comes out of my body"* (ID 061, a multiparous woman) |
| 4 | "…*pretty painful, an epidural would be better"* (ID 002, a multiparous woman) |
| **Topic 3: Feeling the power of their body** | |
| 1 | *"Pushing according to own power, means there less harm to oneself"* (ID 011, a multiparous woman) |
| 2 | *"Cooperate with midwives, breath correctly, enhance the biggest power of your pushing"* (ID 052, a multiparous woman) |
| 3 | *"...inspire body's inner power"* (ID 085, a multiparous woman) |
| 4 | "…*Every woman has a different tolerance of labour pain"* (ID 047, a multiparous woman) |
| **Topic 4: Experiencing enhanced efficacy** | |
| 1 | "*I had birth before, spontaneous pushing is better than others, very satisfied with this time*" (ID 038, a multiparous woman) |
| 2 | *"Push spontaneously, get twice result with half effort"* (ID 096, a multiparous woman) |
| 3 | "*I think spontaneous pushing helps me to labour more quickly*" (ID 045, a multiparous woman) |
| Question 2: Do you have any suggestions to improve the study and to enhance this more natural method of support during second stage? | |
| **Suggestions** | |
| 1 | *'make a promotional video by women who had pushed spontaneously'* (ID 044, a nulliparous |

| | |
|---|---|
| | woman) |
| 2 | *'education about pushing when women admitted to prenatal wards'* (ID 069, a nulliparous woman) |
| 3 | *'tell women more of the benefits of spontaneous pushing and women's successful experience'* (ID 038, a multiparous woman) |
| 4 | *'make the public know more about the benefits of spontaneous pushing'* (ID 005, a multiparous woman) |
| 5 | *'I got to know spontaneous pushing through social media, hope that hospital provide more ways through media to explain this'* (ID 052, a multiparous woman) |
| 6 | *'introduce spontaneous pushing in prenatal education club, to eliminate women's worries'* (ID 066, a multiparous woman) |
| 7 | '*Before the commencement of the second stage, midwives provide more information on what it will be like and how to react to the pushing urges*' (ID 022, a multiparous woman) |
| 8 | *'tell women more about the difference between spontaneous pushing and others, women will know the options and do physiological construction ahead of time'* (ID 094, a multiparous woman) |

## Appendix 13: Childbirth Experience Questionnaire in Chapter Six

To what extend do you agree with the following statement?

| Items | Score | | | |
|---|---|---|---|---|
| 1. Labour and birth went as I expected. | 1 | 2 | 3 | 4 |
| 2. I felt strong during labour and birth. | 1 | 2 | 3 | 4 |
| 3. I felt scared during labour and birth. | 1 | 2 | 3 | 4 |
| 4. I felt capable during labour and birth. | 1 | 2 | 3 | 4 |
| 5. I was tired during labour and birth. | 1 | 2 | 3 | 4 |
| 6. I felt happy during labour and birth. | 1 | 2 | 3 | 4 |
| 7. I have many positive memories from childbirth. | 1 | 2 | 3 | 4 |
| 8. I have many negative memories from childbirth. | 1 | 2 | 3 | 4 |
| 9.Some of my memories from childbirth make me feel depressed. | 1 | 2 | 3 | 4 |
| 10. I felt I could have a say whether I could be up and about or lie down. | 1 | 2 | 3 | 4 |
| 11. I felt I could have a say in deciding my birthing position, including lying, squatting or lying in bed. | 1 | 2 | 3 | 4 |
| 12. I felt I could have a say in the choice of pain relief. | 1 | 2 | 3 | 4 |
| 13. My midwife devoted enough time to me. | 1 | 2 | 3 | 4 |
| 14. My midwife devoted enough time to my partner. | 1 | 2 | 3 | 4 |
| 15.My midwife kept me informed about what was happening during labour and birth. | 1 | 2 | 3 | 4 |
| 16.My midwife understood my needs. | 1 | 2 | 3 | 4 |
| 17. I felt very well cared for by my midwife. | 1 | 2 | 3 | 4 |
| 18. My impression of the team's medical skills made me feel secure. | 1 | 2 | 3 | 4 |
| 19. I felt that I handled the situation well. | 1 | 2 | 3 | 4 |
| ***Please score your feelings for the following three questions from 0 to 100.*** | | | | |
| 20. How painful did you feel childbirth was? | | | | |
| 21. How much control do you feel you had during childbirth? | | | | |
| 22. How secure did you feel during childbirth? | | | | |

## Appendix 14: Tables in women's survey in Chapter Six

**Supplementary Table 1: Scores for the last three questions from the CEQ-C**

| Questions | N | Mean | SD | Min | Max | Quartiles | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | 25% | 50% | 75% |
| How painful did you feel childbirth was? | 101 | 80.25 | 17.880 | 22 | 100 | 71.50 | 82.00 | 97.50 |
| How much control do you feel you had during childbirth? | 96 | 69.56 | 21.128 | 6 | 100 | 50.00 | 71.50 | 85.75 |
| How secure did you feel during childbirth? | 96 | 87.88 | 14.492 | 50 | 100 | 80.25 | 92.00 | 100.00 |

