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

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Background:
In Hong Kong, most women giving birth in public hospitals are taught to use the directed (Valsalva) method to push. Shortcomings of directed pushing have been demonstrated, and there has been an increased appreciation of and interest in the physiological approach to labour. The objective of this study was to determine the relationship between early postpartum fatigue and the pushing technique used during the second stage of labour and to collect available information on fatigue levels in the immediate postpartum period among Chinese women.

Methods:
A randomised controlled trial was undertaken in 2005 to determine any differences between use of the directed and spontaneous pushing techniques in the second stage of labour with respect to maternal fatigue in the first 24 hours' postpartum. Using the visual analogue scale–fatigue, women were asked to indicate their perceived level of fatigue at the onset of labour, at the beginning of the second stage, within 15 minutes of the baby's birth, and around 24 hours' postpartum.

Results:
Seventy-three nulliparous women were randomly allocated to either the control group (directed pushing method, n=38) or the experimental group (spontaneous pushing method, n=35). Women in the experimental group had longer second stages of labour but perceived less fatigue within 15 minutes of childbirth and at 24 hours after delivery. The difference between the two groups was not statistically significant. The control group had higher rates of instrumental delivery, a finding that was statistically significant (p=0.048). There was no statistically significant difference between the groups for any other maternal or neonatal outcome measured.

Conclusion:
The spontaneous pushing technique is safe, less exhausting, and achieves a statistically significant decrease in instrumental delivery. This provides information health care professionals should use to evaluate ways of assisting women with childbirth.
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Introduction

In Hong Kong, midwives direct women to commence pushing once the cervix has been confirmed as fully dilated, by definition the beginning of second stage of labour, regardless of whether they have any urge to bear down. Women are encouraged to employ the 'Valsalva' technique, which requires repeated, prolonged breath holding and bearing down which causes the glottis to close and increases intrathoracic pressure[1]. This is commonly referred to as 'directed pushing'.

Vigorous use of directed pushing during childbirth

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has attracted criticism. Concerns include a decrease in the oxygen supply to the fetus and a lowering of the cord pH[2], unnecessary instrumental delivery due to maternal exhaustion[3], burst blood capillaries in maternal eyes[4], and damage to the muscles of the vagina and perineum[5]. A study by Caldeyro-Barcia et al[2] showed that when women continuously hold their breath for more than 9 seconds, fetal monitoring develops deep decelerations with slow recovery, indicating fetal hypoxia; breath-holding lasting 15 to 18 seconds results in a marked fetal hypoxic effect[2]. In 1996, Mayberry et al[6] raised a concern that use of the directed pushing technique during the second stage may have a significant impact on postpartum maternal fatigue.

Studies on postnatal maternal health have demonstrated that postpartum fatigue has a major impact on women's lives, affecting their relationships with others and their ability to fulfil new roles and cope with household responsibilities[7]. Furthermore, research suggests that maternal fatigue is generally neglected or underreported by health professionals[8-10].

In recent years, there has been an increased appreciation of and interest in the physiological approach to labour with less emphasis placed on time limitations. The spontaneous pushing method has been found to have advantages over directed pushing, such as greater perineal integrity[11], fewer fetal complications including acidosis and heart rate alterations[12], fewer maternal complications such as a change in blood pressure[4], less fatigue[13], and higher maternal satisfaction[14]. Nonetheless, the spontaneous pushing method is not widely used in local maternity units.

The midwife's central role is to help and support women through labour and the transition to early parenting. Good 'pushing techniques' are non-medical practice areas that can bring about significant improvements in maternal and fetal well-being. The relationship between early postpartum fatigue and the pushing technique used during the second stage remains unclear. This study was designed to compare use of the directed pushing method and spontaneous pushing method during the second stage of labour, to assess their effect on women's perceived level of maternal fatigue immediately after and about 24 hours' post birth. This study also aimed to establish a baseline for further studies of fatigue in Chinese childbearing women. The study was approved by the Human Research Ethics Committee of the Faculty of Health Sciences Human Research Ethics Committee, La Trobe University, Australia (Ethics Approval No: FHEC04/191) and Research Ethics Committee (Kowloon Centre / Kowloon East), Hospital Authority, Hong Kong (KC/KE04-0128/FR-2).

