

Effect of educational software on self-efficacy of pregnant women to cope with labor: a randomized controlled trial

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Abstract

Aim The aim of this study was to determine the effect of educational software on self-efficacy of Iranian pregnant women to cope with labor.

Methods This study was a randomized controlled trial which was carried out on 150 Iranian nulliparous pregnant women randomly assigned to two groups of 75 women each. The control group routinely did not receive any kind of childbirth education and the intervention group only received the childbirth educational software for 6–8 weeks. In order to determine self-efficacy, the Childbirth Self Efficacy Questionnaire (CBSEI) was used which measures the outcome expectancy and the self-efficacy expectancy of the first and second stages of labor separately. This questionnaire was completed at 28–32-week gestation as a pre-test and at 36–38 weeks as a post-test by the participants. Data were analyzed using Chi-square, Mann–Whitney *U* and Wilcoxon tests.

Results After the intervention, the median and mean of CBSEI scores for the intervention and the control groups were 607, 604/20 ± 16/630 and 394, 392/51 ± 16/758, respectively. There was a statistical difference between the two groups ($p = 0.001$). Also, statistically significant differences existed in the median of outcome expectancy and self-efficacy expectancy after intervention in both stages of labor between the two groups ($p = 0.001$).

Conclusions The educational software program significantly increased self-efficacy of Iranian pregnant women to cope with labor. Despite lack of educational childbirth classes in Iran, the use of this method is recommended. However, to find whether this technique can be substituted for the educational classes, further studies are needed.

Keywords Education · Software · Self-efficacy · Cope with labor · Pregnancy

Introduction

The relationship between fear of childbirth and self-efficacy to cope with labor are shown in the previous studies [1]. Self-efficacy is defined as a dynamic cognitive process that explains a personal conviction to perform a required behavior in a given situation successfully [1, 2]. Self-efficacy is an important prerequisite for behavior change and self-control [3].

Perceived self-efficacy to control the stressors plays an important role in anxiety arousal [4, 5]. One of these stressful situations is delivery. Self-efficacy in labor is an effective factor to deal with these situations and cope with labor [6]. Pregnant women who have higher levels of confidence in their ability to deal with labor experience less pain during labor and require less analgesia during labor. Also, self-efficacy plays a positive effect on the duration of labor [7, 8].

Self-efficacy is composed of two parts: outcome expectancy and self-efficacy expectancy. Outcome expectancy is the belief that a certain behavior will lead to a certain outcome, while self-efficacy expectancy is the belief that one successfully perform the behavior to produce the desired outcome [4, 5, 9].

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If a pregnant woman thinks that she cannot control labor, the resultant fear and anxiety makes her choose caesarian section (c/s) without any medical indication [1]. Studies showed that except for medical indications, the maternal request is the reason for the increase in the rate of c/s [10–12]. Some researches have revealed that the most common reason of requesting c/s in nulliparous women is fear of childbirth [13–15]. Also in Iran, several researchers have shown that fear of childbirth is an important factor in increasing maternal request for c/s [16–18] and the main cause of fear is labor pain [17–19]. Negahban et al. [18], in a study on 824 pregnant women in Iran, showed that 92% of the participants preferred c/s to vaginal delivery due to the fear of labor pain (78). Other cases, such as doctors' preference [20, 21], influence of the medical staff [17], patient's awareness, fiscal stimulus, philosophy of education, and medical practice with pathological attitudes toward delivery have been considered as other reasons of the increase in c/s rate in Iran [22].

Caesarian section is one of the most commonly performed surgical operations in the world today [23]. In Iran, c/s constitutes 47% of all deliveries in the country, 52% of the deliveries in Tehran and 64% of the deliveries in private hospitals [24]. Also, over the past 30 years in a referral hospital in Tehran, the rate of c/s out of all deliveries increased from 14.3% in 1979 to 22.7% in 1989, 52.5% in 1999, and 85.3% in 2009 [25]. However, according to World Health Organization, a maximum of 15% of deliveries have medical indications for c/s [26].

Programmed interventions such as providing skills to cope with childbirth, especially for nulliparous women, facilitate the achievement of self-efficacy in pregnant women and reduce the fear of labor [27]. In methods of labor preparation such as Lamaz, increasing maternal awareness, self-confidence, and self-control are considered [28].

