JAPAN JOURNAL OF NURSING SCIENCE

*Japan Journal of Nursing Science* (2019) **16**, 71–79 doi:10.1111/jjns.12214

ORIGINAL ARTICLE

# Effect of the fetal movement count on maternal–fetal attachment

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## Abstract

**Aim:** This study aimed to determine the effect of fetal movement counting on maternal–fetal attachment.

**Methods:** This study was a randomized controlled trial, conducted with experimental and control groups, each including 55 pregnant women from six family health centers in the Malatya Province, located in the east of Turkey. The data were collected by using a Personal Information Form and the Maternal Antenatal Attachment Scale. Training for fetal movement counting was provided to the experimental group. The pre- and posttraining maternal–fetal attachment levels of the experimental group (fetal movements that were regularly counted for 4 weeks) and the control group (continual routine monitoring) were compared.

**Results:** In the pretraining pretest, no difference was found between the maternal–fetal attachment scores of the experimental and the control groups, whereas the maternal–fetal attachment score of the experimental group was found to be higher than that of the control group in the post-test that was applied 4 weeks later.

**Conclusion:** This research indicated that fetal movement counting positively affected maternal–fetal attachment.

**Key words:** fetal movement, fetal movement counting, maternal–fetal attachment, pregnancy.

## INTRODUCTION

Maternal–fetal attachment is defined as an affectionate – emotional, warm, and close – relationship between a mother and her child. This attachment might aid in the adjustment of the pregnant woman to pregnancy (Salehi, Salehi, & Shaali, 2017). Pregnant women with a strong attachment to their fetus believe that the fetus is in contact with them and is a separate individual. They are also aware that fetuses require basic needs, such as protection and nutrition. During their pregnancy, future mothers think about the way their fetus will move, their resemblance to persons, and their development in their subsequent years. These feelings, which positively affect attachment, help pregnant women to develop the feelings of protection, sensitivity, and communication with their fetus (Duyan, Kapisiz, & Yakut, 2013; Sjögren, Edman, Widström, Mathiesen, & Uvnäs-Moberg, 2004; Van Den Bergh & Simons, 2009). Thus, the initiation of attachment in the early stages of pregnancy is essential.

Feeling fetal movements during pregnancy helps the mother to bond strongly with her unborn child. Counting fetal movements is a conventional method to measure the fetal movements among pregnant women. Healthy fetuses move at least 10 times in 2 h (Mangesi, Hofmeyr, Smith, & Smyth, 2015). Mothers communicate with their unborn baby while counting fetal movements. They talk to the unborn child, caress their belly, and wonder about the unborn child's resemblance to persons and if the fetus feels the mother's presence (Çoban & Saruhan, 2005). As mothers count the movements of their baby at specific times in a day, the focal point of the mothers becomes their baby. Therefore, the assessment of fetal movements by mothers also has a positive effect on maternal–fetal attachment (Mikhail *et al.*, 1991; Nishikawa & Sakakibara, 2013). A past study by Mikhail *et al.* that was conducted with pregnant American women reported that counting fetal movements strengthened maternal–fetal attachment. Nishikawa and Sakakibara also determined that

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*Received 26 September 2017; accepted 13 March 2018.*

abdominal palpation by using Leopold's maneuvers improve maternal–fetal attachment.

An emotional bond is formed between pregnant women and fetuses due to maternal–fetal attachment. This bond is strengthened during pregnancy and is enhanced because of mother–baby contact (Siddiqui & Hägglöf, 2000; Van Den Bergh & Simons, 2009). The maternal attachment to the fetus during pregnancy implies that pregnant women regard themselves as mothers by developing a motherhood identity during pregnancy, their interaction with their fetus, and their feelings about their fetus (Armstrong, 2002; Cannella, 2005; Duyan *et al.*, 2013). Fetal movement counting helps mothers to exhibit behaviors that increase the emotional attachment to their fetus (Alhusen, 2008; Mehran, Simbar, Shams, Ramezani-Tehrani, & Nasiri, 2013; Rowe, Wynter, Steele, Fisher, & Quinlivan, 2013) Communicating with their unborn baby and trying to discover the extremity and position of their fetus by caressing their belly indicates that the emotional attachment of pregnant women to the fetus has increased (Nishikawa & Sakakibara, 2013). Having more information about fetal activity in prenatal care, especially about fetal movement counting, will probably help pregnant women to build a stronger emotional attachment to the fetus. It is essential that pregnant women easily access antenatal care services and structured antenatal care to improve attachment (Salehi *et al.*, 2017). However, the prenatal care program in Turkey that was prepared by the Ministry of Health is focused on physical care and the psychological aspects of the maternal–fetal relationship are hardly included. Therefore, the effects of fetal movement counting on maternal–fetal attachment are uncertain and more clinical studies are needed.