Methods

The study was designed to look for a difference between two pushing methods with the primary hypothesis being that women in the experimental group (spontaneous pushing technique) would report 10% less fatigue in the first 24 hours following childbirth when compared to the control group (directed pushing technique). All the subjects were nulliparas (Table 1).

Sample Size

Based on the available literature on postpartum fatigue, the most appropriate and accurate tool for assessing early postpartum fatigue is the visual analogue scale–fatigue (VAS-F) [Appendix] used by Troy and Dalgas-Pelish[15]. Their prospective, longitudinal study of 36 women was designed to measure fatigue levels

Table 1. Inclusion and exclusion criteria of women

Inclusion criteria
• Were nulliparas
• Were aged between 18 and 40 years
• Had a healthy singleton fetus with cephalic presentation
• Had reached full term (gestational age ≥37 weeks)
• Were anticipating a vaginal birth (both normal spontaneous or instrumental)
• Had either a spontaneous onset of labour or induction due to premature spontaneous rupture of membranes or post dates pregnancy
• Were able to read Chinese or English
Exclusion criteria
• Did not wish to participate
• Had maternal medical or obstetric complications which would affect the management of the second stage of labour
• Had a baby with congenital anomalies or when fetal compromise was suspected
• Were in established labour
• Had an epidural analgesia

during the first 6 weeks postpartum. The mean fatigue score (taken during the evening) during the first week was 63.45. Using a slightly more conservative mean score estimate of 70 at 24 hours postpartum (as a close estimate to the first week score) as a reasonable estimation of fatigue level, a total sample size of 70 women (35 in each group) would yield an 80% chance of detecting a 10% difference in mean scores at the 5% level of significance using a 2-sided *t*-test (NCSS – Statistical & Power Analysis Software – PASS). A 10% difference in perceived fatigue scores between the two groups would be considered clinically significant.

Randomisation Method and Study Procedure

Women in labour who had provided written consent were cared for as usual by antenatal and labour ward midwives. The current hospital partogram was used to assess the progress of labour. Women who elected to have epidural analgesia for pain management during labour were removed from the study. Randomisation occurred upon confirmation of full dilatation of the cervix (denoting the onset of the second stage) at which point the woman was asked to select one envelope from a set of 20.

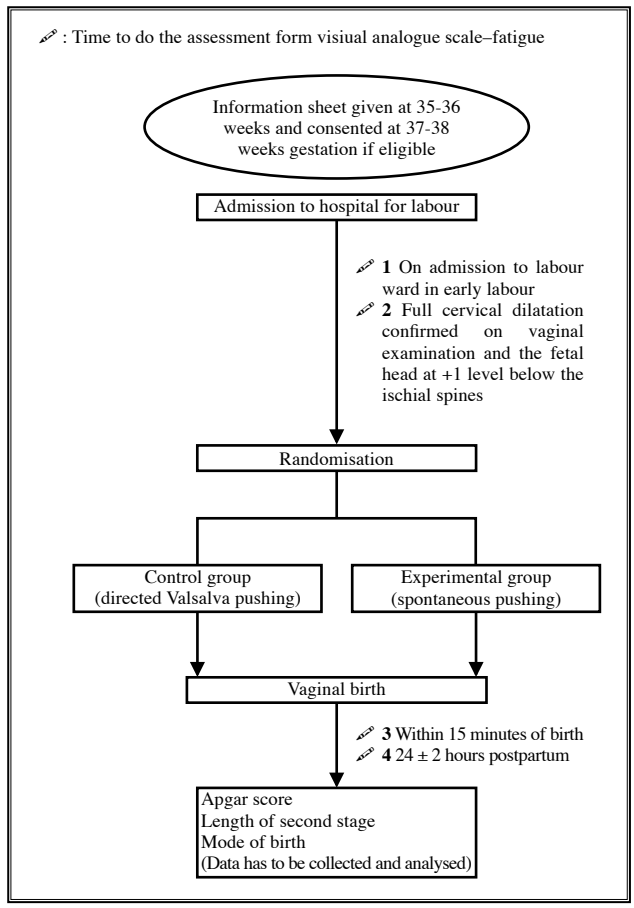

Figure. Study framework

Women randomised to the control group were managed with directed pushing. When it was confirmed that the cervix was fully dilated and the fetal head station was assessed as being plus 1 below the level of the ischial spines of the pelvis, the midwife caring for the woman suggested she commenced pushing using the directed pushing technique regardless of whether she felt an urge to push or not (Figure).

