



Comparisons of the Effects of Watching Virtual Reality Videos and Chewing Gum on the Length of Delivery Stages and Maternal Childbirth Satisfaction: A Randomized Controlled Trial

Atefeh Ebrahimian^{1,2}, MSc;  Roqieh Rahmani Bilandi³, PhD 

¹Department of Midwifery, School of Medicine, Gonabad University of Medical Sciences, Gonabad, Iran;

²Student Research Committee, Gonabad University of Medical Sciences, Gonabad, Iran;

³Social Development and Health Promotion Research Center, Department of Midwifery, School of Medicine, Gonabad University of Medical Sciences, Gonabad, Iran

Correspondence:

Roqieh Rahmani Bilandi, PhD;
Department of Midwifery, School of Medicine, Gonabad University of Medical Sciences, Postal Code: 96917-93718, Gonabad, Iran

Tel: +98 51 57223028

Fax: +98 51 57223815

Email: roghaiehrahmany@yahoo.com

Received: 03 August 2019

Revised: 02 September 2019

Accepted: 08 September 2019

What's Known

- Watching virtual reality videos reduces labor pain and anxiety.
- Chewing gum alleviates anxiety in labor and shortens the length of parturition.

What's New

- Watching virtual reality videos enhances maternal childbirth satisfaction and shortens parturition stages.
- Chewing gum augments maternal childbirth satisfaction and shortens parturition stages.
- We compared the two thought divergence methods of chewing gum and watching virtual reality videos.

Abstract

Background: Maternal childbirth satisfaction is one of the important indicators of the quality of the care provided. The use of non-pharmacological therapies can make the childbirth process a pleasurable event for the mother. This study aimed to compare the effects of watching virtual reality videos and chewing gum on the length of delivery stages and maternal satisfaction.

Methods: This clinical trial study was performed on 93 women with first and second pregnancies, who were referred to Allameh Bohlool Hospital in Gonabad and Sajjadih Hospital in Torbat-e-Jam, Iran, for childbirth between 2018 and 2019. Pregnant women were randomly assigned to three groups of chewing gum, virtual reality, and control. Interventions were performed twice: in the active (dilation of 4–5 cm) and second (dilation of 7–8 cm) phases of parturition for 20 minutes each. Data were collected using data-gathering forms, including a demographic characteristics form, a midwifery characteristics form, and the Mackey Childbirth Satisfaction Rating Scale. The data were analyzed using SPSS, version 22, via the Chi square tests, ANOVA, Kruskal–Wallis, and Tukey's *post hoc* tests.

Results: The difference in the mean maternal childbirth satisfaction score between the two intervention groups of virtual reality and chewing gum was not statistically significant ($P=0.339$), but the mean score in the intervention groups was higher than that of the control group ($P<0.001$). There was no significant difference in the mean length of the active and second phases of parturition between the two intervention groups, but this value in the intervention groups was significantly lower than that of the control group.

Conclusion: The thought divergence interventions of chewing gum and watching virtual reality videos enhanced childbirth satisfaction, and curtailed parturition stages in our sample of pregnant women.

Trial Registration Number: IRCT20181214041963N1.

Please cite this article as: Ebrahimian A, Rahmani Bilandi R. Comparisons of the Effects of Watching Virtual Reality Videos and Chewing Gum on the Length of Delivery Stages and Maternal Childbirth Satisfaction: A Randomized Controlled Trial. *Iran J Med Sci.* 2021;46(1):15-22. doi: 10.30476/ijms.2019.82782.1119.

Keywords • Patient satisfaction • Virtual reality • Chewing gum • Parturition

Introduction

Pregnancy and childbirth represent a major crisis and a stressful period in a woman's life. The quality of the experiences during parturition affects the physical and emotional health of

