

The Effect of an Educational Program Based on the Theory of Planned Behavior on Maternal-fetal Attachment in Primigravid Women

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ABSTRACT

Background & aim: Poor awareness of mothers toward fetal development leads to anxiety and may harm the Maternal-Fetal attachment. This study investigated the effect of an educational program based on the Theory of Planned Behavior (TPB) on Maternal-Fetal Attachment (MFA) in primigravid women.

Methods: This quasi-experimental study was conducted on 106 couples (in two groups of 53) using a convenience sampling method from 4 health centers, which randomly selected in Ahvaz, Iran, in 2016-2017. The intervention group participated in six sessions of maternal-fetal attachment training. Both groups were evaluated using two questionnaires before and four weeks after the intervention. Data were analyzed with SPSS-22 software using paired t-test and independent t-test at a significant level of 0.05

Results: Mean score of MFA after intervention in intervention and control groups (63.1±4.3 vs 57.8±4.3) was significantly different ($P < 0.001$). Also, the mean score of knowledge (5.9±3.7 vs 4.1±5.1), attitude (78.3±3.7 vs 71.2±5.1), subjective norm (45.9±1.9 vs 41.5±3.5), perceived behavioral control (56.7±1.9 vs 50.8±3.6), and behavioral intention (12.8±2.7 vs 9.6±1.2) of pregnant mothers were statistically different between the intervention and control groups ($P < 0.001$).

Conclusion: The results of this study showed that educational intervention based on TPB can be useful and effective in promoting MFA. So, it appears that this model is an effective strategy for behavior change in the field of attachment.

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Introduction

Pregnancy is one of the most valuable and sensitive periods in every woman's life (1). This period involves many physiological, biochemical, and anatomical changes in the mother. Additionally, her lifestyle and self-image may change significantly during this time (2). Pregnancy is a different experience from previous experiences of life with many tensions

that can be one of the most painful and anxious moments that mothers experience in their lives (3-4). Long-term anxiety stimulates the autonomic nervous system and thus uterus-placental blood flow decreases, oxygenation in the uterine decreases, fetal heart rate pattern becomes abnormal, tension and stretching of muscle increases, and stress, fatigue and

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sensitivity to pain increases in the mother and it reduces her ability to adapt to labor pain (5-7).

On the one hand, the lack of awareness and knowledge of primigravid mothers about taking care of the infant, newborn's growth and development, natural characteristics, behaviors and diseases leads to anxiety in mothers, reduces the enjoyment of maternal relationships and has a negative effect on MFA (8). Attachment begins from the beginning of pregnancy and gradually increases and reaches its peak in the third trimester and continues until delivery, which plays an important role in the mother's successful compliance with pregnancy (7). One of the factors influencing the quality of fetal and neonatal care and the increase of maternal-neonatal interactions is maternal role attainment, which depends on the mother's awareness and knowledge of her motherhood role and her ability to learn and play the role of a mother (9). A part of the natural development of the infant depends on the maternal-neonatal interaction which that connects them through psychological and physiological responses. Emotional responses of the mother and infant reflect a complex process called attachment which plays an important role in the development of an infant (10-12).

Research shows that educational interventions and the performance of specific behaviors can lead to increased MFA (13). The value of educational programs depends on the correct use of theories and models used in education (14). Accordingly, due to the limited studies conducted in this area, the Theory of Planned Behavior (TPB) is used in this study.

The rise of theories after the 19th century coincided with the attention of psychologists to the notion of attitude. These kinds of theories suggested that attitudes are capable of explaining human actions (15). Studies show that the most effective educational programs are based on theory-driven approaches rooted in patterns of behavior change. The choice of a health education model is the most important step in the planning process of an educational program while effective health education depends on the researcher's ability to use the best theories and models (16-17).

TPB was developed by Ajzen & Fishbein in 1980 and is one of the models of behavior

change (social-cognitive model of value expectations). It states that intention is the main determinant of behavior and is influenced by the following three independent constructs: an individual's attitude toward behavior, subjective norms, and perceived behavioral control (18).

Indeed health behavior is influenced by three independent constructs of attitude, subjective norms and perceived control. Attitude reflects a person's positive or negative evaluation of behavior. Subjective norm means that people's behavior is influenced by different people in the society such as: wife, mother, doctor, friends, family and so on, Perceived behavioral control is the degree of a people's feeling about the extent to which performing or not performing a behavior is under the control of their will. (Figure 1) (19). Based on the TPB, for increasing maternal and fetal attachment, the more favorable the person's attitude toward a behavior, the more likely they are to do that (20).

According to Klobas and some other researchers, TPB is a useful model for studying fertility and can be used for fertility-related decisions (21-23).

The results of studies based on educational models theory of planned behaviour and BASNEF model reported a positive impact on mother's attitudes toward infant's nutrition and care (24-256), promoting physical activity and nutritional behaviors (26-27). Khoury AJ et al. showed that increased awareness and knowledge leads to a change in mothers' attitude toward breastfeeding infants (28).

Exclusive Breastfeeding, physical activity and health, choice of delivery, and breastfeeding (29-31) have been studied based on the theories in Iran and the world in areas such as smoking and AIDS prevention skills but there is no study on MFA. In this study, we used TPB that is not used in previous studies. TPB is one of the theories used in health education and training programs. Nowadays, the effectiveness of health education programs depends on the correct use of the theories for health education. Therefore, this study aimed to investigate the effect of TPB-based education on MFA in primigravid women.