When women in the experimental group 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.

In both groups, if midwives or obstetricians were concerned about the maternal and / or fetal well-being at any time, or delivery was not imminent after 60 minutes (prolonged second stage of labour), the woman was reassessed to gauge maternal and fetal condition and adopt whatever clinical management was deemed necessary to facilitate a safe birth. A set of 4 identical assessment forms (VAS-F) was given to each woman. They were asked to indicate their perceived level of fatigue at 4 time-points: in early labour or after induction of labour, on confirmation of full cervical dilatation, immediately post birth (about 15 minutes after childbirth), and about 24 ± 2 hours post birth when fully awake. These specific time-points were selected to ensure the change in levels of fatigue felt during labour and the early postpartum period were not affected by other antenatal and postnatal factors unrelated to labour, such as antenatal fatigue, sleeping patterns, or modes of infant feeding.

Fatigue Assessment and Analysis

The (VAS-F) tool consists of an 18-item scale (13 items concerning fatigue and 5 items on energy). The scale has been validated and tested for its validity and reliability[16]. Each analogue scale has bipolar end anchors related to descriptors of fatigue, with a high score indicating more of the attribute (fatigue or energy). This tool is easily understood, requires minimal reading skills and takes little time to complete (less than 2 minutes)

Table 2. Neonatal characteristics of two study groups

Variables	Mean ± standard deviation / No. (%)	
	Control group (n=38)	Experimental group (n=35)
Gestation (days)	275.7 ± 6.5	277.5 ± 5.8
Birth weight (g)	3131.0 ± 417.4	3134.9 ± 315.4
Apgar score 1 min	8.0 ± 0.5	8.0 ± 0.5
Apgar score 5 min	8.5 ± 0.5	8.5 ± 0.5
Admission to NICU*	4 (10.5%)	3 (8.6%)

* NICU denotes neonatal intensive care unit

with little bias. A standard metal ruler with mm marking was used to measure the marking point and length (100 mm). Mean scores for fatigue and energy at each time-point were calculated. The differences between fatigue scores, the length of the first and second stages of labour, birth outcomes, and the Apgar scores were also analysed.

Data Analysis

The Statistical Package for the Social Sciences (SPSS) was used to analyse the results. *t*-Tests were used to study the difference between the fatigue scores of the two groups at different stages. Chi-square testing was used to study the statistical significance of the differences between fatigue scores, different pushing methods and their relationship with the length of the first and second stages, delivery outcomes and babies' Apgar scores. The significance level was set at alpha equal to 0.05. The SPSS default settings were used unless otherwise stated.

Results

A total of 396 eligible nulliparous women consented to take part in the study during the period from 10 January 2005 to 5 August 2005. Among these, 97 chose epidural analgesia during the first stage of labour. Another 117 did not continue with the study at different stages. The major reasons for discontinuation included 51 who were admitted in active labour, 17 who had suspected fetal distress, moderate meconium-stained liquor, or a non-reassuring cardiotocography during the second stage of labour. Overall, 73 women successfully completed the four fatigue assessment forms (38 in the control group and 35 in the experimental group).

Demographics Profile

Maternal Characteristics

All participants were Chinese. No significant difference was found between the two groups for age, body weight, height and body mass index or education level.

Neonatal Characteristics

The Apgar score means were similar at 1 minute and 5 minutes after birth. There was also no statistically significant difference between the numbers of babies admitted to the neonatal intensive care unit (Table 2).