**Supplementary Table 2: Comparison of women's experience supported by different midwives**

| Outcomes | Women supported by midwives with more than 10 years' experience (N=76) | | Women supported by midwives with less than 10 years' experience (N=26) | | p-Value | Effect size (Cohen's *d*) |
|---|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | | |
| Pushing experience | | | | | | |
| Average score | 4.18 | 0.764 | 4.23 | 0.735 | 0.773 | 0.757 |
| Have a say | 3.55 | 1.380 | 3.54 | 1.303 | 0.964 | 1.361 |
| Feel capable | 3.89 | 1.102 | 4.04 | 1.113 | 0.568 | 1.105 |
| Enough professional support | 4.71 | 0.780 | 4.73 | 0.604 | 0.904 | 0.740 |
| Feel safe | 4.57 | 0.822 | 4.62 | 0.752 | 0.787 | 0.805 |
| Childbirth Experience Questionnaire | | | | | | |
| Total score | 60.93 | 8.115 | 62.04 | 7.164 | 0.539 | 7.888 |
| Dimension - 1 Professional support | 21.97 | 3.141 | 22.54 | 2.213 | 0.399 | 2.937 |
| Dimension - 2 Own capacity | 19.21 | 3.352 | 19.96 | 3.538 | 0.333 | 3.399 |
| Dimension - 3 Self-perception | 11.26 | 2.288 | 10.08 | 3.261 | 0.095 | 2.566 |
| Dimension - 4 Participation | 8.45 | 2.163 | 9.46 | 2.549 | 0.061 | 2.266 |
| Painful | 80.11 | 18.095 | 80.65 | 17.589 | 0.894 | 17.589 |
| Control | 69.90 | 20.469 | 68.60 | 23.317 | 0.793 | 21.232 |
| Secure | 88.66 | 13.622 | 85.64 | 16.825 | 0.373 | 14.507 |

## Appendix 15: Interview schedule for midwives in Chapter Seven

**Semi-structured interview schedule**

| Interview questions |
| --- |
| 1. Tell me about your experience of participating in this study? |
| 2. What do you think is the most attractive part in this study? |
| 3. How do you think the training sessions, helped you prepare for the study and then implementing spontaneous pushing? |
| 4. What do you think facilitated your uptake of the new intervention? |
| 5. How could the procedures in this study been implemented that would have helped you implement the study and spontaneous pushing smoother? |
| 6. What obstacles did you face when implementing an alternate mode of pushing rather than the normal practice of directed pushing? |
| 7. What do you think of the safety and the efficacy of the new intervention? |
| 8. From your experience, how women react to the new intervention? |
| 9. From your experience of participating in the study, what is your preference in supporting women's pushing and your rationale for selecting that choice. |
| 10. Is there anything else that you want to add? |