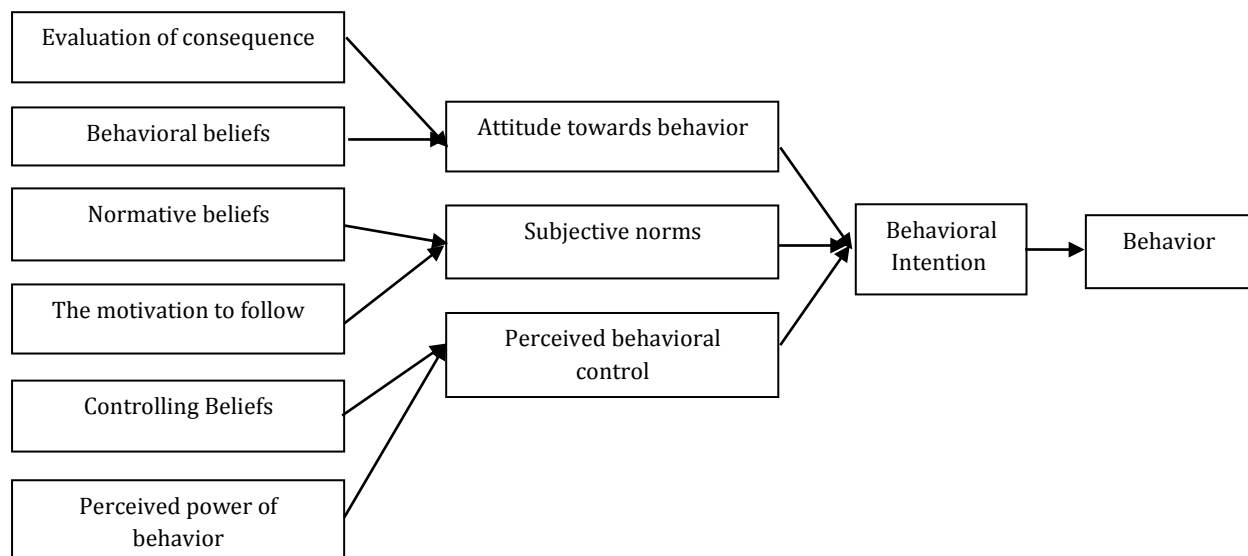


Figure 1. Theory of Planned Behavior

Materials and Methods

This quasi-experimental study with a pre-test post-test design, and a purposeful sampling was carried out on 106 sample (53 women per group) among primigravid women with a gestational age of 24-30 weeks referred to Ahvaz Health and Social Care centers in 2016-2017.

The sample size was determined based on a previous study (1) using the formula of differences between two sample means. PASS software provides sample size tools for over 1100 statistical test and confidence interval scenarios - more than double the capability of any other sample size software. In relation to the constructs of attachment behaviors, the highest sample size was related to the construct of maintaining close relationships between mother and infant (mean of intervention group: 44.8 ± 1.4 , mean of control group: 41.6 ± 7.4 .) (1). Considering the parameters of $\alpha=0.05$, test power of 80%, $\delta=3.2$, $m_1=41.6$, $m_2=44.8$, and SD pooled=5.3, the estimated sample size was $n=90$, and n per group=45 ($n_1=n_2=45$). The sample size was increased to 53 persons in each group considering 20% attrition (total=106 people).

The study inclusion criteria were being a primigravid woman with singleton pregnancy and gestational age of 24-30, lack of mental

illness (psychosis, schizophrenia) and chronic malaise (cardiovascular disease, hypertension and diabetes) (according to medical records), with minimum literacy of reading and writing (elementary). The study exclusion criteria were unwillingness to continue to participate in the study, absence for more than one session in educational classrooms, refusal to participate in the study or relocation, and not participating in pre-test, post-test or both of them.

Sampling was done in 2016 for 3 months from July to September. Ahvaz Health and Social Care centers had 7 centers among which 4 Healthcare Centers number 1, 3, 6, and 7, were selected randomly (by a coin flip) in which two centers were randomly assigned to the experimental group and two centers to the control group.

The data collection tools in this study included:

a) Cranley's Maternal-Fetal Attachment Scale (MFAS): This self-report questionnaire was completed by pregnant women. In this questionnaire, maternal and fetal behaviors were examined by 24 items in five dimensions of: accepting the role of motherhood, interaction with the fetus, attributing characteristics to the fetus, distinguishing between self and fetus, and devotion. In this questionnaire, pregnant women are asked to select answers to each phrase based on their feeling as follows: Definitely yes (3 points), I do not know or I am

not sure (2 points), definitely no (1 point). So the lowest score is 24 and the highest score is 72. This questionnaire was translated by Khorram-Roodi in Iran and its reliability and validity was determined using various methods. The validity of this questionnaire was confirmed by 10 faculty members of the Faculty of Nursing and Midwifery, Iran University of Medical Sciences and its reliability was confirmed by the test-retest method with Cronbach's alpha of 85% (32).

b) Self-structured questionnaire based on TPB in the field of the maternal role: Due to the lack of a standard questionnaire in this field, different resources, reference books and relevant studies in this field were used and the above-mentioned questionnaire was developed. The validity of the questionnaire was confirmed by 8 experts (five professors of Health Education and Health Promotion as well as Ph.D. students and three faculty members of the department of midwifery). To assess its reliability, the questionnaire was completed by 30 eligible individuals. The re-test was performed after 14 days and the Cronbach's alpha coefficient was calculated using a test-retest including values of knowledge (0.85), attitude (0.81), subjective norms (0.73), perceived behavioral control (0.80) and behavior intention (0.86) that showed a reliability of the questionnaire.