The aim of this study was to examine the effect of fetal movement counting on maternal–fetal attachment. This study was designed to contribute to the prenatal training programs and midwifery by creating a new intervention area for improving prenatal maternal attachment.

# METHOD

## Study setting and participants

This study was a randomized controlled trial, conducted in six family health centers (FHCs) in Malatya Province, located in eastern Turkey. Pregnant women were randomly divided into two groups: the intervention group (required to conduct fetal movement counting) and the control group (received standard antenatal care). The routine pregnancy monitoring of FHCs is conducted by family physicians and midwives in accordance with the *Antenatal Care Management Guide* that was developed by the Ministry of Health and recommends that a healthy pregnant woman should be monitored at least four times (Turkish Public Health Agency and Department of Women's and Reproductive Health, 2014). In FHCs, there is one midwife or nurse under the management of each family physician and who conducts the routine monitoring of pregnant women. These units do not serve for childbirth, which is conducted in hospitals. A power analysis was conducted to determine the sample size. The sample size was calculated as 55 pregnant women for each group with a 5% margin of error, two-way significance level, at a 95% confidence interval, with 95% ability (power) to represent the universe (55 experimental, 55 control group women). The inclusion criteria of the study were as follows: being at 28–32 weeks of pregnancy, literate or having a relative or helper who could record the number of fetal movements, having singleton pregnancy, not having any risky situation (such as placenta previa, preeclampsia, intrauterine growth retardation) diagnosed in themselves or the fetus, and becoming pregnant without infertility treatment. The volunteer information form was read to the pregnant women who agreed to participate in the study and their verbal and written consent was received.

## Procedure

The researcher used the FHCs' records to determine the number of pregnant women who were registered in them ($n$ =790) and the number of those that met the inclusion criteria ($n$ = 171). The pregnant women who met the inclusion criteria of the study were selected for the sample by using the probability basic random sampling method. Therefore, the pregnant women were listed and numbered and they were selected to be included in the sample by using the random number table by the authors. Randomization was determined according to a computer-generated random allocation list by the authors. The pregnant women with odd numbers were included in the experimental group, whereas those with even numbers were included in the control group. After allocation, blinding for group assignment was not possible for the participants or researchers. This was because the fetal movement chart was intended to be an active tool for interaction between the pregnant women and the researchers.