Obstetric Outcomes

The mean length of the first stage of labour was 4 hrs 54.6 mins (294.6; standard deviation [SD], 204.0 mins) for the control group and 4 hrs 36 mins (276.0; SD, 193.7 mins) for the experimental group. The maen length of the second stage of labour was 31.9 (SD, 19.1) mins for the control group and 38.1 (SD, 26.8) mins for the experimental group.

Total labour mean length was 5 hrs 26.5 mins (326.5; SD, 207.0 mins) for the control group and 5 hrs 14.2 mins (314.2; SD, 193.3 mins) for the experimental group (Table 3). The experimental group had a slightly shorter total length of labour, but their second stage of labour was longer than that of the control group; this was not statistically significant.

The only statistically significant difference identified between the groups was the mode of birth. Four women required an assisted instrumental delivery in the control (directed pushing) group, whereas all the women in the spontaneously pushing group had spontaneous vaginal births (χ^2 (1, N=73)=3.898, p=0.048) [Tables 3 and 4]. The small numbers involved mean any implications for practice should be viewed with caution.

Maternal Fatigue and Energy Score

The Fatigue Score

The fatigue scores given by the two groups of women from the early onset of labour until around 24 hours after birth are described in Table 5.

The mean fatigue scores around 24 hours post delivery (f4) were 41.8 (SD, 18.3) for the experimental

Table 3. Obstetric outcomes of the two study groups

Variables	Mean ± standard deviation / No. (%)	
	Control group (n=38)	Experimental group (n=35)
Mode of delivery		
Spontaneous vaginal delivery	34 (89.5%)	35 (100%)
Instrumental delivery*	4 (10.5%)	0
Prolonged 2nd stage	2	0
Non-reassuring cardiotocography	2	0
Partner-accompanied labour		
Yes	22 (57.9%)	23 (65.7%)
No	16 (42.1%)	12 (34.3%)
Pethidine		
Yes	21 (55.3%)	18 (51.4%)
No	17 (44.7%)	17 (48.6%)
Length of 1st stage of labour (mins)	294.6 ± 204.0	276.0 ± 193.7
Length of 2nd stage of labour (mins)	31.9 ± 19.1	38.1 ± 26.8
Total length of labour (mins)	326.5 ± 207.0	314.2 ± 193.3
Estimated blood loss (ml)	228.9 ± 99.0	240.0 ± 123.5

* $p<0.05$

Table 4. Correlation between two pushing methods and delivery outcomes

Variables	p Value (Pearson Chi-square)
Mode of delivery	
Instrumental delivery	0.048
Admission to NICU*	0.777
Special consultation immediate after delivery	0.634

* NICU denotes neonatal intensive care unit

group while the control group scored 45.5 (15.9). Thus the use of directed pushing during the second stage of labour led to higher fatigue scores at 24 hours after birth. The difference between the two groups was 3.7 (8.1%). The experimental group had a longer second stage of labour (38.1 mins) than the control group (31.9 mins). This indicates that women in the experimental group were less fatigued after childbirth than women in the control group even though they had longer second stages of labour (Table 5).

The difference in fatigue scores given at the beginning of the second stage and 15 minutes after birth (f3 – f2) were -13.7 (SD, 18.3) for the control group and -14.1 (SD, 19.9) for the experimental group. The difference in fatigue scores given 15 mins post birth and around 24 hours after birth (f4 – f3) was -10.8 (SD, 24.5) for the control group and -13.6 (SD, 17.4) for the experimental group, indicating that women in the experimental group recovered from fatigue more rapidly. These differences were not statistically significant, however.

The Energy Score

The energy scores given by the two groups from early onset of labour until 24 hours after delivery are described in Table 6.

The difference in energy scores recorded at the beginning of the second stage and 15 minutes after birth (e3 – e2) was 5.2 (SD=27.4) for the control group and 9.1 (SD=19.6) for the experimental group. The difference in energy scores recorded 24 hours after birth (e4) and 15 minutes after group was 9.5 (SD=21.7) for the control group and 7.6 (SD=21.2) for the experimental group (Table 6).