The questionnaire contained 70 items and consisted of two parts. The first part includes the demographic information of the pregnant woman and her husband with 20 items and the second part contained items related to TPB constructs scored by a 5-point Likert scale as completely agree (5), agree (4), no idea (3), disagree (2), and completely disagree (1). Items on the construct of knowledge had a maximum score of 6; items about the construct of attitude to the attachment of mother to the fetus had a minimum score of 17 and a maximum score of 85 points; Items about the construct of the subjective norm had a minimum score of 10 and a maximum score of 50 points; items on the perceived behavioral control construct relative to the maternal attachment to the fetus had a minimum score of 12 and a maximum score of

60 points; and items about the behavioral intention (5 items) had a 5-point Likert scale (scoring of 1-5), which in total the construct of behavioral intention to the attachment of mother to the fetus (minimum 5 and maximum 25 points). The statement #2 of the construct of the intention was scored in reverse. The direct intervention was conducted for 15-member groups of pregnant women in the intervention group during 4 sessions of 90 minutes, as two sessions per week for two weeks. In addition, indirect education interventions for relatives of pregnant women (husband, family) were provided by presenting pamphlets and a booklet containing the contents of the training sessions through pregnant women (Table 1). Pregnant women were asked to take note of daily experiences and behaviors of themselves and their husbands and if they wished they could present them at the end of the next session. At the end of each session, the evaluation of the training session was conducted orally as a summary of the subjects provided by the volunteers with the confirmation of the educator. Also, training was reinforced twice a week by sending text messages to pregnant women and their husbands. Overall evaluation was performed before training classes (pre-test) and one month after completing the educational intervention (post-test). Besides, during the study, 7 people from each group were excluded from the study due to amniotic fluid reduction, bleeding, high blood pressure, premature birth, diabetes, and migration, and 53 people remained in each group at the end of the study (Table 1). Common educational methods which has been used included; Interactive lecture, Question and answers, along with computer-aided teaching aids, video projector, PowerPoint, moulage, whiteboard, marker, slide and booklet.

Data were analyzed by SPSS-22 software using paired t-test and independent t-test.

Paired t-test was used for MFA in intervention group before and after the intervention. Independent t-test was used for comparison between MFA scores in the control and intervention groups before and after intervention.

Table 1. Title and content of training sessions in the intervention group

	Title	Content
1	Promoting mother's knowledge and awareness	Physical and mental changes in the mother during pregnancy, fetal growth in different months of pregnancy
2	The concept of maternal attachment to the fetus and its benefits to maternal and fetal health	Education of behaviors involving maternal attachment to the fetus and their practical implementation (touching and stroking the fetus from the abdomen, counting fetal movements, talking to the fetus, calling the fetus by name, guessing the embryo's parts, looking at the abdomen, paying attention to the movement of the embryo, and the imagination of infant's hugging and breastfeeding) to change the attitude of mothers towards fetus, adoption and performance of mother-to-fetus attachment behaviors
3	Increasing the perceived behavioral control and self confidence	Empowering pregnant mothers to care for themselves and their fetus and reinforcing their intention to observe MFA behaviors and reduce their concerns during pregnancy.
4	Changing the attitude of subjective norms (husband, family)	Encouraging pregnant women to accept the fetus and to engage in attachment behaviors. The sessions focused on the education about the father's role in providing mental and physical support to the mother and contributing to the attachment of the mother to the fetus, fetus acceptance and postnatal care.
5		
6		

Results

The initial research subjects who assessed for eligibility consisted of 116 people, from whom 10 participants were excluded due to not meeting exclusion criteria and 106 participants were allocated to the intervention (n=53) and control group (n=53). Due to not having lost to follow up, the data from all these individuals were analyzed (Figure 2).

Maternal educational level in the intervention group was 49.1% academic, 22.6% high school and 28.3% elementary, and in the control group it was 56.6%, 18.9% and 24.5% respectively. Most mothers in the control (66.1%) and intervention (62.3%) groups were housewives. In 95.2% of the subjects, pregnancy was planned and they were living in Ahwaz (Table 2).

Table 2. Frequency Distribution of Demographic Characteristics of Participants

Variable	Intervention N (%)	Control N (%)	P-Value
Maternal education			
High School	15(28.3)	13(24.5)	0.071
Diploma	12(22.6)	10(18.9)	
University	26(49.1)	30(56.6)	
Maternal Occupation			
Employed	18(33.9)	20(27.7)	0.611
Housewife	35(66.1)	33(62.3)	
Maternal age (Mean±SD)	27.6±4.2	27.3±3.7	0.711

The two groups were compared in terms of the underlying variables such as level of education, occupation, type of pregnancy and type of delivery. The results of chi-square test showed no significant difference between the two groups ($P>0.05$). The mean MFA scores in the

Intervention group compared to the control group have increased significantly after the intervention ($P<0.001$) (Table 3). The mean scores of the knowledge and attitude of pregnant women in the intervention group compared to the control group have increased significantly after the intervention ($P<0.001$) (Table 4).