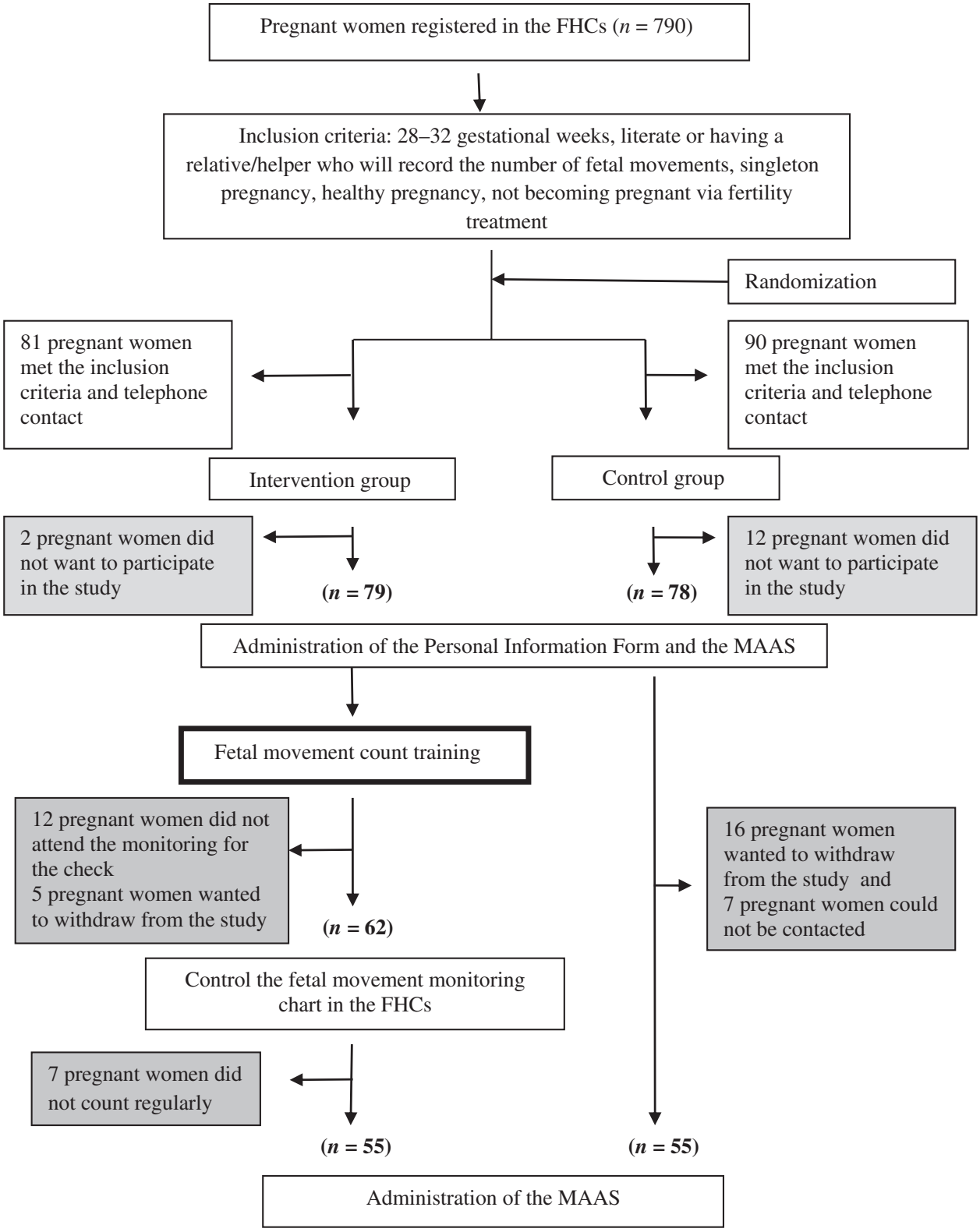


**Figure 1** Flow chart of the participants. FHC, family health center; MAAS, Maternal Antenatal Attachment Scale.

 

The pregnant women in the experimental and control groups were contacted by using their phone number in the records of the FHC and they were informed about the study by the authors. An appointment was scheduled for those who agreed to participate in the study (the researchers contacted 171 pregnant women, 14 of whom did not want to participate in the study). In the first interview, the Personal Information Form and the Maternal Antenatal Attachment Scale (MAAS) were administered to the experimental and control groups as a pretest. The researchers trained only the pregnant women in the experimental group to count fetal movements on an individual basis. The training was given for ~15–20 min in a single session. The pregnancy training classes of the FHCs were used. After the training was completed, the fetal movement monitoring chart was given to each pregnant woman. The fetal movement monitoring chart includes a table that will help pregnant women to record their fetal movements daily. The researcher called the pregnant women 2 weeks later to invite them to the FHC to check for the accurate interpretation and regular performance of counting (12 pregnant women did not attend the monitoring check, while five pregnant women wanted to withdraw from the study). The pregnant women in the experimental group were once more invited to the FHC 4 weeks after the first monitoring to collect the post-test data (seven pregnant women were excluded from the study because they did not do the counting regularly). The pregnant women in the control group also were invited to the FHC 4 weeks after the first monitoring to collect the post-test data (16 pregnant women wanted to withdraw from the study, while the researcher could not contact seven participants). The researchers did not make any intervention with the control group that was not provided as standard care by the FHC (Fig. 1).