## Appendix 16: Codes into categories from midwives' interviews in Chapter Seven

| | | 1.Returning to a physiological process of childbirth | | | 2.Creating a win-win situation by spontaneous pushing | | 3.Reframing the approach to physiological labour and birth | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | 1.1 Align with midwifery philosophy<br>1.2 Women taking the lead<br>1.3 Midwives supporting and being with woman | | | 2.1 Better outcomes for women and baby<br>2.2 Experience positivity for midwives | | 3.1 Challenging the routine practice<br>3.2 Misinterpretation and pre-conceived concerns<br>3.3 Involving all stakeholders<br>3.4 Intention to adopt spontaneous pushing with necessary guidance | | | |
| | | 1.1 | 1.2 | 1.3 | 2.1 | 2.2 | 3.1 | 3.2 | 3.3 | 3.4 |
| General experience | Love to participate | ☆ | | | | | | | | |
| | Strengthen midwifery skills | | | | | ☆ | | | | |
| | Avoid misleading impression | | | | ☆ | | ☆ | | | |
| | Enhance women's experience | | | | ☆ | | | | | |
| | Akin to natural process | ☆ | | | | | | | | |
| | Should not be like | | | | | | | | | ☆ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| What is SP and facilitating strategies | Wait and follow bodily urges | ☆ | | | | | | | | |
| | Win-win situation | | | | ☆ | | | | | |
| | Women taking the lead | | ☆ | | | | | | | |
| | Midwives supporting | | | ☆ | | | | | | |
| | Misunderstanding | | | | | | | ☆ | | |
| | Communication | | | | | | | ☆ | | |
| | Breath | | ☆ | | | | | | | |
| | Short pushes | | ☆ | | | | | | | |
| | Pushing position | | ☆ | | | | | | | |
| | Avoid too much vaginal examination | ☆ | | | | | | | | |
| | Reduce physical exertion | | | | | ☆ | | | | |
| | Workload shift | | | ☆ | | ☆ | | | | |
| | Easy to understand | | | | | ☆ | | | | |
| | Guiding in a targeted approach | | | | | | | | | ☆ |
| | Midwives' fulfilment | | | | | ☆ | | | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Most attractive | Better outcomes for women and baby | | | | ☆ | | | | | |
| | Harmony in the birth units | | | | ☆ | | | | | |
| | Attracted by the intervention-free idea | ☆ | | | | | | | | |
| | Align with midwifery ethics | ☆ | | | | | | | | |
| | Resonate public demand | | | | ☆ | | | | | |
| | Trial | | | | | | | | ☆ | |
| | Smooth midwifery workflow | | | | | ☆ | | | | |
| | Inspiring topic | ☆ | | | | | | | | |
| Training sessions | Satisfied of and benefited from the training | | | | | | | | ☆ | |
| | Shift in mindset | | | | | | ☆ | ☆ | ☆ | |
| | In real world scenarios | | | | | | | | ☆ | |
| | Simulated practice | | | | | | | | ☆ | |
| | Discussion session | | | | | | | | ☆ | |
| | Refine sessions | | | | | | | | ☆ | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Pitfalls | | | | | | | ☆ | | |
| | Communication skills | | | | | | | ☆ | | |
| | Target audience | | | | | | | | ☆ | |
| | The number of sessions | | | | | | | | ☆ | |
| | Advice from senior midwives | | | | | | | | ☆ | |
| Facilitators | Training | | | | | | | | ☆ | |
| | Leader support | | | | | | | | ☆ | |
| | Peer support | | | | | | | | ☆ | |
| | Midwives' communication skills | | | | | | | ☆ | | |
| | Women and newborn's condition | | | | | | | | | ☆ |
| | Midwives' proficiency | | | | | | | | ☆ | |
| | Policy 1: Leader in a group | | | | | | | | ☆ | |
| | Policy 2: Companion during labour | | | | | | | | ☆ | |
| | Policy 3: Single room | | | | | | | | ☆ | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Positive results | | | | | | | | ☆ | |
| | Start with pilot group | | | | | | | | ☆ | |
| | No additional effort | | | | | ☆ | | | | |
| | Easy to practice | | | | | ☆ | | | | |
| | Relief of workload | | | | | ☆ | | | | |
| | Second nature | | | | | | | | ☆ | |
| | Antenatal education | | | | | | | | | ☆ |
| | Midwives' observation and summary | | | ☆ | | | | | | |
| Barriers | Use of medical pain relief | | | | | | | ☆ | ☆ | |
| | Variation in midwives' competency | | | | | | | | ☆ | |
| | Doctors (against) | | | | | | | | ☆ | |
| | Doctors (agree) | | | | | | | | ☆ | |
| | Women's literacy | | | | | | | | ☆ | |
| | Women's physical condition | | | | | | | | | ☆ |
| | Not enough attention | | | | | | | | ☆ | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Heavy workload | | | | | | | | | ☆ |
| | Deep-rooted belief | | | | | | | ☆ | | |
| | Misunderstanding | | | | | | | ☆ | | |
| | No standard formula | | | | | | | | ☆ | |
| Safety | Low risk | | | | ☆ | | | | | |
| | Main concern | | | | ☆ | | | | | |
| | Midwives' assessment | | | ☆ | ☆ | | | | | |
| | Avoid pushing too frequently and too forcefully | | | ☆ | ☆ | | | | | |
| | Avoid pushing too early | | | ☆ | ☆ | | | | | |
| Efficacy | Shorter labour durations | | | | ☆ | | | | | |
| | Easier and less tired | | | | ☆ | | | | | |
| | Positive experience | | | | ☆ | | | | | |
| | Effective pushing efforts | | | | ☆ | | | | | |
| | Less perineal damage | | | | ☆ | | | | | |
| Confused | Midwives' misunderstanding | | | | | | | ☆ | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Midwives' anxiety to change inherent work habit | | | | | | | ☆ | | |
| | Pressure in communicating | | | | | | | ☆ | | |
| Women's reaction | Women's enhanced experience | | | | ☆ | | | | | |
| | Women's empowerment | | | | ☆ | | | | | |
| | Women's confidence | | | | ☆ | | | | | |
| | Control of body | | | | ☆ | | | | | |
| | Women's self-possession | | | | ☆ | | | | | |
| | Endure labour progress | | | | ☆ | | | | | |
| | Feeling in directed pushing-positive | | | | | | | ☆ | | |
| | Feeling in directed pushing-negative | | | | ☆ | | ☆ | | | |
| | Not so related to pushing | | | | | | | | | ☆ |
| Future preference | Intention to support SP in the future | | | | | | | | | ☆ |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Proper guidance when necessary | | | | | | | | | |
| | A balancing act | | | | | | | | | ☆ |