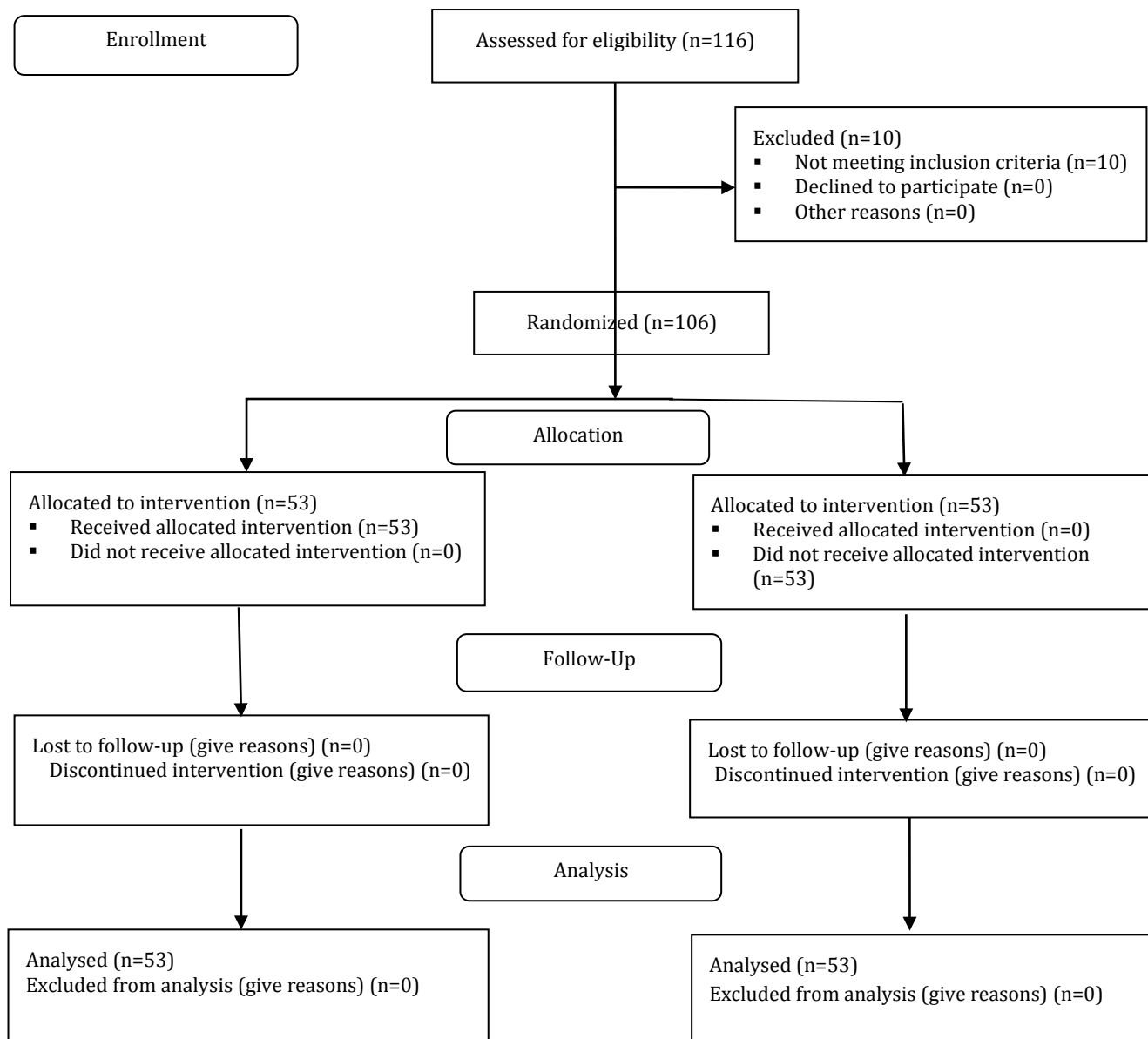


Figure 1. The CONSORT flow diagram of intervention in the two groups

Table 3. Comparison of Mean MFA scores before and after Intervention in Both Experimental and Control Groups

Variable	Intervention Mean ± SD	Control Mean ± SD	*P-Value
Before Intervention	57.8±4.3	56.8±4.8	0.340
After Intervention	63.1±4.3	57.9±4.3	<0.001
The Mean Change Scores	5.3±4.7	1.1±4.8	-
**p	<0.001	0.511	-

*Independent T-test; ** Paired t test

The mean scores of the subjective norms and perceived behavioral control in the intervention group compared to the control group have

increased significantly after the intervention ($P < 0.001$) (Table 5).