## Fetal movement count training

The fetal movement count training was based on the "count-to-10 method." This technique, also known as the "Cardiff method," was used by Pearson and Weaver (1976) for the first time. According to the original technique, 10 movements should be counted within 12 h. However, this protocol was modified by Liston (10 movements within 6 h) and Moore (10 movements within 2 h) (Baskett & Liston, 1989; Moore & Piacquadio, 1989). The count-to-10 method, which was developed by Moore and recommended by the Royal College of Obstetricians & Gynaecologists and the American Pregnancy Association, is the most commonly used method for counting fetal movements and for identifying reduced fetal movements today (APA, 2015; RCOG, 2010; Tveit *et al.*, 2009). In this technique, pregnant women count and record 10 movements of their fetus. During the process of counting, pregnant women should ensure: that the fetus is awake; should be calm, take a rest, be full, and already have met their need to use the toilet; should lie down in a lateral position; and should put their hands on their belly. To increase the accuracy level of counting, pregnant women should start recording when they feel the first movement of the fetus and continue counting until they count 10 movements within 2 h (Mangesi *et al.*, 2015; Sheikh, Hantoushzadeh, & Shariat, 2014; Smith, Begley, & Devane, 2014; Winje *et al.*, 2011).

## Data collection tools

The data were collected by using a Personal Information Form and the MAAS between January and May, 2016.

### *Personal Information Form*

This form was developed by the researchers and consisted of questions about the sociodemographic (age, educational status, working status, type of family) and obstetric (number of pregnancies, week of pregnancy, having living children, number of living children) characteristics of the pregnant women.

### *Maternal Antenatal Attachment Scale*

The scale was developed by Condon (1993) and its validity and reliability study for Turkey was conducted by Golbasi, Ucar, and Tugut (2015). All the items of the scale consist of 19 items focusing on the feelings, attitudes, and behaviors of pregnant women toward their fetus. A five-point, Likert-type scale was used for each item, with scores ranging from 1 to 5 (5 represents "strong emotions toward the fetus," whereas 1 represents "the absence of feelings toward the fetus"). The scale has two subdimensions. The quality of attachment subdimension has 10 items and represents the quality of emotional experiences (feelings of closeness and tenderness compared to feelings of distance and irritation) of a pregnant woman for the fetus. The sub dimension's total score ranges between 10 and 50. The amount of time spent in attachment, as the second subdimension, has eight items and represents the intensity of pregnant women's preoccupation with the fetus and thinking about the fetus, talking with it, and touching it. The sub dimension's total score ranges between 8 and 40. High scores obtained from the scale indicate high levels of

 

attachment (Golbasi, Ucar, & Tugut, 2015). The Cronbach's alpha reliability coefficient of the scale was found to be 0.76 in this study. The Cronbach's alpha reliability coefficient for the subdimensions of the scale was 0.61 for the quality of attachment and 0.70 for the amount of time spent in attachment.

### Ethical issues

This study was approved by the ethical review boards at the authors' institution (and each FHC) (No. 2015/8-6). The volunteer information form was read to the pregnant women who agreed to participate in the study and their verbal and written consent was received before the present study was conducted. It was explained that the obtained data would be published for scientific purposes without using the name of the participants.

### Data analysis

For the statistical analysis, the data were assessed by using SPSS v. 16.0 for Windows software (SPSS, Chicago, IL, USA). An independent *t*-test was used for comparing between the two groups. To compare the groups in terms of demographics and obstetric variables, an independent *t*-test was used, and for the categorical variables, a chi-squared test was carried out.