the mother, her willingness to have another child, and her emotional relationship with the child.¹ In recent decades, studies have shown associations between enhanced maternal childbirth satisfaction and the quality of care and childbirth services provided.² A lack of satisfaction can lead to postpartum depression, lactation disorders, and changes in maternal attitude to having another child in the future, and subsequent changes in parturition with related disorders.³ The feasibility of methods capable of alleviating pain in delivery stages can transform childbirth into a positively satisfactory experience.⁴ Among these modalities, non-pharmacological and supportive treatments can, by virtue of reducing the severity of pain and fear, improve the mental and emotional aspects of childbirth, lower the incidence of elective cesarean section, and increase the statistics of natural labor.⁵ When a pregnant woman is experiencing pain and stress despite therapeutic measures, the sympathetic nervous system is in a state of constant stimulation, leading to a rise in the secretion of catecholamines and, thus, an increase in the number of pulses and the systolic blood pressure.⁶ The increase in catecholamines can reduce the blood flow from mother to fetus and ultimately result in less effective uterine contractions, and protracted parturition.⁷ It is, therefore, advisable to enhance maternal and fetal outcomes to positively affect the mother's satisfaction with delivery.⁸

Prolonged delivery stages with such concomitant maternal and fetal complications as contractile abnormalities in the uterus, fetal distress, low Apgar scores, and infant mortality can reduce satisfaction with delivery, and cause postpartum hemorrhagic disorders.⁹ As a result, measures aimed at decreasing pain and shortening the length of delivery stages can boost the mother's satisfaction with the experience of child delivery.⁴ Maternal and fetal complications limit the use of pharmacological modalities to facilitate labor, which is why more user-friendly, non-prescriptive methods with lower costs and fewer complications are more favored.¹⁰ Although there are currently many techniques to make the experience of childbirth pleasing, it is still essential to find more easily applicable methods.¹¹ One of the nonmedical interventions to lessen sensitivity is the cognitive-behavioral approach, whereby the individual's attention is distracted from a painful stimulus to an external stimulus.¹² Gum chewing is one of these thought divergence methods.¹³ This non-pharmacological approach can be adopted to alleviate stress and lower cortisol concentrations in response to stress.^{14, 15} Indeed,

a previous study showed that the mean length of the first and second phases of parturition was lower in the chewing gum group than in the control group.⁶ Another new method of thought divergence is watching virtual reality videos, whereby the individual in the virtual environment thinks that he or she is in the real world. This technology allays pain and fear by allowing the user to communicate with the virtual environment to pay less attention to the real world.¹⁶ A study in 2019 showed that the use of virtual reality significantly reduced anxiety, cognitive pain, and emotional pain during delivery stages.¹⁷ Various independent studies have demonstrated that both watching virtual reality videos and chewing gum are effective in assuaging pain and anxiety in delivery stages. Still, there is a dearth of data on the efficacy of non-pharmacological methods in enhancing maternal satisfaction with labor experience.

Accordingly, the present study aimed to compare the effects of watching virtual reality videos and chewing gum on the length of delivery stages and maternal childbirth satisfaction.

Patients and Methods

The present three-group clinical trial was conducted on 93 pregnant women, who referred to Allameh Bohlool Hospital in Gonabad and Sajjadih Hospital in Torbat-e-Jam, Iran, for childbirth between 2018 and 2019. This study is a part of a larger study that examines the results of maternal childbirth satisfaction and the length of delivery stages. The study protocol was approved by the Ethics Committee of Gonabad University of Medical Sciences (Code: IR.GMU.REC.1397.088) and was registered with the Clinical Trials Code of IRCT20181214041963N1.

The required sample size for the one-way analysis of variance (ANOVA) was calculated using G*Power software,¹⁸ version 2.9.1.3, based on numerical methods to obtain the number of samples in k groups ($k=3$). The effect size of "F" was 0.35, the maximum first type error was 5%, the test power was 80%, and the number of comparison groups was three. The sample size was determined at 84. Considering a 10% drop in the final sample size, we divided 96 pregnant women into three groups.¹⁸

$$\frac{\sum (\bar{y}_L - \bar{y}_{..}) / (k - 1)}{\sum \sum (y_{ij} - \bar{y}_L) / (n - k)}$$

$$F_{1-\alpha}(k - 1, n - k) > F_{1-\beta}(k - 1, n - k)$$

The inclusion criteria consisted of first and second pregnancies; low-risk pregnancy; live fetus; an estimated fetus weight of up to 4000 g;

singleton pregnancy; maternal age of 18 to 35 years; gestational age of 37 to 42 weeks; entrance into the active phase of labor; willingness to participate in the study; and the absence of the following: medical and psychological disorders, abnormal fetal or intrauterine growth restriction, vertebral vasectomy, indications for cesarean section, a history of motion disorders, blindness, addiction, and a time-lapse of less than eight hours from the rupture of the fetal membrane.