There are different methods of teaching. If the people involved in their learning or the more senses used in learning, the learning rate increases. Employment of multimedia technology provides correct and multi-sensorial input for the learners and can improve the quality of education [29, 30]. Electronic learning materializes many ideals of education, such as independent learning, self-learning, learning in any place and time, and fast feedback of lessons [31–33]. Studies that have compared computer-assisted education with other common training practices have shown more positive results and encouraging results [34] such as an increase in knowledge in comparison with traditional teaching [35]. Also, Hausenblas et al. [36] reported that software training of exercise during pregnancy and after delivery increased awareness and self-efficacy of the pregnant women. Escott et al. [8] suggested that training programs for labor preparation could be

provided by several electronic methods, such as websites, the Internet, and educational software (619).

Considering the high rate of c/s in Iran (3–4 times higher than what is accepted by the World Health Organization) and its growing trend [37], and the facts that fear of childbirth is one of the most common reasons for requesting c/s by nulliparous women [13–19] and increased self-efficacy in pregnant women to cope with labor has a key role in reducing their fear and anxiety, good compatibility with labor pain and selection of the delivery method [1, 2, 38, 39], presenting strategies to increase self-efficacy in pregnant women to cope with labor is necessary.

Proper education can increase self-efficacy [36, 40, 41]. Maternal education can improve their knowledge and self-confidence, and change their attitude toward vaginal childbirth. According to the approved midwife duties of Ministry of Health, Medical and Education of Iran, holding of childbirth preparation classes for mothers are the midwives' tasks [42]. But the methods of labor pain relief and preparation for labor methods are not taught to midwifery students desirably. So the midwives performed labor pain relief methods in the delivery units rarely in Iran [43]. Recently, the Ministry of Health, Medical and Education of Iran has trained some midwives for teaching in childbirth preparation classes; and has planned some strategies to run these classes [42] but these classes are not held for many pregnant women and are not available for all pregnant women in Iran. The pregnant women in Iran only receive some major information for 10–15 min during perinatal care; and they get almost any kind of birth preparation program in the healthcare system [43]. Therefore, we decided to design an educational software for pregnant women to enhance their ability to cope with labor. This learning method by its flexibility, lack of time, and space constraints and other features can affect some of the problems in the field of maternal education. If this educational method is effective, it can be used for education of many Iranian pregnant women when childbirth classes are not available for them or be used as a complementary approach along with these classes.

Methods

This study used a randomized controlled trial design and was conducted from October 2010 to February 2011 at the health centers of Ghaemshahr, Iran. Women in the study were randomly assigned to the interventional or control groups from eight health centers. In order to prevent cross-contamination through informal information sharing by the intervention group, the health centers were randomly allocated by the cluster randomization to intervention (four centers) and control (four centers) group. In each health

center, the participants were determined randomly by opaque sealed envelope technique.

Criteria for the recruitment were age range 18–35 years, being primiparous, gestational age 28–32 weeks, access to computer, ability to read and write, and no history of participation in childbirth classes. Exclusion criteria were any complication in pregnancy (such as placenta previa, previous uterine surgery reconstructive or myomectomy entering the uterine cavity, malpresentation, active genital herpes infection, multiple pregnancy, placental abruption, fetal death, premature rupture of membrane, preterm labor, any known chronic disease, gestational hypertension, infertility history, current use of cerclage in pregnancy, gestational diabetes, known mental illnesses, etc.).

The control group only received routine prenatal care so they get any kind of birth preparation programs while the intervention group received routine prenatal care and were trained by an educational software (prepared in a CD) that was designed by the researchers as the Lamaze technique to improve their ability to cope with labor. So the control group received any kind of education about birth preparation and the intervention group received only educational software as birth preparation.

Before the educational CD was delivered to mothers, the necessary instructions in order to use the CD and access its content were provided by the researcher via a personal computer. The pregnant women could use the CD whenever they wished at home. The educational software taught them how to become prepared for delivery via providing information on the delivery canal, onset of labor, labor stages, choosing the method of delivery (advantages and disadvantages of vaginal delivery and cesarean section), distinguishing between true and false labor, the non-pharmacologic ways of reducing labor pain, such as relaxation techniques, respiratory techniques, massage, music therapy, and planning for delivery. Teaching media included texts, images, video clips, and animations.

The intervention group got telephone contact (mean = 1.4, min = 1 and max = 3 contacts) by a person who had not aware of contents of CD. In these contacts they only asked the participants about their availability to use the CD and solved their problems about using the computer.