## RESULTS

The researchers invited 171 pregnant women into the study. Twenty-four (14.0%) participants of the intervention group were excluded from the study: this was done for 12 pregnant women in the first assessment for not attending the assessment and for five pregnant women who wished to opt out of the study; in the second assessment, seven pregnant women were excluded for not regularly counting. Twenty-three(13.4%) participants of the control group were excluded from the study: in the second assessment, five pregnant women were excluded for their wish to withdraw from the study and seven pregnant women for the researcher's failure to contact them. Eventually, the data from 110 participants (55 experimental and 55 control group participants) were used for the analysis.

The characteristics of the pregnant women who participated in the study are shown in Table 1. The mean age of the pregnant women was found to be 27.62 years (standard deviation [SD]: 4.69; range: 19–40). Among these, 29.1% were found to be primary school graduates, 84.5% were unemployed, 77.3% had a nuclear family, and 57.3% had living children. The mean week of pregnancy was found to be 29.58 (SD = 1.48; range: 28–32) and most (68.2%) of the pregnant women were multigravida. The study found no statistically significant difference between the pregnant women in the experimental and control groups regarding age, educational level, employment status, type of family, having living children, week of pregnancy, and parity ($P > 0.05$).

The comparison of the MAAS total and subdimension pretest–post-test mean scores of the pregnant women in the experimental and control groups is shown in Table 2. No statistically significant difference was found between the MAAS total and subdimension pretest mean scores in the experimental and control groups ($P > 0.05$). The posttraining MAAS total and post-test mean scores of its subdimensions, quality of attachment and amount of time spent in attachment, were found to be higher in the experimental group. The post-test means and SD in the total scores of the MAAS were 72.25 (7.16) and 78.41 (6.65) for the control and intervention groups, respectively, which was found to be statistically significant ($P < 0.001$).

A comparison of the difference in the pretest and post-test MAAS total and its subdimension mean scores of the women in the experimental and control groups is shown in Table 3. The difference between the post-test and pretest mean scores of the MAAS total and its subdimensions, quality of attachment and amount of time spent in attachment, in the experimental group (7.63, 2.34, and 5.16, respectively) were higher than those in the control group (0.67, 0.38, and 0.20, respectively) and the difference between the mean scores of the groups was significant ($P < 0.001$).

## DISCUSSION

The data analysis and interpretation showed that the maternal–fetal attachment level of the pregnant women in the experimental group, who received training about fetal movement counting, was higher than that of the pregnant women in the control group. Many studies are examining the factors that affect the maternal–fetal attachment that is found as a result of the maternal perception of fetal movements increasing the level of fetal attachment (Lerum & LoBiondo-Wood, 1989; Mehran *et al.*, 2013; Rowe *et al.*, 2013; Yarcheski, Mahon, Yarcheski, Hanks, & Cannella, 2009). This study's result showed that the fetal movement count, which is

 

**Table 1** Characteristics of the pregnant women

| Characteristic | Experimental group ($n$ = 55) | Control group ($n$ = 55) | Total ($n$ = 110) | $P$-value |
|---|---|---|---|---|
| Age (years): mean ± SD | 28.11 ±5.08 | 27.13 ±4.24 | 27.62 ±4.69 | 0.274† |
| Parity: N (%) | | | | |
| Primigravida | 20 (36.4) | 15 (27.3) | 35 (31.8) | 0.306‡ |
| Multigravida | 35 (63.6) | 40 (72.7) | 75 (68.2) | |
| Gestational weeks: mean ±SD | 29.30 ± 1.55 | 29.85 ±1.37 | 29.58 ±1.48 | 0.054† |
| Educational level: N (%) | | | | |
| Primary school | 14 (25.5) | 18 (32.7) | 32 (29.1) | 0.780‡ |
| Secondary school | 13 (23.6) | 12 (21.8) | 25 (22.7) | |
| High school | 10 (18.2) | 11 (20.0) | 21 (19.1) | |
| University | 18 (32.7) | 14 (25.5) | 32 (29.1) | |
| Employment status: N (%) | | | | |
| Employed | 7 (12.7) | 9 (16.4) | 16 (14.5) | 0.589‡ |
| Unemployed | 48 (87.3) | 46 (83.6) | 94 (85.5) | |
| Family type: N (%) | | | | |
| Nuclear family | 43 (78.2) | 42 (76.4) | 85 (77.3) | 0.820‡ |
| Extended family | 12 (21.8) | 13 (23.6) | 25 (22.7) | |
| Have living children: N (%) | | | | |
| Yes | 30 (54.5) | 33 (60.0) | 63 (57.3) | 0.563‡ |
| No | 25 (45.5) | 22 (40.0) | 47 (42.7) | |