Table 4. Comparison of Mean changes in knowledge and Attitude of Pregnant Women about MFA Behaviors in Intervention and control groups

Variables	Changes in knowledge			Changes in attitude		
	Intervention Mean \pm SD	Control Mean \pm SD	*P-Value	Intervention Mean \pm SD	Control Mean \pm SD	*P-Value
Before Intervention	4.3 \pm 1.2	4.3 \pm 1.1	0.54	73.7 \pm 4.7	71.1 \pm 5.1	0.481
After Intervention	5.9 \pm 3.7	4.1 \pm 5.1	<0.001	78.3 \pm 3.7	71.2 \pm 5.1	<0.001
The Mean Change scores	1.6 \pm 2.8	0.1 \pm 0.01	-	4.6 \pm 3.8	0.1 \pm 0.01	-
**p	<0.001	0.23	-	0.007	0.340	-

*Independent T-test; ** Paired t test

Table 5. Comparison of mean changes in subjective norm score and perceived behavioral control in pregnant women in relation to MFA behaviors in both experimental and control groups

variables	Subjective norms			Perceived behavioral control		
	Intervention Mean \pm SD	Control Mean \pm SD	P*	Intervention Mean \pm SD	Control Mean \pm SD	*p-Value
Before Intervention	42.9 \pm 3.1	41.4 \pm 4	0.58	53.5 \pm 3.3	50.7 \pm 3.9	0.391
After Intervention	45.9 \pm 1.9	41.5 \pm 3.5	<0.001	56.7 \pm 1.9	50.8 \pm 3.6	<0.001
The Mean Change Scores	3 \pm 2.8	0.1 \pm 0.01	-	3.2 \pm 2.8	0.1 \pm 0.01	-
**p	<0.001	0.48	-	<0.001	0.630	-

*Independent T-test; ** Paired t test

Table 6. Comparison of mean changes behavioral intention among pregnant women in intervention and control groups

variables	Intervention Mean \pm SD	Control Mean \pm SD	P*-Value
Before Intervention	9.7 \pm 1.7	9.2 \pm 1.1	0.371
After Intervention	12.8 \pm 2.7	9.6 \pm 1.2	<0.001
The Mean Change scores	3.1 \pm 1.8	0.4 \pm 0.1	-
**p	<0.001	0.510	-

*Independent T-test; ** Paired t test

The mean scores of the behavioral intention of pregnant women in the intervention group compared to the control group increased significantly after the intervention ($P < 0.001$) (Table 6).

Discussion

According to the results, the mean MFA score in the intervention group was significantly increased compared to the control group after the intervention and indicated the effect of educational program based on TPB to increasing the maternal attachment to the fetus. Other studies in which educational interventions have

been conducted (in spite of using different teaching method) are consistent with this study and have reported that some of the educational interventions increased maternal-fetal attachment (33-36). Besides, In Freda et al.'s study, the difference in attachment after the intervention (counting fetal movements by the mother) was significant in the experimental and control groups. In this research, like the current research, the level of attachment has increased after the intervention. According to Freda's statements, this increase can be attributed to performing behaviors such as counting fetal movement, which engages the mother in actions

that stimulate the mother's emotions and interact with the fetus (37).

It seems that one of the reasons for promoting MFA is the training of interactions that the mother has received during her pregnancy and has performed for her fetus.

Also it has been showed that the interactive activities of mother and fetus including talking to the fetus, touching the fetus in the abdomen and paying attention to the movements of the fetus promotes attachment (34). The results of our research could also be due to the use of various educational methods including interactive lectures, group discussions, questions & answers, role-playing and functional work along with computer-aided teaching aids, video projector, PowerPoint software, whiteboard and marker and booklet.

Our findings indicated the effect of educational intervention on improving the knowledge and attitude of pregnant women about MFA behaviors in the intervention group so that pregnant mothers, after the educational intervention, believed that the fetus was an independent entity and the presence of the fetus increased the sensitivity of the mother to the infant in a way that mother is attached to her child, becomes important to her, and motivates her to pay attention to the infant's needs. Therefore, the pregnant mother who is attached to the fetus is trying to ensure the health and well-being of her fetus by observing her own necessary health care (38). In a study, researchers argued that attitude should be considered as an important structure in interventions of pregnancy period and related measures for maternal health should be considered too (39). Also another study, in line with the present study, considered the effective role of educational intervention based on TPB in infant care and suggested that the maternal attitude score in the intervention group was higher than that of the control group (40). Another study also was consistent with the results of this study acknowledging that the maternal attitude toward the infant changed after intervention and the mother better accepted her infant after the intervention (41). In one study, mothers who had more attachment to their fetus during pregnancy were more responsible and more sensitive mothers

compared to mothers who had very little attachment to their fetus during pregnancy (42). However, some studies have also shown that parent education has no effect on the attachment of the mother and father and it is advised that there is a need to increase the content of the educational planning of attachment for parents (43).

Our results indicated an increase in the mean score of the subjective norm of pregnant women in relation to MFA behaviors in the intervention group compared to the control group. These findings indicate the effect of educational intervention on promoting the perceptions of pregnant women in social protection of influential people in their lives such as their husband, mother, father, sister, friends, and other close relatives. Appropriate and supportive feedback from influential people will improve the sense of serenity and competency. This serenity and a sense of value will make the sense of consent of pregnancy in pregnant women and will improve MFA. Delavari et al. also found a significant relationship between social support and MFA. They recommended plans to increase support for women and improve the awareness of community and families about these issues in an effort to have healthy mothers, families and communities (44). However, Koniak et al. reported that there is no significant relationship between social support and maternal attachment to the fetus which contradicts the findings of the present study (45).