The exclusion criteria were comprised of the following: the mother's reluctance to cooperate, the occurrence of midwifery problems, less than 20 minutes of chewing gum, less than 20 minutes of virtual reality video watching, the use of Entonox, and spinal and epidural anesthetics.

Data were collected using data-gathering forms, comprising a demographic characteristics form (including information on age, education, occupation, and economic status), a midwifery characteristics form (including information on gestational age, the number of pregnancies and deliveries, pregnancy requirements, and participation in childbirth preparation classes), and the Mackey Childbirth Satisfaction Rating Scale. The demographic characteristics form was submitted for review to 10 faculty members, whose corrective comments were subsequently applied. The Mackey Childbirth Satisfaction Rating Scale contains 18 questions about satisfaction with delivery rated on a five-point Likert scale, ranging from "very satisfied" (score 5) to "very dissatisfied" (score 1). In total, scores of 1 to 22 denote very dissatisfied, 23 to 45 dissatisfied, 46 to 68 satisfied, and 69 to 90 very satisfied. The Persian version of this scale was confirmed through the content validity method, and its reliability was validated by Moody and others,⁴ with an internal consistency of 0.78.

Nonrandom sampling (available) method was employed, and sextet blocks were used to randomly assign the samples to intervention and control groups. First, six possible block states were listed, and each block was assigned a number from one to six, and then, a number between one and six was selected randomly. Afterward, the participants were assigned to the virtual reality group (B), the chewing gum group (C), and the control group (A), based on the block corresponding to the selected number. At the beginning of the study and after the provision of written informed consent by the participants, the demographic and midwifery characteristics forms were completed using hospital files. For the chewing gum group, Orbit Mint gum (sugar-free; Wrigley Company, USA) with a weight of 1 g was used in two stages: at the beginning of the active (dilation of 4–5 cm) and second (dilation

of 7–8 cm) phases of parturition. The mothers were asked to run their natural chewing speed for at least 20 minutes. In the virtual reality group, virtual reality goggles were used in two stages: at the beginning of the active (dilation of 4–5 cm) and second (dilation of 7–8 cm) phases of parturition. Each intervention was performed for 20 minutes. In the virtual reality group, a 360° video of natural sceneries such as rivers, shores, waterfalls, and lakes were used.¹⁹ There was no intervention in the control group except for routine care. The labor position for all the mothers was the lithotomy position. In the research process, the researcher recorded the duration of the active phase and the length of the second stage of child delivery in minutes. The Mackey Childbirth Satisfaction Rating Scale form was completed by all three groups after their condition became stable in the postpartum section.

In this study, the researcher was present in the morning, evening, and night shifts for sampling in the maternity ward. The statistical analyst was blinded to the grouping of the participants and performed the statistical analyses based on groups A, B, and C. The participants and researchers, as opposed to the statistical analyst, were not blind to the intervention. The Kolmogorov–Smirnov test was used for data normalization. The data were analyzed using SPSS, version 22, via ANOVA, Kruskal–Wallis, and *post hoc* Tukey tests. Additionally, the Chi square tests were applied for the qualitative data. The significance level was considered to be 0.05.

With regard to ethical considerations, the participants were reassured about the ethicality of the research methods, and the dissemination of the findings, the strict confidentiality of their information, their ability to leave the study at any phase of the research, and the absence of any known physical or psychological harm.

