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THE EFFECT OF PUSHING TECHNIQUES ON DURATION OF THE SECOND LABOR STAGE, MOTHER AND FETUS: A RANDOMIZED CONTROLLED TRIAL

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Abstract: *This study evaluated the effects of pushing techniques on the second stage of labor duration and maternal and fetal outcomes. The pregnant women were divided randomly into Valsalva pushing (n =20) or spontaneous pushing (n =20) groups. The experimental group received spontaneous pushing training in the latent phase. Interventions during labor as well as maternal and fetal complications and the duration of the second stage of labor were recorded. There was a significant difference in fetal Apgar scores and the duration of second labor stage between the two groups (p<0.005). Fetal distress, oxygen use, increase in oxytocin, operative intervention, perineal laceration, and postpartum hemorrhage were seen less in the spontaneous pushing group. However, no statistical difference was found between the groups (p>0.05). Spontaneous pushing is effective in shorter second stages of labor and higher Apgar scores. It should be included in maternal hospital protocols.*

Key words: *pushing techniques, labor second stage duration, maternal outcomes, fetal outcomes.*

1.Introduction

The second stage of labor is defined as the period from full dilatation of the cervix until expulsion of the fetus [1]. This stage includes frequent and regular pushing and women experience frequent vaginal rectal pressure and extreme pushing [2]. During the second stage of labor, spontaneous pushing (open glottis pushing while breathing out) or Valsalva maneuver techniques (closed glottis pushing while holding the breath) are used [3].

A common technique is to encourage women to use a closed-glottis pushing (holding breath while pushing) duration of 10 seconds or more, once the cervix has reached 10 cm dilation [4, 5]. In this procedure, women are coached to take a deep breath at the beginning of a contraction, then hold the breath as long and hard as possible and bear down towards the vagina throughout the contraction [5]. The process of taking a deep breath and holding it with a closed glottis is called the Valsalva Maneuver (VM). Several physiological findings oppose the use of the VM of 10 seconds or more, as this type of

directed pushing can negatively affect fetal acid-base balance, apgar scores and cerebral oxygenation. It can also interfere with the duration of the second stage of labour, increase maternal fatigue, cause damage to the maternal pelvic floor structures and impair bladder function [5, 6, 7, 8, 9]. A relationship has been observed between the Valsalva maneuver and reduction of oxygen supply to the fetus, maternal fatigue, and damage to the perineum. Recent scientific publications do not support the use of the Valsalva maneuver during the second stage of labor, and evidence suggests that it might be harmful [10, 11, 12].

In contrast, some authors argue that breathing control interventions should not be imposed during the expulsive stage and that rather than follow direct instructions for the VM, women should be free to follow their own instincts in response to the physiology of this stage in labour [5, 13]. This approach is known as ‘spontaneous or involuntary pushing’ and most of the respiratory effort to help in this type of bearing down occurs with an open glottis. [14]. Additionally, women who use spontaneous pushing begin at a resting respiratory volume, push three to five times per contraction and take several breaths between each bearing down effort. Spontaneous pushing occurs as a result of optimal obstetric conditions for fetal descent which includes fetal station of at least +1 and fetal position (approaching occipito anterior position. This condition evokes the Ferguson’s reflex, through increased oxytocin release, which augments maternal bearing down efforts by making them more effective and less fatiguing. The same uncertainty occurs in relation to the second-stage labour care of women [4, 5].

Spontaneous pushing is a method that is used in the management of the second stage of labor and suggested to be more physiological for the mother and infant [2]. However, this technique is less used [10].

There are no data to support a policy of directed maternal pushing. Despite several publications showing the adverse maternal and fetal effects from the use of the sustained VM, this choice of method is still common practice worldwide, and the scientific evidence base supporting the recommendation of breathing control for the expulsive stage is scant. The Valsalva pushing technique is used routinely in the second stage of labor and is accepted as standard obstetric management in Turkey, even though no research has been conducted in the country on the effects of pushing techniques.

The present study was planned to determine the effects of pushing techniques on the second stage of labor duration and maternal and fetal outcomes. This study will concentrate on all eligible studies using spontaneous versus directed pushing and delayed versus early pushing for bearing down during the second stage of labour.

2. Materials and Methods

2.1. Design

The study utilizes a randomized controlled trial design.

2.2. Setting and participants

The study was conducted in the delivery room of Dumlupınar University Kütahya Evliya Celebi Training and Research Hospital. Sample acceptance criteria were: nulliparous women 18-35 years of age who were 38- 42 weeks pregnant with a single healthy fetus in vertex position, expected to have spontaneous vaginal delivery, without any pregnancy complications and in the latent phase of labor (0-4 cm).