Self-efficacy in coping with labor was measured by Childbirth Self-Efficacy Inventory (CBSEI) developed by Lowe (1993). This questionnaire measures maternal confidence in coping abilities during labor. The CBSEI is a 62-item self-report instrument with four subscales and two total scores. The four subscales are: (1) outcome expectancy active labor, items 1–15; (2) self-efficacy expectancy active labor items 16–30; (3) outcome expectancy second stage of labor, items 31–46; and (4) self-efficacy expectancy second stage of labor, items 47–62. A total childbirth outcome expectancy score is computed by summing the

outcome expectancy active labor and outcome expectancy second stage of labor scale scores. A total self-efficacy expectancy score is computed by summing the self-efficacy expectancy active labor and self-efficacy expectancy second stage of labor scale scores. The total self-efficacy score is computed by summing total outcome expectancy score and total self-efficacy expectancy score [44].

The childbirth self-efficacy inventory was translated into Persian by Khorsandi (2008). The internal consistency of each of the four scales of this questionnaire was estimated by Cronbach's alpha. The indices ranged from 0.84 to 0.91 [5].

Khorsandi reported that “a majority of participants indicated that religious coping strategies, such as prayer and worshipping God might play an integral role in coping with labor. Thus, a new item was added to the four subscales of the questionnaire, which resulted in increasing the internal consistency of the instrument, ranging from 0.93 to 0.96” (p. 2850) [5].

Data regarding demographic characteristics and CBSEI of the intervention and control groups were collected at 28–32 weeks gestation as baseline (pre-test) and 6–8 weeks later, 36–38 weeks gestation, by the two groups again (post-test). A separate researcher (not the same that educated how to use CD to the participants) were involved to distribute and collect the questionnaires. So she cannot identify the groups of the participants.

The required sample size with a two-tailed alpha of 0.05 and a power of 80% was estimated 75 in each group. The initial sample size in this study was 150 pregnant women, 75 primiparas in the intervention group and 75 primiparas in the control group. Four pregnant women were excluded from follow-up in the intervention group, two for premature birth and two for moving to a different city. In the control group, six pregnant women were excluded, two for pre-eclampsia, three for premature labor, and one for fetal death. We replaced these excluded participants in two groups. So four women were added to the intervention group and six women were included in the control group. Therefore, the number of participants who completed the education program was 75, and the control group number was 75.

In order to analyze the data, the difference of the distribution of self-efficacy scores (before and after intervention) was assessed; analysis showed that it was not normal, so non-parametric tests of Mann–Whitney *U* and Wilcoxon were used. Permission to use the translated and validated CBSEI was obtained from the author. The Ethical Committee of Tehran University of Medical Sciences approved the study. The study and its aim were explained for the participants and informed consents were taken from them. This trial has been registered in Iranian Registry of Clinical Trials (IRCT). The registration ID in IRCT is IRCT201103025918N2. This study was a postgraduate thesis of Tehran University of Medical Sciences and the

funding is provided by the university. Also we declare that we have no conflict of interest.

Results

The intervention and control groups did not differ significantly in any demographic characteristics including age, educational level, and occupation of the participants and their husbands, housing, monthly family income, and family income adequacy for living. Also, there were no statistically significant differences between the two groups in familiarity with computer, access to computer, and interest in computer education (Table 1).

Tables 2 and 3 summarize the medians and means \pm standard deviations for self-efficacy in coping with labor and each of the subscales. There were no significant differences in self-efficacy ($p = 0.583$), outcome expectancy ($p = 0.496$) and self-efficacy expectancy ($p = 0.943$) between the two groups before intervention (pre-test) (Table 2). Results of Mann–whitney U test showed that there were statistically significant differences in self-efficacy in coping with labor and each of the subscales between the two groups after intervention (post-test). Analysis indicated significant differences in post-test self-efficacy ($p = 0.001$), outcome expectancy ($p = 0.001$) and self-efficacy expectancy ($p = 0.001$) between the intervention and control groups (Table 3).

Also, there were no statistical differences between pre and post-tests in self-efficacy ($p = 0.650$), outcome expectancy ($p = 0.197$) and self-efficacy expectancy ($p = 0.214$) in the control group while significant differences were noted before and after the intervention in self-efficacy ($p = 0.001$), outcome expectancy ($p = 0.001$) and self-efficacy expectancy ($p = 0.001$) in the intervention group.

Discussion

This study showed that self-efficacy of Iranian pregnant women participating in the educational software program to cope with labor significantly increased; these results are consistent with previous researches indicating that childbirth training enhances self-efficacy in pregnant women [6, 7].

The individuals with high self-efficacy are expected to be able to cope with labor pain and perceive labor and delivery as a positive experience [9] and realize more favorable outcome [1]. Women with greater self-efficacy report lower anxiety specific to childbirth [39] and decreased pain perception and required analgesia during labor [45].