Results

During the intervention, three participants (one of each group) were excluded from the study, due to high concentrations of meconium and fetal bradycardia in the active phase. The curtailment diagram of this study is presented in figure 1. The findings showed no statistically significant differences between the three groups of mothers in relation to the demographic characteristics such as education, occupation, and family status, and midwifery characteristics such as maternal age, gestational age, wanted pregnancy, number of pregnancies and deliveries, and participation in pregnancy preparation classes (table 1). The mean score of the first-minute Apgar

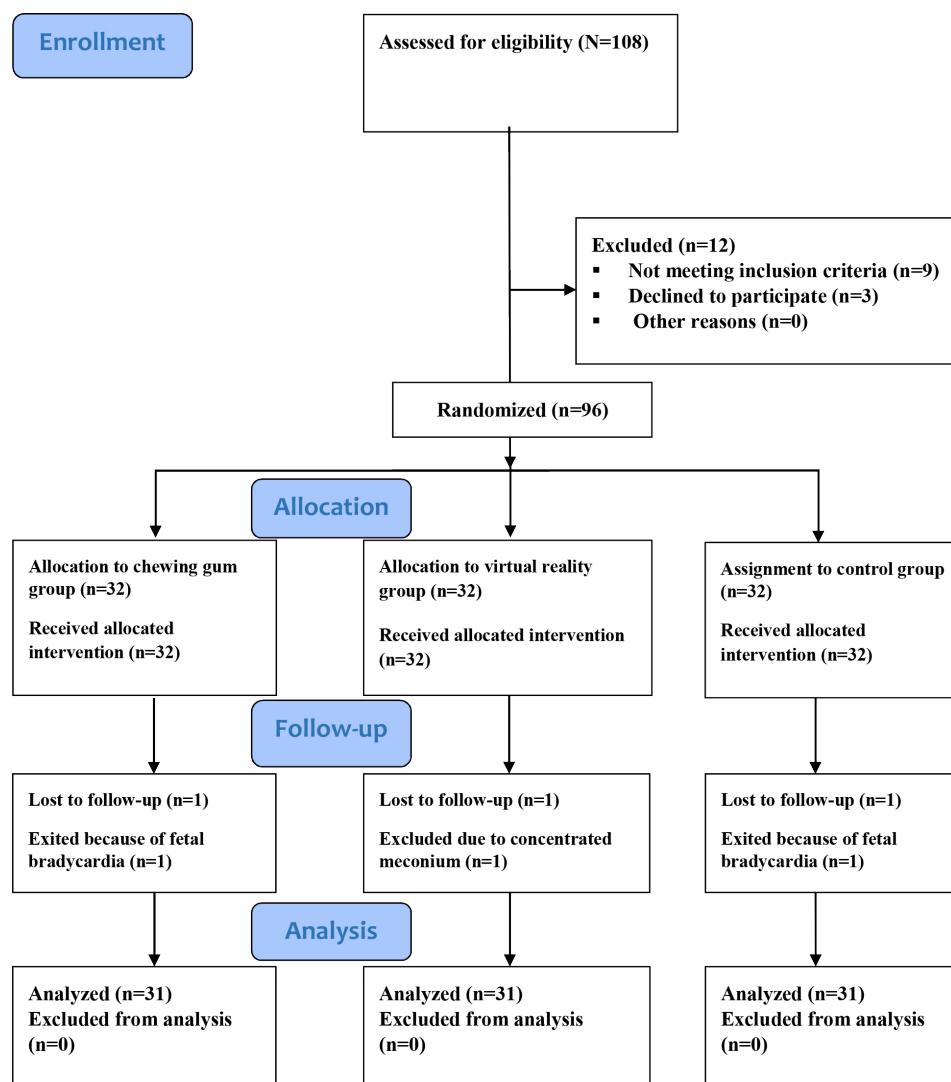


Figure 1: CONSORT diagram shows the flow of the participants through each stage of the present three-group randomized trial

Table 1: Demographic and midwifery characteristics in the three groups of chewing gum, virtual reality, and control