The results showed that the design and implementation of educational programs based on TPB for improving the perceived behavioral control of pregnant women contributes to MFA which illustrates the impact of education on building the power and perception of overcoming the barriers to MFA. Improved perceived behavioral control indicates increased self-efficacy in pregnant women. Research has also shown that self-efficacy is one of the most important predictors of behaviors during pregnancy and delivery (46). Bandura also defined self-efficacy and confidence of a person's belief in a specific behavior (47). By increasing the sense of control and self-efficacy, the pregnant mother's confidence in her ability to care for the fetus and eventually the infant

increases, which reduces the stress and anxiety caused by the inexperience of the first pregnancy. The mother is attached to a fetus and she is confident she can take care and control the fetus' health during pregnancy and birth. On the other hand, feelings of having control and self-efficacy are effective on the motivation of the individual and help the individual to try and implement the recommended behaviors (48). MFA, which increases during pregnancy, also continues in the years of afterbirth (11-12, 40).

Our results indicated an increase in the mean scores of behavioral intentions of pregnant women regarding MFA in the intervention group after the educational intervention. This result is in line with other studies (49-52). Another aspect that is noteworthy in this review is that gaining new knowledge in the first pregnancy experience can reduce pregnancy stress and subsequently increase one's attachment behaviors.

The plan used in this study was effective because of identifying the knowledge and attitude weaknesses before the intervention and tailoring content and educational strategies to it. According to the results of education based on this theory, if women obtain enough knowledge and awareness about the importance of MFA, and take seriously the risk of not paying attention to the fetus and the physical and psychological risks to the newborn; and if they acquire clinical perceptions of controlling preventive behavior, then behaviors affecting MFA will be improved. This study showed that educational programs should be implemented to strengthen women's minds and beliefs about the proper behaviors of practical methods and practical behaviors of mother, husband and other family members with the fetus. In this regard, doctors, midwives and health workers are the most important sources of information.

Due to the cultural and social differences of Ahvaz region with other regions of Iran, this study may not be generalizable to other pregnant women.

To the best of our knowledge, such intervention with this framework has not used in Iranian studies, and therefore it is novel and important. This is because teaching pregnant women for the first time due to the lack of previous experience of pregnancy is a

part of modern midwifery care. Additionally, teaching attachment behaviors is a therapeutic, non-invasive and non-pharmacological method suitable for improving the mother's attachment status, which ultimately leads to the improvement of the health of pregnant mothers and embryo and establish effective communication between them in the future.

Designing studies using other models and theories of behavior change to measure their effectiveness in promoting MFA. Comparing TPB and other theories in promoting MFA. Investigating father-fetus attachment as well as conducting interventions like the current study in other settings are recommended for the future research.

Conclusion

The results of this study showed that education based on TPB that includes participants' attitudes and beliefs can be useful and effective in promoting MFA. The constructs of knowledge, attitude, subjective norm and perceived control of TPB had a significant effect on the behavioral intention of primigravid pregnant mothers for developing of maternal attachment to the fetus. It is recommended and emphasized to use the educational program based on the theory of planned behaviour as a model for promoting the behavior of maternal attachment to the fetus.

Declarations

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Conflicts of interest

Authors declared no conflicts of interest.

Ethical consideration

This research project was approved by the local Ethics Committee of Shiraz University of Medical Sciences and written informed consent was obtained from all the participants. (Proposal No. 9536. Ethic code: IR.SUMS.REC.1394.162).

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Authors' contribution

All authors had contribution in all parts of the study. Also, they read and approved the final manuscript and agreed to be accountable for all aspects of the study.