2.3. Sampling and randomization

The study population consisted of 192 nulliparous women who had applied for hospital delivery service a year prior to giving birth to their first child, who had vaginal deliveries and who did not have any communication problems. In this research, the sample size was subdivided into two medium-sized

independent groups. A t-test was applied, obtaining a rate of 80% in the power test and an alpha value of 0.05 with a 95% confidence level, which was calculated using estimation G-Power Software version 3.0.10. Pregnant women were randomly selected via a coin toss, and they were assigned to either the experimental or control group. The pregnant women were assigned alternately on one day to the experimental group and on the other to the control group. Attention was paid for the pregnant women who were taken into the practice at the same time to be monitored in different rooms. Thus, 40 pregnant women, 20 for experimental group and 20 for control group, participated in this study between November 2013 and March 2014.

2.4. Data Collection Tools

The “Personnel Information Form” and “Labor Observation Form” were used to collect data and record information related to labor stages.

2.4.1. Personal Information Form

Socio-demographical and obstetric characteristic questions were asked such as age of the pregnant women, willingness to become pregnant, and having information about labor.

2.4.2. Labor Observation Form

Information regarding second, third, and fourth stages of labor were compiled as a result of a literature search. This form included questions about second (fetal distress, increase in oxytocin rate given to mothers, oxygen use, duration of second stage, and operative labor interventions), third (perineal lacerations), and fourth (postpartum hemorrhage and 5th minute Apgar score) stages of labor.

2.5. Data Collection Methods

Pregnant women were followed during labor when cervical dilatation reached 4 cm. The fetus was assessed at delivery. The data were collected using face to face interviews. From the beginning of the study, doctors and midwives working in the labor room regularly assessed cervical dilatation. Pregnant women’s characteristics about second, third, and fourth stages of labor were recorded. Moreover, information from the second stage of labor was recorded on the Labor Observation Form.

2.6. Intervention

The second stage of labor occurs during the period between cervical dilatation at 10 cm and delivery of the baby.

Women in both groups started pushing when

- Cervical dilatation was 10 cm.
- Strong uterine contractions occurred.
- Fetal head rotation was completed.
- Fetal head was at + 1 level in the pelvis at least.

The following applications for Valsalva Pushing and Spontaneous Pushing were used for participating pregnant women

- Meeting with pregnant women.
- Determination of the pregnant women who meet the criteria and agreed to participate in the study.
- Giving information about the aim of the study.
- Completing the personal information form through a face to face interview.
- Assessment and recording of fetal distress, increase in oxytocin, oxygen use, and operative labor interventions on the Labor Observation Form.
- Recording the duration of the second stage of labor on the Labor Observation Form.
- Assessing fetus and mother in terms of 5th minute Apgar score and hemorrhage control, perineal lacerations, and pads and recording it on the Labor Observation Form (Fig.1).