Variable		Virtual Reality N (%)	Chewing Gum N (%)	Control N (%)	P value
Education level	Illiterate	0 (0%)	2 (6.45%)	0 (0%)	0.069
	Below high school	14 (45.16%)	12 (38.70%)	11 (35.48%)	
	Diploma	16 (51.61%)	9 (29.03%)	13 (41.94%)	
	Academic	1 (3.23%)	8 (25.82%)	7 (22.58%)	
Occupation	Homemaker	31 (100%)	27 (87.09%)	28 (90.32%)	0.178
	Student or employed	0 (0%)	4 (12.91%)	3 (9.68%)	
Socioeconomic Status	Poor	19 (61.29%)	14 (45.16%)	14 (45.16%)	0.341
	Average	12 (38.71%)	17 (54.84%)	17 (54.84%)	
Pregnancy Condition	Wanted	30 (96.77%)	27 (87.09%)	28 (90.32%)	0.384
	Unwanted	1 (3.23%)	4 (12.91%)	3 (9.68%)	
Participation in Maternal Readiness Classes	Yes	7 (22.58%)	13 (41.93%)	9 (29.03%)	0.264
	No	24 (77.42%)	15 (58.07%)	22 (70.97%)	
Fundamental Pressure	Yes	9 (29.03%)	9 (29.03%)	11 (35.48%)	0.818
	No	22 (70.97%)	22 (70.97%)	20 (64.52%)	
Gravida	1	15 (48.38%)	16 (51.62%)	23 (74.19%)	0.081
	2	16 (51.62%)	15 (48.38%)	8 (25.81%)	
Parturition	0	18 (58.07%)	18 (58.07%)	25 (80.64%)	0.097
	1	13 (41.93%)	13 (41.93%)	6 (19.36%)	

*Analyzed by the Chi square test

Table 2: Mean of the maternal childbirth satisfaction scores in the three groups of chewing gum, virtual reality, and control *

Variable	Virtual Reality mean±SD	Chewing Gum mean±SD	Control mean±SD	P value
Delivery Satisfaction	79.64±5.48	77.77±5.35	69.35±4.77	<0.001

*Analyzed by ANOVA

Table 3: Mean score of the length of the delivery stages in three groups of chewing gum, virtual reality, and control *

Variable	Virtual Reality mean±SD	Chewing Gum mean±SD	Control mean±SD	P value
Active Phase Length (min)	271.12±52.05	266.61±73.86	304.51±65.66	0.001
Length of the Second Stage (min)	21.61±6.50	21.29±6.82	26.45±6.60	0.007

*Analyzed by Kruskal–Wallis statistical test

($P=0.858$) and the fifth minute Apgar ($P=0.368$) was also not significantly different between the three study groups. The mean age of the mothers participating in the study was 24.23 ± 4.44 years, and the mean gestational age was 39.31 weeks. The majority of the participants were experiencing their first pregnancy (65.6%), and most of them had episiotomy incisions during labor (77.4%). The mothers in the three groups did not show statistically significant differences concerning oxytocin levels ($P=0.177$), other delivery accelerators, and pain relievers. The ANOVA test revealed a significant difference between the three groups in terms of satisfaction with the experience of delivery ($P<0.001$) (table 2). According to the Tukey's *post hoc* test, whereas the mean maternal childbirth satisfaction score was not significantly statistically different between the intervention groups ($P=0.339$), the mean score of the two intervention groups was significantly higher than that of the control group ($P<0.001$). The Kruskal–Wallis test demonstrated that the time interval from the mothers' admission to the parturition active phase was 115.4 ± 37 minutes for the chewing gum group, 128 ± 42 minutes for the virtual reality group, and 140.3 ± 41 minutes for the control group, indicating that the three groups were homogeneous in this regard ($P=0.063$). Nonetheless, the mean length of the active and second phases of labor was significantly different between the three groups (table 3). The Tukey's *post hoc* test showed that the mean length of the active phase was not significantly different between the two intervention groups ($P=0.955$), but this value in the intervention groups was significantly less than that of the control group ($P<0.001$). The mean length of the second stage did not differ significantly between the two intervention groups ($P=0.980$), but this value in the intervention groups was significantly less than that of the control group ($P<0.014$). The results indicated the efficacy of chewing gum and watching virtual reality videos in curtailing

the length of the active and second phases of parturition as well as enhancing maternal childbirth satisfaction.