References

- Toosi M, Akbarzadeh M, Zare N. Effect of attachment training on anxiety and attachment behaviors of first-time mothers. *Journal of Hayat*. 2011; 17(3): 69-79.
- Mattran K, Mudd LM, Rudey RA. Leisure-time physical activity during pregnancy and offspring size at 18 to 24 months. *Journal of Physical Activity and Health*. 2011; 8(5): 655-662.
- Chang H-C, Yu C-H, Chen S-Y. The effects of music listening on psychosocial stress and maternal-fetal attachment during pregnancy. *Complementary Therapies In Medicine*. 2015; 23(4): 509-515.
- Nakamura Y, Takeishi Y, Ito N. Comfort with motherhood in late pregnancy facilitates maternal role attainment in early postpartum. *The Tohoku Journal of Experimental Medicine*. 2015; 235(1): 53-59.
- Sullivan R, Perry R, Sloan A. Infant bonding and attachment to the caregiver: insights from basic and clinical science. *Clinics in Perinatology*. 2011; 38(4): 643-655.
- Toosi M, Akbarzadeh M, Ghaemi Z. The Effect of Relaxation on Mother's Anxiety and Maternal-Fetal Attachment in Primiparous IVF Mothers. *Journal of the National Medical Association*. 2017; 109(3): 164-171.
- Moradi Z, Akbarzadeh M, Moradi P. The Effect of Acupressure at GB-21 and SP-6 Acupoints on Anxiety Level and Maternal-Fetal Attachment in Primiparous Women: a Randomized Controlled Clinical Trial. *Nursing and Midwifery Studies*. 2014; 3(3): e19948
- Gyesaw NYK, Ankomah A. Experiences of pregnancy and motherhood among teenage mothers in a suburb of Accra, Ghana: a qualitative study. *International Journal of Women's Health*. 2013; 5: 773-780.
- Liu CC, Chen YC, Yeh YP. Effects of maternal confidence and competence on maternal parenting stress in newborn care. *Journal of Advanced Nursing*. 2012; 68(4): 908-918.
- Mohammadkhani P, Mohammadi M, Nazari M. Preparation, validity and reliability of self-report measures of child abuse (CASRS) students in Iran. *International journal of the Islamic Republic of Iran*. 2003; 17(1): 51-58. [Parsian]
- Dokuhaki A, Akbarzadeh M, Pishva N. A study of the effect of training pregnant women about attachment skills on infants motor development indices at birth to four months. *Family Medicine & Primary Care Review*. 2017; 19(2): 114-122.
- Dokuhaki S, Heidary M, Akbarzadeh M. Investigation of the effect of training attachment behaviors to pregnant mothers on some physical indicators of their infants from birth to three months based on the separation of male and female infants. *Pediatrics & Neonatology*. 2019; 60(3): 324-331.
- Belliemi C, Ceccarelli D, Rossi F. Is prenatal bonding enhanced by prenatal education courses. *Minerva Ginecologica*. 2007; 59(2): 125-129.
- Laxton-Kane M, Slade P. The role of maternal prenatal attachment in a woman's experience of pregnancy and implications for the process of care. *Journal of Reproductive and Infant Psychology*. 2002; 20(4): 253-266.
- Ajzen I. The theory of planned behaviour: reactions and reflections. *Psychology & Health*. 2011; 26(9): 1113-1127.
- Kirby D, Obasi A, Laris BA. The effectiveness of sex education and HIV education interventions in schools in developing countries. *WHO Technical Report Series*. 2006; 938: 103-150.
- Felsher M, Szep Z, Krakower D. I Don't Need PrEP Right Now: A Qualitative Exploration of the Barriers to PrEP Care Engagement Through the Application of the Health Belief Model. *AIDS Education and Prevention*. 2018; 30(5): 369-381.
- Khani Jeihooni A, Layeghian M, Yari A, Rakhshani T. Nutrition Research Center. The effect of educational intervention based on the theory of planned behavior on improving physical and nutrition status of obese and overweight women. *BMC Women's Health*. 2022; 22(1): 13.
- Klobas J. The theory of planned behaviour as a model of reasoning about fertility decisions. *Yearbook of Population Research*. 2011; 9(1): 47-54.
- Morgan SP, Bachrach CA. Is the theory of planned behaviour an appropriate model for human fertility. *Vienna Yearbook of Population Research*. 2011; 9(1): 11-18.
- Liefbroer AC. On the usefulness of the theory of planned behaviour for fertility research. *Vienna Yearbook of Population Research*. 2011; 9(1): 55-62.
- Sadeghi Sahebzad E, Baghdari N, Kheirkhah M. The Relationship between Marital Satisfaction and Social Support with Maternal Fetal Attachment in Pregnant Women with a History of Baby Loss. *Iranian Journal of Obstetrics, Gynecology and Infertility*. 2014; 17(106): 16-22.
- Matlabi M, Khajavi A, Askari F. The Impact of Educational Intervention Based on Theory of