In our study, self-efficacy expectancy and outcome expectancy increased significantly in the participants who received the educational software program in both the active phase and second stage of labor. The results of our study support the findings of Khorsandi et al. [6], Ip et al. [7] and Howharn [46].

In each of the four subscales in the intervention group in post-test, the scores we calculated in this study were higher than the scores of other samples using CBSEI [38, 44]. There appear to be several possible explanations for these findings. First, despite every woman's access to perinatal care in Iran, almost no type of childbirth education program exists in Iran's perinatal care system. Severe fear of labor pain and lack of childbirth education program characterize Iranian women's experience of pregnancy and birth [43]. In Iran the pregnant women rarely received information about the birth process, coping skills concerning labor pain and birth options. In addition during the recent decades, giving birth has become viewed and managed as a medical event and not a normal transition period [5]. Policies that have recently been adopted in Iran mainly focused on training specialists, while the role of midwives in maternal care has been mostly neglected [47]. Thus, it is not a surprise that, in Iran, with an intervention like software education for childbirth, the score of CBSEI raises so much. In addition, the participants were asked to see the CD for several times and act according to its recommendations. The participants had seen the CD at least three times. In overall, perhaps high motivation of participants because of the lack of childbirth class and frequent use of the CD led to high impact. In our study the participants in intervention group seemed satisfied after getting the CD or use it, but the satisfaction measurements were not validated in this study.

Median scores of self-efficacy expectancy and outcome expectancy in the control group decreased in both the active phase and second stage of labor, which is consistent with the findings of Howharn [46]. With increase the gestational age, the level of fear and anxiety of the mothers from labor pain is expected to increase; so the childbirth self-efficacy is decreased [48, 49].

The individuals with high self-efficacy are expected to be able to cope with labor pain and perceive labor and delivery as a positive experience [9] and realize more favorable outcome [1]. Women with greater self-efficacy report lower anxiety specific to childbirth [39] and decreased pain perception and required analgesia during labor [45]. Howharn reports that "knowledge of labor augments self-efficacy expectancy by minimizing fear and enhancing perceived control. Theoretically, participants in childbirth preparation programs increase their self-efficacy expectancy through cognitive and behavioral preparation for birth. These strategies help persuade participants that

Table 1 Differences in demographic characteristics between experimental and control groups ($n = 150$)

Variable	Experimental group ($n = 75$) N (%)	Control group ($n = 75$) N (%)	p -value
Age (M \pm SD)	25/17 \pm 3/89	24/79 \pm 4/21	0/890
18–23	29(38/7)	31(41/3)	
24–29	33(44)	33(44)	
30–35	13(17/3)	11(14/7)	
Educational level			
High school	16(21/3)	18(24)	0/637
Diploma	40(53/3)	42(56)	
University	19(25/3)	15(20)	
Occupation			
Housewife	62(82/7)	68(90/7)	0/150
Employed	13(17/3)	7(9/3)	
Husband Educational level			
Primary	10(13/3)	8(10/7)	0/632
High school	18(24)	23(30/7)	
Diploma	33(44)	27(36)	
University	14(18/7)	17(22/7)	
Husband Occupation			
Employee	8(10/7)	8(10/7)	0/873
Full-time job	35(46/7)	38(50/7)	
Unemployed	32(42/7)	29(38/7)	
Kind of House			
Personal	27(36)	25(33/3)	0/602
Rental	41(54/7)	39(52)	
Living with relatives	7(9/3)	11(14/7)	
Family income adequacy for living			
Adequate	20(26/7)	18(24)	0/432
Partly adequate	49(65/3)	46(61/3)	
Insufficient	6(8)	11(14/7)	
Familiar with Computer			
Low	5(6/7)	11(14/7)	0/5
Partly	35(46/7)	10(13/3)	
High	20(26/6)	33(44)	
Access to Computer			
Low	21(28)	26(34/7)	0/711
Partly	15(20)	14(18/6)	
High	39(52)	35(46/7)	
Interest in computer education			
Low	10(13/3)	21(28)	0/668
Partly	37(49/3)	42(56)	
High	28(37/3)	23(30/7)	

they are capable of coping with childbirth” [46]. Therefore, the educational software program can increase the knowledge of the pregnant women regarding labor and behaviors for coping with labor pain and promotes their self-efficacy in the face of stressful situations [36].

Several studies regarding the independent usefulness of computer-assisted learning as an educational method is

done in the world [34, 40]. An intervention study was developed by Hausenblas et al. [36] which evaluated a multimedia CD-ROM for exercise during pregnancy and postpartum. The results of this study showed that the participants who received multimedia CD-ROM training reported significantly higher self-efficacy and exercise knowledge as compared to the control group.