Discussion

The results of the current study showed that the thought divergence methods of chewing gum and watching virtual reality videos enhanced maternal childbirth satisfaction, and shortened the length of the active and second phases of parturition in mothers with first and second pregnancies. Various studies have indicated that maternal childbirth satisfaction can be boosted via women's empowerment, and a sense of self-control in choosing non-pharmacological methods to lessen the severity of labor pain and the duration of its stages.^{20, 21} We drew upon the Mackey Childbirth Satisfaction Rating Scale to assess the satisfaction of mothers with the experience of delivery. One of the dimensions of this scale is satisfaction with the severity of pain and overall satisfaction with delivery. So far, no study has been published on the impact of the use of virtual reality and chewing gum on satisfaction with the experience of child delivery. The pain and anxiety in the active phase of parturition by increasing the levels of catecholamines and cortisol can cause disorders in uterine contractions, and ultimately prolong parturition stages. It appears that non-pharmacological interventions are capable of alleviating pain by lessening the severity of pain and anxiety. This change can subsequently prevent the elevation in the levels of catecholamines and adrenalin and, as a result, facilitate childbirth.

The current investigation is the first of its kind to evaluate satisfaction with parturition experience after thought divergence interventions of chewing gum and watching virtual reality videos. To ensure the comprehensiveness of the results, we performed the interventions in mothers with first and second pregnancies and selected three homogeneous groups in terms of pregnancy and

delivery. Hanjani and colleagues²¹ conducted a study on 80 primiparous women, and reported that local therapeutic interventions increased the mothers' satisfaction by decreasing labor pain and the duration of parturition stages. In their review study, Rosen and others concluded that reducing labor pain without causing side effects for mother and fetus was associated with increased maternal childbirth satisfaction.²² Scholey and others found that chewing gum diminished negative mood and cortisol levels during experimental acute stress.²³ They also reported that chewing gum increased the heart rate and the blood flow to the brain by boosting the metabolism of glucose in the frontal cortex and, as a result, lowering the concentration of cortisol in response to stress. In the present study, it appears that the increase in the satisfaction rate of the mothers in the virtual reality and chewing gum groups was associated with reduced labor pain, and shortened parturition stages, which is consistent with the results of the abovementioned studies. The ability of pregnant women to choose self-doable childbirth facilitation techniques can not only alleviate labor pain, and enhance satisfaction but also augment control over the process and thus, boost self-confidence. Furthermore, reducing cortisol levels exerts a significant effect on anxiety, and thus, facilitates delivery.

In the present study, the two thought divergence interventions had a positive impact on maternal delivery satisfaction and delivery length in the three study group mothers, who were not significantly different concerning socio-demographic characteristics such as age, education, occupation, and economic status and midwifery characteristics such as the number of pregnancies and deliveries, participation in pregnancy preparation classes, labor position, neonatal Apgar scores in the first and fifth minutes, and the interval from admission to the onset of the active phase. The fact that our three study groups were homogeneous indicates that the mothers' satisfaction was the result of interventions and pain control.

We found that the thought divergence interventions of chewing gum and watching virtual reality videos influenced the length of the active and second phases of child delivery insofar as the length of the active and second phases was significantly lower in the two intervention groups than in the control group. The existing literature contains very few studies on the effect of chewing gum or watching virtual reality videos on the length of delivery stages. Makvandi and colleagues studied 66 primiparous women and reported that the

length of the active and second stages of child delivery in their chewing gum group was lower than that of their control group. They posited that a drop in anxiety levels was the cause of the reduction in labor stages. Their result regarding the efficacy of chewing gum in assuaging stress is concordant with our findings.⁶ A study by Salari and others on the effect of gum chewing on salivary cortisol in the first stage of parturition in 60 primiparous women indicated that chewing mint gum lowered the level of salivary cortisol, and thus, reduced the level of stress and anxiety.¹⁴ According to Sketchley-Kaye and colleagues, chewing gum was able to cause a change in apparent anxiety in socially stressful situations. The authors simulated stressful conditions, and found that gum chewing ameliorated anxiety and augmented consciousness, but it failed to affect the level of satisfaction.²⁴ These results indicate the effect of anxiety and pain on the length of delivery stages and are consistent with the results of our study concerning the efficacy of gum chewing in shortening the length of parturition.

Frey and others and Pratiw and colleagues showed that watching virtual reality videos with 360° goggles during the first stage of parturition reduced pain and anxiety, which is in the same line with our findings as regards the efficacy of watching virtual reality videos in shortening delivery length, probably due to reduced pain and labor anxiety.^{17, 19}

A salient limitation of the present study is that the participants' perceptions and impressions with respect to their parturition were affected by their individual, cultural, and psychological differences, notwithstanding our efforts to minimize them through random group assignment. The strength of this study, however, lies in our effort to limit the research scope to assessing the effects of watching virtual reality videos and chewing gum on the process of childbirth. Our study should pave the way for further research, since not only do our two thought divergence interventions have a significant side-effect-free impact on facilitating the parturition process but also they are readily available and low cost.