- Planned Behavior in Breast Self-Examination of Women Referred to Health Centers. *Horizon Med Sci*. 2018; 24 (2) :132-138
24. Hamilton K, Daniels L, White KM. Predicting mothers' decisions to introduce complementary feeding at 6 months. An investigation using an extended theory of planned behaviour. *Appetite*. 2011; 56(3): 674-681.
 25. Zhang Z, Zhu Y, Zhang L. What factors influence exclusive breastfeeding based on the theory of planned behaviour. *Midwifery*. 2018; 62: 177-180.
 26. Akbarzadeh M, Rad SK, Moattari M. Investigation of breastfeeding training based on BASNEF model on the intensity of postpartum blues. *Eastern Mediterranean Health Journal*. 2018; 23(12): 830-835.
 27. Stolte E, Hopman-Rock M, Aartsen MJ, Van Tilburg TG, Chorus A. The theory of planned behavior and physical activity change: outcomes of the aging well and healthily intervention program for older adults. *Journal of Aging and Physical Activity*. 2017; 25(3): 438-445.
 28. Jadgal MS, Sayedrajabizadeh S, Sadeghi S, Nakhaei-Moghaddam T. Effectiveness of nutrition education for elementary school children based on the theory of planned behavior. *Current Research in Nutrition and Food Science Journal*. 2020; 8(1): 308-317.
 29. Khoury AJ, Moazzem SW, Jarjoura CM. Breastfeeding initiation in low-income women: Role of attitudes, support, and perceived control. *Women's Health Issues*. 2005; 15(2): 64-72.
 30. Bashirian S, Haidarnia A, Allahverdipour H. Application of theory of planned behavior in predicting factors of substance abuse in adolescents. *Journal of Fasa University of Medical Sciences*. 2012; 2(3): 156-162.
 31. Matlabi M, Sharifirad G, Mostavafi F. Factors affecting fish consumption based on structures of health education. *Journal of Health System Research*. 2012; 8(4): 523-536.
 32. Trinh L, Plotnikoff RC, Rhodes RE. Correlates of physical activity in a population-based sample of kidney cancer survivors: an application of the theory of planned behavior. *International Journal of Behavioral Nutrition and Physical Activity*. 2012; 9(1): 96.
 33. khoramrody R. The effect of mothers touch on Maternal Foetal Attachment. *Iran Nursing and Midwifery Journal*. 2000; 13(24): 33-41. [Persian]
 34. Akbarzadeh M, Rafiee B, Asadi N. Comparative Effect of Attachment and Relaxation Training on Perception of Fetal Movement and Mother's Anxiety in Primiparous Women: A Randomized Controlled Study. *Trends in Medical Research*. 2016; 11(2): 62-68.
 35. Toosi M, Akbarzadeh M, Sharif F. The Reduction of Anxiety and Improved Maternal Attachment to Fetuses and Neonates by Relaxation Training in Primigravida Women. *Women's Health Bulletin*. 2014; 1(1): e18968
 36. Akbarzadeh M, Moattari M, Abootalebi M. Effect of the BASNEF Model on Maternal-Fetal Attachment in the Pregnant Women Referring to the Prenatal Clinics Affiliated to Shiraz University of Medical Sciences. *Iranian Journal of Neonatology*. 2017; 8(3): 31-37.
 37. Setodeh S, Pourahmad S, akbarzadeh M. A study of the efficacy of fathers' attachment training on paternal-fetal attachment and parental anxiety. *Family Medicine & Primary Care Review*. 2017; 19(4): 393-398.
 38. Freda MC, Mikhail M, Mazloom E, Polizzotto R, Damus K, Merkatz I. Fetal movement counting: which method?. *MCN: The American Journal of Maternal/Child Nursing*. 1993; 18(6): 314-321.
 39. Lawson KL, Turriff-Jonasson SI. Maternal serum screening and psychosocial attachment to pregnancy. *Journal of Psychosomatic Research*. 2006; 60(6): 371-378.
 40. Arshad SM, Khani-jeihooni A, Moradi Z. Effect of Theory of Planned Behavior-based Educational Intervention on Breastfeeding Behavior in Pregnant Women in Fasa City, Iran. *Journal of Education and Community Health*. 2017; 4(2): 55-63.
 41. Akbarzadeh M, Dokuhaki A, Joker A. Teaching attachment behaviors to pregnant women: a randomized controlled trial of effects on infant mental health from birth to the age of three months. *Annals of Saudi Medicine*. 2016; 36(3): 175-183.
 42. Rollè L, Giordano M, Santoniccolo F, Trombetta T. Prenatal Attachment and Perinatal Depression: A Systematic Review. *International Journal of Environmental Research and Public Health*. 2020; 17(8): 2644.
 43. Serçekuş P, Başkale H. Effects of antenatal education on fear of childbirth, maternal self-efficacy and parental attachment. *Midwifery*. 2016; 34: 166-172.
 44. Delavari M, Mirghafourvand M, Mohammad-Alizadeh-Charandabi S. The relationship of Maternal-Fetal attachment and depression with social support in pregnant women referring to health centers of Tabriz-Iran, 2016. *The Journal of Maternal-Fetal & Neonatal Medicine*. 2018; 31(18): 2450-2456.
 45. Koniak-Griffin D, Verzemnieks I. Effects of nursing intervention on adolescents' maternal

- role attainment. *Issues in Comprehensive Pediatric Nursing*. 1991; 14(2): 121-138.
46. Tam C-L, Chong A, Kadirvelu A. Parenting styles and self-efficacy of adolescents: Malaysian scenario. *Global Journal of Human-Social Science Research*. 2013; 12(14-A): 18-25.
47. Bandura A. Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review*. 1977; 84(2): 191-215.
48. Laxton-Kane M, Slade P. The role of maternal prenatal attachment in a woman's experience of pregnancy and implications for the process of care. *Journal of Reproductive and Infant Psychology*. 2002; 20(4): 253-266.
49. Darabi F, Yaseri M, Kaveh MH. The Effect of a Theory of Planned Behavior-based Educational Intervention on Sexual and Reproductive Health in Iranian Adolescent Girls: A Randomized Controlled Trial. *Journal of Research in Health Sciences*. 2017; 17(4): e00400.
50. Jalambadani Z, Garmaroudi G, Tavousi M. Education Based on Theory of Planned Behavior over Sexual Function of Women with Breast Cancer in Iran. *Asia-Pacific Journal of Oncology Nursing*. 2018; 5(2): 201-207.
51. Ghasemi S, Nazari M, Vafaei H. The impact of educational intervention based on the theory of planned behavior in choosing delivery mode in primigravida pregnant women. *International Journal of Women's Health and Reproduction Sciences*. 2017; 5(1): 47-54.
52. Nazari M, Basiri F, Kaveh MH. Investigating the Effect of Fordyce Happiness Cognitive-Behavioral Training on Perceived Stress and Happiness in Pregnant Females: Applying the Self-Efficacy Theory. *Iranian Red Crescent Medical Journal*. 2018; 20(10): e59284.