An independent sample *t*-test was used to test the relationships between different pushing methods, fatigue levels, and energy in the early postnatal period. No statistically significant differences between the energy scores either immediately or at 24 hours post birth (Tables 5 and 6) were found.

Summary

The major findings were:

(1) The second stage of labour was longer when spontaneous pushing was used but maternal fatigue decreased, though not statistically significant.

(2) Women in the directed pushing group required an instrumental delivery more often than women in the spontaneous pushing group. This difference was statistically significant (p=0.048). The numbers are very small, so this finding should be viewed with caution when interpreting its possible significance for clinical practice.

Table 5. Visual analogue scale–fatigue (VAS-F) score: fatigue for the two study groups

	Mean ± standard deviation		p Value (independent *t*-test)
	Control group (n=38)	Experimental group (n=35)	
At early first stage of labour (f1)	51.2 ± 17.8	54.8 ± 16.5	-
At beginning of 2nd stage of labour (f2)	70.0 ± 20.9	69.6 ± 18.2	-
Within 15 mins after childbirth (f3)	56.3 ± 21.4	55.4 ± 18.3	-
At about 24 hrs after childbirth (f4)	45.5 ± 15.9	41.8 ± 18.3	-
Fatigue difference f2 – f1	18.7 ± 17.1	14.7 ± 16.2	0.313
Fatigue difference f3 – f2	-13.7 ± 18.3	-14.1 ± 19.9	0.92
Fatigue difference f4 – f3	-10.8 ± 24.5	-13.6 ± 17.4	0.576
Fatigue difference f4 – f2	-24.53 ± 27.68	-27.79 ± 22.36	0.583

Table 6. Visual analogue scale–fatigue (VAS-F) score: energy of two study groups

	Mean ± standard deviation		p Value (independent *t*-test)
	Control group (n=38)	Experimental group (n=35)	
At early first stage of labour (e1)	42.2 ± 19.7	36.8 ± 19.5	-
At beginning of 2nd stage of labour (e2)	35.6 ± 23.5	34.8 ± 23.2	-
Within 15 mins after childbirth (e3)	40.9 ± 21.6	43.9 ± 19.5	-
At 24 hrs after childbirth (e4)	50.4 ± 13.9	51.5 ± 15.3	-
Energy difference between e2 – e1	-6.6 ± 20.1	-1.9 ± 21.6	0.347
Energy difference between e3 – e2	5.2 ± 27.4	9.1 ± 19.6	0.495
Energy difference between e4 – e3	9.5 ± 21.7	7.6 ± 21.2	0.704
Energy difference between e4 – e2	14.76 ± 28.05	16.7 ± 23.42	0.75

(3) There were no statistically or clinically significant differences in the obstetric or neonatal outcomes for the two groups.

(4) Fatigue and energy score data for first-time mothers in the early postpartum period after a normal vaginal delivery (without epidural analgesia) are available for further evaluation.

Discussion

Several studies have reviewed the reported causes of maternal fatigue in the early postpartum stage. These include physical factors such as length of labour, type of delivery and blood loss associated with delivery[17]; maternal hormonal shifts, anaemia, wound / episiotomy healing, discomfort / pain and breastfeeding[18]; antenatal anxiety and depression[19]; long hospital stays and the mode of delivery[20]. Pugh et al[21] suggested that breathing patterns used during labour also affect maternal fatigue. Mayberry et al[6] explained in detail how excessive and prolonged pushing efforts lead to fatigue, and that fatigue accumulated during labour actually continued beyond the first week of the postpartum period.