Conclusion

Our two thought divergence interventions of chewing gum and watching virtual reality videos during the active phase of labor were effective in enhancing maternal childbirth satisfaction and curtailing the length of parturition phases. These effects were similar for mother and fetus, and there was no side effect.

Acknowledgment

This study is a part of a master's degree thesis by Atefeh Ebrahimian granted by Gonabad University of Medical Sciences. The authors would like to thank the Research Affairs Department of Gonabad University of Medical Sciences, Allameh Bohlool Hospital in Gonabad, Sajjadih Hospital in Torbat-e-Jam, and all the professors and participants in this research. We would like to express our gratitude to Mohammad Reza Rahmani and Zahra Sabzeh for their scientific cooperation.

Conflict of Interest: None declared.

References

- Vaziri F, Khademian Z, Behbahani BM. Qualitative investigation of experiences and perception of primiparous women regarding childbirth in women referring to educational hospitals of Shiraz University of Medical Sciences. *Modern Care Journal*. 2012;9. Persian.
- Jha P, Larsson M, Christensson K, Skoog Svanberg A. Satisfaction with childbirth services provided in public health facilities: results from a cross-sectional survey among postnatal women in Chhattisgarh, India. *Glob Health Action*. 2017;10:1386932. doi: 10.1080/16549716.2017.1386932. PubMed PMID: 29087240; PubMed Central PMCID: PMC5678347.
- Sayed W, AbdEIAal D, Mohammed HS, Abbas AM, Zahran KM. Maternal satisfaction with delivery services at tertiary university hospital in upper Egypt, is it actually satisfying. *Int J Reprod Contracept Obstet Gynecol*. 2018;7:2547-52. doi: 10.18203/2320-1770.ijrcog20182859.
- Kordi M, Bakhshi M, Masoudi S, Esmaily H. Effect of Prenatal Psychological Trainings on Satisfaction with Childbirth and Maternal Role Competence in Primiparous Women. *Journal of Mazandaran University of Medical Sciences*. 2018;28:98-108. Persian.
- Jafari E, Mohebbi P, Rastegari L, Mazloomzadeh S. The comparison of physiologic and routine method of delivery in mother's satisfaction level in Ayatollah Mosavai Hospital, Zanjan, Iran, 2012. *The Iranian Journal of Obstetrics, Gynecology and Infertility*. 2013;16:9-18. Persian.
- Makvandi S, Zargar Shoshtari S, Montazeri S, Ahangarpour A. The effect of chewing sugar-free gum on the anxiety level of active phase of labor in nulliparous women. *Razi Journal of Medical Sciences*. 2013;20:9-15. Persian.
- Hekmatzadeh S, Mirmolaei S, Hoseini N. The effect of boiled dill (*Anethum graveolens*) seeds on the long active phase and labor pain intensity. *Armaghane danesh*. 2012;17:50-9. Persian.
- Zare S, Zandvakili F, Soofizade N, Farhadifar F, Sadrinezhad A. Evaluation of the causes and maternal and fetal complications in prolonged pregnancy compared with term pregnancy in Sanandaj Besat hospital during 2013-2014. *The Iranian Journal of Obstetrics, Gynecology and Infertility*. 2017;20:29-34. Persian.
- Fathi L, Amraei K. Effects of Phoenix dactylifera Syrup Consumption on the Severity of Labor Pain and Length of the Active Phase of Labor in Nulliparous Women. *Iran Journal of Nursing*. 2019;31:18-27. doi: 10.29252/ijn.31.116.18. Persian.
- Mirghafourvand M, SehhatieShafaie F, Vosoughi-Niri J. The effect of non-pharmacological methods of labor pain relief on mothers' perceived stress: A randomized controlled trial. *Journal of Ardabil University of Medical Sciences*. 2014;14:398-411. Persian.
- Siddiquee NA. E-government and transformation of service delivery in developing countries. *Transforming Government: People, Process and Policy*. 2016;10:368-90. doi: 10.1108/TG-09-2015-0039. Persian.
- Indovina P, Barone D, Gallo L, Chirico A, De Pietro G, Giordano A. Virtual Reality as a Distraction Intervention to Relieve Pain and Distress During Medical Procedures: A Comprehensive Literature Review. *Clin J Pain*. 2018;34:858-77. doi: 10.1097/AJP.0000000000000599. PubMed PMID: 29485536.
- Hirano Y, Onozuka M. Chewing and attention: a positive effect on sustained attention. *Biomed Res Int*. 2015;2015:367026. doi: 10.1155/2015/367026. PubMed PMID: 26075234; PubMed Central PMCID: PMC4449948.
- Salari P, Alavian F, Fayyazi Bordbar MR, Hashemi E. The effect of mint chewing gum on salivary cortisol the first stage of labor in nulliparous women. *Evidence Based Care*. 2013;3:17-26. Persian.
- Mansouri A, Vahed AS, Shahdadi H, Mehr SD, Arbabisarjou A. A comparative study on the effect of sugarless chewing gum with sugarless candy on xerostomia in patients undergoing hemodialysis. *Bali Med J*. 2018;7:146-51. doi: 10.15562/bmj.v7i1.844.