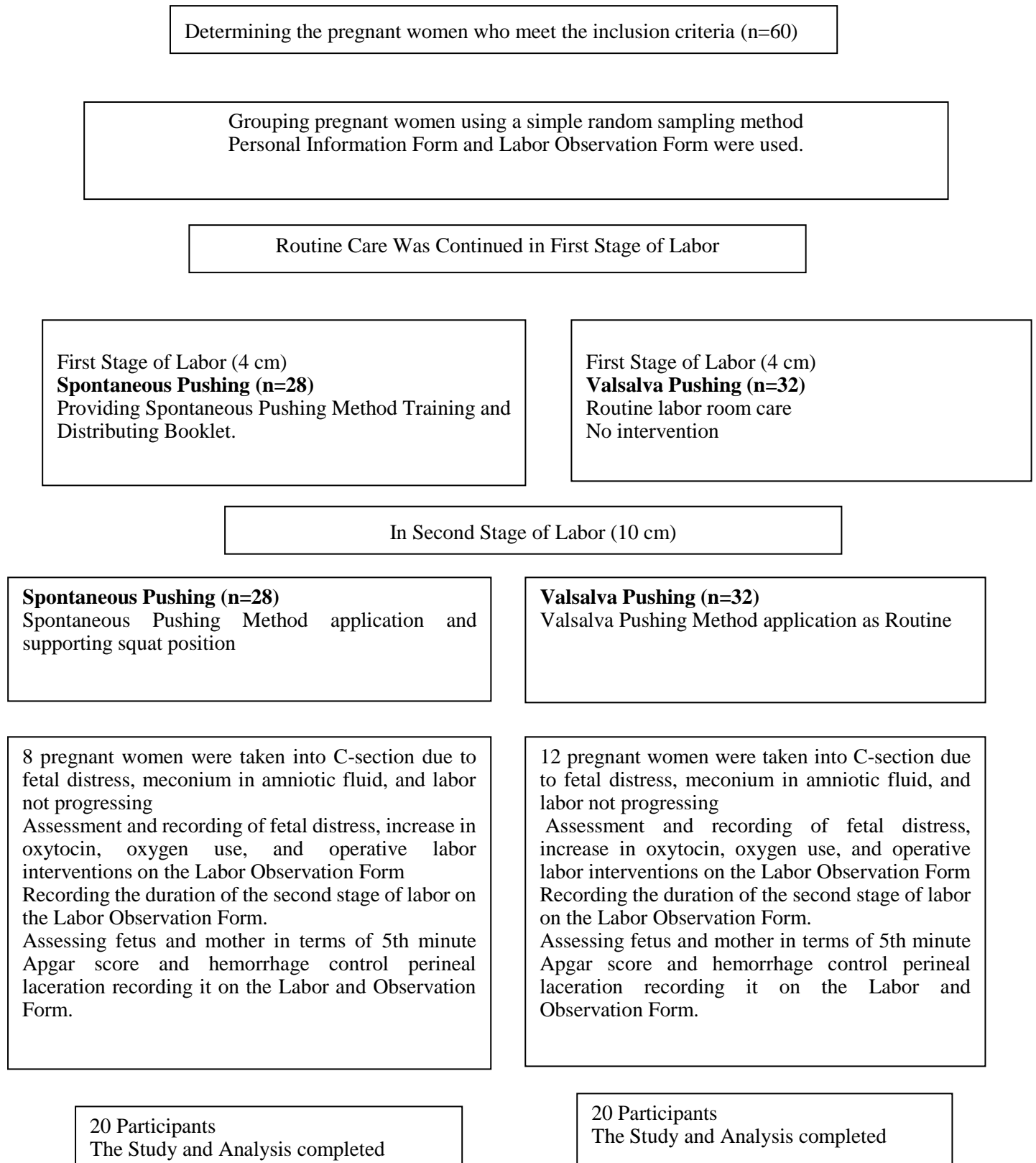


Fig. 1. Study Plan

Processes performed on Spontaneous Pushing Group:

During the second stage of labor, women mostly stood in a squat position. Women were informed about spontaneous pushing and provided booklets during the active stage of dilatation (dilatation was 4 cm). Women were supported for spontaneous pushing and the women's desire to push was considered. Spontaneous pushing was applied as follows:

- Regular breathing until pushing feeling occurs when contractions start,
- Breathing and retraction of core muscles,
- Pushing gradually,
- Smoothly breathing out by pursing when pushing,
- Pushing for 5-6 seconds while breathing out,
- Breathing in and pushing while breathing out for 5-6 seconds smoothly and regularly,
- Regular breathing when contractions slow down

Processes performed on Valsalva Pushing Group:

Pushing techniques were not taught to the pregnant women in the Valsalva pushing group. No intervention was made to these pregnant women except standard hospital practices, although they were observed during delivery. Valsalva pushing was applied as follow :

- Two regular breaths when contractions start
- Breathing deeply and holding breath
- Squeezing breath with diaphragm and abdominals
- Pushing as much as hard and long (10-15 seconds)
- Holding breath when pushing (closed glottis)
- Breathing out, breathing in deeply, holding breath
- Pushing hard for 10-15 seconds again
- Stop pushing when contractions ease
- Relaxing and resting until next contraction [15].

2.7. Data analysis

The data were analyzed using SPSS 20.0 software. Number, percentage, Chi-Square test, and Fisher Exact Chi-Square test and A paired t test were used for data analysis.

2.8. Ethical considerations

The purpose of the study was explained to each pregnant and their consent was obtained. The research permit was issued by the General Secretary of the Turkish Public Hospitals Agency of Kütahya Province under the Ministry of Health. Dumlupınar University ethics committee approved the study.