On the other hand, a slower second stage may have beneficial outcomes including a rise in the rate of spontaneous births and a major decline in episiotomy rates with no change to neonatal outcomes[22]. Traditional midwifery textbooks no longer give a recommended length for the second stage of labour[23,24]. The main reason for using the Valsalva technique to assist uterine contraction and shorten the second stage of labour is that prolonged second stages may lead to higher maternal and fetal mortality rates. Some studies have demonstrated a time-dependent fall in fetal pH during the second stage[25-27] but this has been challenged[28]. An extensive review of 25,069 births found that the duration of the second stage was not significantly associated with the risk of a low Apgar score or admission to a special care baby unit[29]. Different studies have investigated outcomes of different pushing methods. Substantial evidence supports the use of spontaneous maternal pushing for both maternal and fetal benefit and a few studies have specifically compared

directed pushing and spontaneous pushing methods[30-32]. These studies have reported different outcomes for both the women and their babies, but no adverse effects have been found in the spontaneous pushing group. Moreover, two studies comparing the effects of spontaneous versus directed pushing revealed more positive effects on perineal integrity and cord blood pH and maternal satisfaction when spontaneous pushing methods were adopted[33,34].

One recent small study[35] (30 in each group) evaluated the effects of directed versus spontaneous pushing on postpartum fatigue using a 30-item checklist to measure fatigue, perineal pain, and satisfaction. It found significantly lower fatigue scores ($p<0.01$), less perineal pain ($p<0.01$) and higher levels of childbirth satisfaction ($p<0.01$) in the spontaneous group. Although the sample was small, this study had similar results to our current study.

Limitation

This study was limited by a high dropout rate during the first and second assessment, mainly due to requests for epidural pain management and refusals to complete the assessment form. A common reason cited for not completing the forms was pain. Problems dealing with labour pain made the full assessment difficult for some women, despite their very positive responses during the recruitment stage. Modification of the study design to include a more realistic assessment time-point during the extremely tense period so close to the birth should be considered to avoid such high attrition rates in any similar study conducted in the future.

Implications for Midwifery Practice

A number of studies and publications advocate spontaneous pushing during childbirth to achieve better neonatal, maternal, and obstetric outcomes[32-35]. Midwives who assist childbirth in a directed way may be responding to particular obstetric situations, such as labour progress being less than optimal or fetal compromise. Nevertheless, as midwives we should promote measures that avoid reversion to directed, prolonged bearing down by encouraging physiological descent, flexible, effective birth positions in the second stage, and good physical and psychological support during childbirth[36,37]. This study addressed maternal fatigue, which may also affect the physical status of women in labour. Though the results demonstrated no statistically significant adverse effects on maternal and neonatal outcomes, a statistically significant correlation between use of a directed pushing technique and instrumental delivery was detected. The data in this study, particularly the fatigue and energy scores, provide useful baseline information for future midwifery practice and further studies of Chinese women.

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Appendix. Visual analogue scale for fatigue (VAS-F)

This assessment is used to find out your level of fatigue before and after childbirth. There are a total of 18 items. This should only take about 1 minute of your time. Thank you.

Please place a cross mark "X" through these lines to indicate how you are feeling **RIGHT NOW.**

For example, suppose you have not been eaten since yesterday. Where would you put the "X" on the line below?

Not at all hungry ——— *Extremely hungry*

NOW PLEASE COMPLETE THE FOLLOWING ITEMS:

1.	Not at all tired	Extremely tired
2.	Not at all sleepy	Extremely sleepy
3.	Not at all drowsy	Extremely drowsy
4.	Not at all fatigued	Extremely fatigued
5.	Not at all worn out	Extremely worn out
6.	Not at all energetic	Extremely energetic
7.	Not at all active	Extremely active
8.	Not at all vigorous	Extremely vigorous
9.	Not at all efficient	Extremely efficient
10.	Not at all lively	Extremely lively
11.	Not at all bushed	Extremely bushed
12.	Not at all exhausted	Extremely exhausted
13.	Keeping my eyes open is no effort at all	Keeping my eyes open is a tremendous chore
14.	Moving my body is no effort at all	Moving my body is a tremendous chore
15.	Concentrating is no effort at all	Concentrating is a tremendous chore
16.	Carrying on a conversation is no effort at all	Carrying on a conversation is a tremendous chore
17.	I have absolutely no desire to close my eyes	I have a tremendous desire to close my eyes
18.	I have absolutely no desire to lie down	I have a tremendous desire to lie down

Items 1-5 and 11-18 belong to the fatigue subscale. Items 6-10 belong to the energy subscale. With actual use, the horizontal lines should be exactly 100 mm.