- 16 Yokoyama I, Sarai T, Asai T, Kitou N, Nozaki H, Kondo Y, et al. Virtual reality and augmented reality applications and simulation in vascular access management with three-dimensional visualization. *J Vasc Access*. 2019;20:65-70. doi: 10.1177/1129729818776904. PubMed PMID: 31032726.
- 17 Frey DP, Bauer ME, Bell CL, Low LK, Hassett AL, Cassidy RB, et al. Virtual Reality Analgesia in Labor: The VRAIL Pilot Study-A Preliminary Randomized Controlled Trial Suggesting Benefit of Immersive Virtual Reality Analgesia in Unmedicated Laboring Women. *Anesth Analg*. 2019;128:e93-e6. doi: 10.1213/ANE.0000000000003649. PubMed PMID: 31094789.
- 18 Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G*Power 3.1: tests for correlation and regression analyses. *Behav Res Methods*. 2009;41:1149-60. doi: 10.3758/BRM.41.4.1149. PubMed PMID: 19897823.
- 19 Pratiwi I, Husin F, Ganiem AR, Susiarno H, Arifin A, Wirakusuma F. The effect of virtual reality on pain in primiparity women. *International Journal of Nursing and Health Science*. 2017;4:46-50.
- 20 Ganji Z, Shirvani MA, Rezaei-Abhari F, Danesh M. The effect of intermittent local heat and cold on labor pain and child birth outcome. *Iran J Nurs Midwifery Res*. 2013;18:298-303. PubMed PMID: 24403926; PubMed Central PMCID: PMC3872865.
- 21 Moghimi Hanjani S, Mehdizadeh Tourzani Z, Zeighami Mohammadi S, Nasrollahi S, Haghghi Khoshkho N, Tajvidi M. The Effect of Local Heat Therapy Method on Pain, Child-birth's Outcomes, and Rate of Satisfaction in Primiparous Women: Randomize Clinical Trial. *Qom University of Medical Sciences Journal*. 2018;12:35-43. doi: 10.29252/qums.12.5.35. Persian.
- 22 Rosen MA. Nitrous oxide for relief of labor pain: a systematic review. *Am J Obstet Gynecol*. 2002;186:S110-26. doi: 10.1067/mob.2002.121259. PubMed PMID: 12011877.
- 23 Scholey A, Haskell C, Robertson B, Kennedy D, Milne A, Wetherell M. Chewing gum alleviates negative mood and reduces cortisol during acute laboratory psychological stress. *Physiol Behav*. 2009;97:304-12. doi: 10.1016/j.physbeh.2009.02.028. PubMed PMID: 19268676.
- 24 Sketchley-Kaye K, Jenks R, Miles C, Johnson AJ. Chewing gum modifies state anxiety and alertness under conditions of social stress. *Nutr Neurosci*. 2011;14:237-42. doi: 10.1179/1476830511Y.0000000017. PubMed PMID: 22053754.