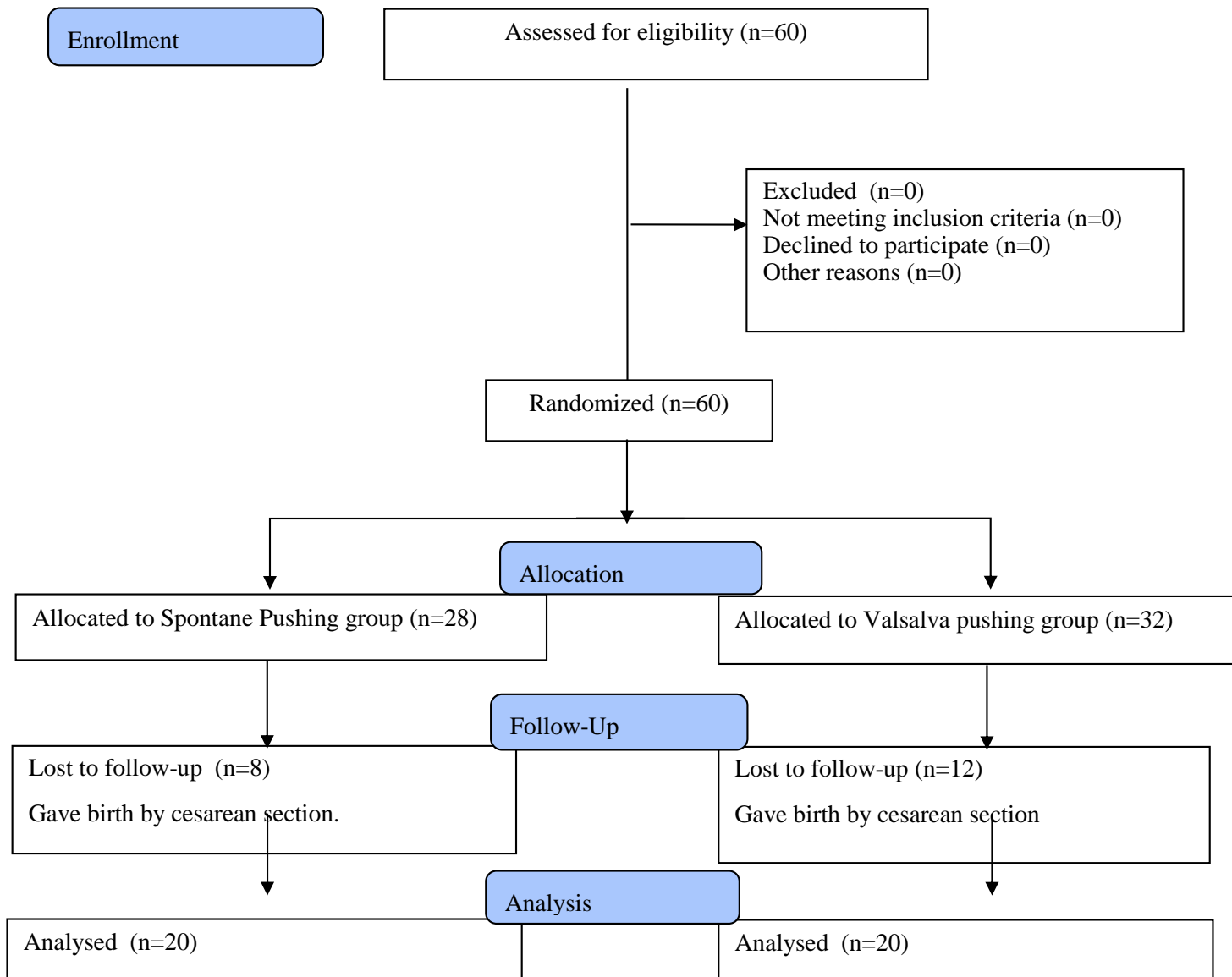


Fig. 2. Consort Flowchart

3. Results

During data collection, 60 pregnant women were randomly assigned to the experimental (spontaneous Pushing) and control groups (Valsalva pushing). 20 pregnant women were excluded from the research. The research was conducted with 20 pregnant women in the experimental group and 20 women in the control group (Fig. 2). Both groups are similar in terms of their socio-demographic and obstetric characteristics ($p > 0.05$) (Table 1).

Of the pregnant women in the spontaneous pushing group, 40% whereas in the Valsalva pushing group 55% of pregnant women were aged between 20-24 ($X^2=13.474$, $p>0.05$).

Most of the pregnant women in the spontaneous pushing group (95%) and all pregnant women in Valsalva pushing group stated that they wanted the pregnancy ($X^2=1.026$, $p>0.05$). Many women (65% in both groups) stated that they had no information regarding labor ($X^2=0.000$, $p>0.05$) (Table 1).