Table 2 Comparison median scores on self efficacy of pregnant women to cope with labor before intervention between two experimental and control groups

	Experimental group (<i>n</i> = 75) Median Mean ± SD	Control group (<i>n</i> = 75) Median Mean ± SD	<i>p</i> -value Mann-whitney <i>U</i> test
Self efficacy	395 394/07 ± 20/021	394 391/95 ± 19/8	0/583
Outcome expectancy	204 205/43 ± 11/73	204 203/33 ± 11/427	0/496
Self efficacy expectancy	191 188/64 ± 10/664	192 188/61 ± 10/397	0/943
Outcome expectancy Active Labor	103 103/67 ± 6/366	104 102/85 ± 6/383	0/610
Self efficacy expectancy active labor	98 95/51 ± 5/525	98 95/41 ± 5/388	0/982
Outcome expectancy second stage	100 101/76 ± 5/695	100 100/48 ± 5/389	0/302
Self efficacy expectancy second stage	95 93/13 ± 5/866	95 93/20 ± 5/594	0/867

Table 3 Comparison median scores on self efficacy of pregnant women to cope with labor after intervention between two experimental and control groups

	Experimental group (<i>n</i> = 75) Median Mean ± SD	Control group (<i>n</i> = 75) Median Mean ± SD	<i>p</i> -value Mann-whitney <i>U</i> test
Self efficacy	607 604/20 ± 16/630	394 392/51 ± 16/758	0/001
Outcome expectancy	307 304/61 ± 9	202 202/49 ± 9/58	0/001
Self efficacy expectancy	301 299/59 ± 8/698	193 190/01 ± 8/267	0/001
Outcome expectancy active labor	153 152/31 ± 4/598	102 101/87 ± 5/453	0/001
Self efficacy expectancy active labor	150 150/21 ± 4/598	98 96/61 ± 4/347	0/001
Outcome expectancy second stage	153 152/21 ± 4/502	100 100/63 ± 4/750	0/001
Self efficacy expectancy second stage	150 149/37 ± 4/520	95 93/85 ± 4/447	0/001

Also, Casazza et al. [40] reported that individuals who received the computer-based intervention showed increased knowledge, physical activity self-efficacy and decreased fat, decreased meals skipped. These results are consistent with our findings which suggested the effective training of software on self-efficacy.

A study by Kou et al. [41] showed that e-learning could increase maternal awareness and confidence in infant care. Also, the results of a study conducted by Meizen et al. [50] showed that women who received web-based breast-feeding education had more knowledge regarding breast-feeding and improved their breast-feeding rate [50]. The results

of a systematic study by Beranova and Sykes [51] showed that the participants in computer-based education had high knowledge levels which remained high even at 6-month follow-up. Also, they reported high satisfaction with the educational programs [51].

Results of various studies have shown that computer-assisted instruction as an independent educational method can potentially affect the achievement of the desired educational objectives. Although these studies are different from each other or our study in areas such as the educational content, methods, study design, sample size, the study population, and the quality of computer programs,

they have shown that a computer-assisted instruction can improve the knowledge [29], confidence in care newborn [41], individuals skills [26] and self-efficacy [40].

The individuals are responsible for their learning in computer training. Therefore, a deep learning is created that can be an important factor to increase self-efficacy. Evidence suggests that computer training is effective for knowledge transfer, skill development, and enhancing the ability of the individuals in different positions [31, 51].

We evaluated the self-efficacy of pregnant women to cope with labor before starting labor pain. Further studies are suggested to determine the effect of educational software in real labor. It maybe that high self-efficacy expectation and outcome expectation levels from the prenatal period will be lowered by experience. Particularly, the high intensity and frequent contractions of transition may make it difficult for a woman to cope.

Despite lack of educational childbirth classes in Iran, using this method is recommended. However, to find whether this technique can be substituted for the educational classes, further studies are needed.

Conclusion

These findings indicate that the educational software increases self-efficacy of Iranian women to cope with labor. Studies have shown that self-efficacy can decrease pain perception [45] and fear of labor [43]. Also in Iran, several researchers have shown that fear of labor is an important factor to increase maternal request for c/s and recently Iranian women's request for c/s is increased [16–18]. Finally there is an evident growing rate of c/s in Iran, which is now becoming an epidemic. Immediate strategies should be adopted to prevent the rising trend and increasing number of unnecessary c/s in Iran [47]. So it seems that the use of the educational software by Iranian pregnant women could be an effective way to reduce the c/s rate in Iran indirectly.

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