† *t*-test.
‡ Chi-squared test.
SD, standard deviation.

used frequently to assess fetal health, positively affected maternal–fetal attachment. Pregnant women communicate with their baby while counting fetal movements. They talk with their baby, caress their belly by putting their hands on it, and think of their baby's resemblance to themselves and to their family and their baby's awareness of its mother's presence (Mehran *et al.*, 2013; Siddiqui & Hägglöf, 2000). As a result of the mothers counting the movements of their fetus at specific times during the day, the focal point of pregnant women becomes their baby. Therefore, the assessment of fetal movements by pregnant women also has a positive effect on maternal–fetal attachment (Mikhail *et al.*, 1991; Nishikawa & Sakakibara, 2013).

Few studies have examined the effect of fetal movement counting on maternal–fetal attachment. A study that was conducted by Mikhail *et al.* (1991) examined the effect of fetal movement counting on the attachment of 213 pregnant women who had a healthy pregnancy and the attachment scores of the pregnant women in the experimental group, who counted the fetal movements, were found to be higher, compared with those in the control group. This result was corroborated by the present study. Studies that have been conducted by different groups also reported similar results. For example, a study conducted by Damato (2005) found that the perception of fetal movements in twin pregnancies was a factor affecting prenatal attachment. In a study that was

**Table 2** Comparison of the Maternal Antenatal Attachment Scale (MAAS) total and subdimension pretest–post-test mean scores of the pregnant women in the experimental and control groups

| | Pretest (mean ± SD) | | | Post-test (mean ± SD) | | |
|---|---|---|---|---|---|---|
| Variable | Experimental group ($n$ = 55) | Control group ($n$ = 55) | $P$-value† | Experimental group ($n$ = 55) | Control group ($n$ = 55) | $P$-value† |
| Quality of attachment | 41.80 ± 3.40 | 41.78 ±3.48 | 0.977 | 44.14 ±3.29 | 42.16 ±3.28 | 0.002 |
| Time spent in attachment | 25.49 ± 4.27 | 25.63 ± 4.87 | 0.866 | 30.65 ±3.86 | 25.83 ±4.81 | <0.001 |
| MAAS total | 70.78 ± 6.78 | 71.58 ± 7.54 | 0.536 | 78.41 ±6.65 | 72.25 ±7.16 | <0.001 |

† $P < 0.05$ indicates significant difference, according to independent *t*-test.
SD, standard deviation.

**Table 3** Comparison of the difference in the Maternal Antenatal Attachment Scale (MAAS) total and its subdimension mean scores of the pregnant women in the experimental and control groups

| Variable | Mean ± SD | | |
|---|---|---|---|
| | Experimental group ($n$ = 55) | Control group ($n$ = 55) | $P$-value[†] |
| Quality of attachment difference score | 2.34 ± 2.17 | 0.38 ± 0.97 | <0.001 |
| Time spent in attachment difference score | 5.16 ± 2.76 | 0.20 ± 1.19 | <0.001 |
| MAAS total difference score | 7.63 ± 3.85 | 0.67 ± 1.61 | <0.001 |

[†] $t$-test.
SD, standard deviation.

conducted by Pollock and Percy (1999), the method of ultrasound imaging was used, whereby the pregnant women were asked to count the fetal movements simultaneously. Therefore, its effect on attachment was examined and the level of maternal–fetal attachment was found to be higher in the pregnant women who counted the fetal movements. These results showed that the fetal movement counts positively affected maternal–fetal attachment.