Table 1. Sociodemographic ve obstetric history characteristics of the pregnant

Characteristics	Spontaneous Pushing (n=20)		Valsalva Pushing (n=20)		X^2	p
	No	%	No	%		
Age (year)						
15-19	2	10	4	20		
20- 24	8	40	11	55		
25-29	9	45	-	-	13.474	0.509*
30- 34	1	5	2	10		
35 years and up	-	-	3	15		
Willingness to become pregnant						
Yes	19	95	20	100	1.026	0.500*
No	1	5	-	-		
Having information about labor						
Yes	7	35	7	35	0.000	0.629*
No	13	65	13	65		

* $p>0.05$

The duration of second stage of labor was 10-15 minutes and 10-20 minutes for 45 % of pregnant women both in the spontaneous pushing and Valsalva pushing groups, respectively. The duration of the second stage of labor in the spontaneous pushing group was statistically shorter than in the Valsalva pushing group ($X^2=15.209$, $p<0.05$) (Table 2).

Table 2 . Duration of the second stage of labor

	Spontaneous Pushing (n=20)		Valsalva Pushing (n=20)		X^2	p
	No	%	No	%		
0-5 min	3	15	-	-		
5-10 min	8	40	6	30		
10-15 min	9	45	4	20	15.209	0.004*
15-20 min	-	-	9	45		
20 min	-	-	1	5		

* $p<0.05$ (Significant)

Of the pregnant women in the spontaneous pushing group, 35% had an oxytocin increase and 15% were given oxygen. Of the pregnant women in the Valsalva pushing group, 60% had an oxytocin

increase and 25% were given oxygen. Of the pregnant women in the spontaneous pushing group, 80% did not receive fundal pressure or a vacuum, whereas in the Valsalva pushing group 50% did not. There was no statistical difference between groups, although there was less intervention in the spontaneous pushing group ($X^2=4.308$, $p>0.05$) (Table 3).

Of the pregnant women, 95% in the spontaneous pushing group and 65% in the Valsalva pushing group had an episiotomy ($X^2=5.925$, $p>0.05$). In both groups, mostly mild postpartum hemorrhage occurred (spontaneous pushing=70%; Valsalva pushing=45%; $X^2=2.572$, $p>0.05$) (Table 3).

The mean apgar scores were 9.86 ± 0.21 for the spontaneous pushing group, 9.37 ± 0.11 for the valsalva pushing group ($t=-4318$, $p<0.05$). There was a statistically significant difference in the mean apgar scores among both groups (Table 3). The Apgar score was higher in the spontaneous pushing group ($p<0.05$) and a statistically significant difference was found between them.

Table 3. Obstetric problems, management of the stages of labor and Apgar score

	Spontaneous Pushing (n=20)		Valsalva Pushing (n=20)		X ² /t	p
	No	%	No	%		
Fetal Distres						
Occured	3	15	5	25	0.625	0.695
Did not occur	17	85	15	75		
Increase in oxytocin dose						
Increased	7	35	12	60	2.506	0.205
Not increased	13	65	8	40		
Oxygen use						
Used	3	15	5	25	0.625	0.347
Not used	17	85	15	75		
Operative intervation						
Yok	16	80.0	10	50	4.308	0.116
Fundal pressure	4	20.0	9	45		
Vacuum	-	-	1	5		
Postpartum hemorrhage						
Too little	2	10	4	20	2.572	0.276
Mild	14	70	9	45		
Middle	4	20	7	35		
Apgar scoru (5min)						
Mean \pm SD	9.86 ± 0.21		9.37 ± 0.11		$t=-4318$	0.001*

* $p<0.05$ (Significant)

4. Discussion

In the present study, the duration of the second stage of labor was shorter in the spontaneous pushing group than in the Valsalva pushing group. Some studies have reported for a long time that Valsalva pushing shortens the second stage of labor. Koyuncu and Demirci [2] assessed the effect of pushing techniques on mother and fetus and showed the mean duration of the second stage of labor was significantly shorter in the Valsalva pushing group than the spontaneous pushing group. Another compilation by Prins et al. [12], which assessed 425 women, found the duration of the second stage of labor was shorter in the Valsalva pushing group. Vaziri et al. [11] found the labor duration of pregnant women in the spontaneous pushing

group was significantly higher than in the Valsalva pushing group. However, other studies showed that spontaneous pushing shortened the second stage of labor [3, 16, 17]. Bloom et al. [16] conducted a study on 320 women and found that the duration of second stage of labor was approximately 13 minutes shorter in the spontaneous pushing group. Jahdi et al. [17] found in their study on 191 women that the duration of the second stage of labor was significantly shorter in the spontaneous pushing group. According to a study by Mohamed and AbdElati [18], the duration of the second stage of labor was significantly shorter in the spontaneous pushing group than the Valsalva pushing group. The results are parallel to the present study results.