The present study demonstrated that the mean score of the quality of attachment, as a subdimension of the MAAS, was found to be higher in the experimental group, compared with the control group. The quality of attachment subdimension represents the quality of emotional experiences (feelings of closeness and tenderness compared to feelings of distance and irritation) of a pregnant woman for the fetus (Condon, 1993). The fact that pregnant women touch their abdomen while counting fetal movements might increase their sensitivity and sensibility toward the fetus and develop intimacy with the fetus. Therefore, fetal movement counting might enhance the quality of attachment. Mehran *et al.* (2013) defined the behavior that is exhibited by pregnant women who develop maternal–fetal attachment. It was stated that the pregnant women with a high level of maternal–fetal attachment were sensitive to the fetal movements and used the movements to communicate with their baby (Mehran *et al.*, 2013). Nishikawa and Sakakibara (2013) had pregnant women carry out Leopold's maneuvers in their 30th, 32nd, and 34th weeks of their pregnancy with the help of a midwife. The pregnant women were asked to touch their belly during these maneuvers and learn the extremity and position of their fetus. The sensitivity of the pregnant women who carried out these maneuvers increased towards their fetus. Moreover, the fetal movements were found to increase and therefore the maternal–fetal attachment became strong.

The present study found that the amount of time spent in attachment, as the second subdimension of the MAAS, was found to be higher in the experimental group, compared with the control group. The amount of time spent in attachment represents the intensity of pregnant women's preoccupation with the fetus and thinking, talking, and feeling the fetus (Condon, 1993). While counting the fetal movement, pregnant women think about the presence of the fetus, imagine it, and communicate with it. The routine antenatal practices, such as checking the fetal heart rate and the palpation of the body parts of the fetus, might help pregnant women to think about their fetus and increase prenatal attachment (Malm, Hildingsson, Rubertsson, Rådestad, & Lindgren, 2015). Moreover, because the fetal movements are regularly counted, they might provide pregnant women with an opportunity to extend the amount of time spent thinking about their fetus and talking and touching it (Mehran *et al.*, 2013). In a study that was conducted by Saastad *et al.* (), most (79%) of the pregnant women in the experimental group who counted the fetal movements daily stated that they developed positive feelings.

Attachment, which begins during pregnancy, develops during labor and the post-partum period (Tilokskulchai, Phatthanasiriwethin, Vichitsukon, & Serisathien, 2002). However, low levels of attachment are essential because they cause problems in post-partum maternal adaptation (Abasi, Tahmasebi, Zafari, & Takami, 2012). Therefore, the intervention to increase the level of maternal–fetal attachment should be a part of antenatal practices. The fetal movement count is considered to be a practice that could increase maternal–fetal attachment.

## Limitations of the study

This study has some limitations. One limitation is that the results cannot be generalized to women across the country as the study was conducted only with pregnant women in one city. Another limitation is that it is not possible to anticipate the type of attachment to be created by fetal movement counting in women with risky pregnancies because the study was conducted with healthy pregnant women only. Moreover, the study

 

sample included only women who were 28–32 weeks' pregnant; thus, it will provide no precise information about the level of attachment in the other weeks. Future studies should be conducted with larger samples and their confounders should be controlled.

## CONCLUSION

This study revealed that the fetal movement counts positively affected maternal–fetal attachment. The development of maternal–fetal attachment by integrating fetal movement counting education into prenatal education programs and adding them to the curriculum of pregnancy education classes would improve the knowledge and skills of the health personnel who will participate in this training. It is advisable to carry out long-term and extensive research to obtain more detailed and comprehensive information.

## ACKNOWLEDGMENTS

The authors express thanks to the pregnant women for participation in the study. This research was given as an oral presentation at ICM 2017: 19th International Conference on Midwifery, January 30–31, 2017, Jeddah, Saudi Arabia. This study was accepted as a master thesis by _Inönü University Health Sciences Institute on July 28, 2016.

## DISCLOSURE

The authors declare no conflict of interest.

## AUTHOR CONTRIBUTIONS

E. G. and T. U. contributed to the conception and design of this study, carried out the statistical analysis, drafted and critically reviewed the manuscript, and supervised the whole study process. Both authors read and approved the final manuscript.

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