There was an increase in oxytocin rate in the spontaneous pushing group but no significant difference was found between the groups. In a compilation of 9 randomized controlled studies also found no difference in oxytocin use between groups [10]. Yıldırım and Beji [3] determined the effects of pushing techniques during the second stage of labor on mother and fetus and found no difference between Valsalva pushing and spontaneous pushing in oxytocin use increase. In parallel to the present study, previous studies support that pushing techniques do not affect oxytocin use [3, 6].

Although the intervention (forceps, fundal pressure, or vacuum) rate in the spontaneous pushing group was less in the present study, no significant difference was found between the two groups. Yıldırım and Beji [3] also found no difference in oxygen use between Valsalva pushing and spontaneous pushing group. Although the intervention incidence (forceps, Valsalva maneuver and vacuum) was less in intervention made to labor in spontaneous pushing group, the difference between them was not significant. A study by Schaffer et al. [6] performed with 128 women showed there was no difference between Valsalva pushing and spontaneous pushing in episiotomy and forceps use. A compilation by Barasinski et al. [19] assessed 7 randomized controlled studies and 2 meta-analysis studies and found no difference between the spontaneous pushing and Valsalva pushing groups in episiotomy incidence. In a compilation by Prins et al [12] that assessed 425 women found no difference between groups in interfered birth rates. The literature shows that pushing techniques do not affect operative labor techniques, which supports the present study results [2, 3, 5, 16].

A study by Mohamed and AbdElati [18] found that perineal lacerations were significantly less in the spontaneous pushing group than the Valsalva pushing group. In the present study, there was no difference between the two groups while perineal laceration was seen significantly less in the present study. Another compilation by Prins et al. [12] that assessed 425 women found no difference in perineal recovery. A study by Koyuncu and Demirci [2] performed to assess the effects of pushing techniques on mother and fetus found no significant difference between Valsalva pushing and spontaneous pushing groups in perineal-cervical laceration. Some results in the literature are parallel to the present study results and support that pushing techniques do not affect perineal trauma rates [3, 5, 10, 16, 19].

Although the hemorrhage incidence was less in spontaneous pushing group, there was no significant difference between the groups. In a compilation by Tayrac and Letouzey [10] that assessed 9 randomized controlled study found no difference between groups in postpartum hemorrhage. Previous studies were parallel to the present study results and supported that pushing techniques do not affect postpartum hemorrhage [3, 12].

Fetal distress frequency in this study was less in the spontaneous pushing group, but there was no statistically significant difference between two groups. Fetal distress occurs more in the Valsalva pushing group than the spontaneous pushing group [20]. In this study, the 5th minute Apgar score of the spontaneous pushing group was higher than the Valsalva pushing group. A study by Mohamed and AbdElati [18] found that mean Apgar score of spontaneous pushing group are higher than the Valsalva pushing group. A study by Yıldırım and Beji [3] conducted to determine the effects of pushing technique on mother and fetus in second stage of labor found that the neonate mean Apgar score was significantly higher in the spontaneous pushing group than the Valsalva pushing group. Results of previous studies were parallel to the present study results. However, there are studies that report no difference in Apgar scores. Jahdi et al. [17] found in their study on 191 women that there was no difference in 1st and 5th minute Apgar scores between pushing groups. Vaziri et al. [11] also found no significant difference in 5th minute mean Apgar scores between the spontaneous and Valsalva pushing groups.

5. Conclusions

Spontaneous pushing training given during the second stage of labor is effective for completing labor with requiring less intervention, and delivering in a shorter time and increased the fetal Apgar score. Spontaneous pushing during the second stage of labor should be included in maternal hospital protocols.

6. Limitations

There are some limitations of this study. Application of treatment routines (oxytocin, dolantin, and epidosin) to all pregnant women did not allow the researchers to limit the effects of these factors. Taking pregnant women into C-section prolonged the duration of the study. A separate pain room was used to do the practice. Therefore, some pregnant women felt alone and abandoned. Some problems occurred because environmental simulators were not controlled sufficiently.

Conflict of interest

The authors declared no conflict of interest.

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