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Original Article

The effectiveness of prenatal attachment behavior training in maternal-fetal attachment & attachment styles in pregnant women

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ABSTRACT

This study explores the effectiveness of prenatal training in attachment behaviors aimed at improving mother-fetus attachment and the attachment styles of first-time pregnant women characterized by insecure attachment. The study employed an experimental design featuring a pre-test-post-test structure alongside a control group. A total of 40 first-time pregnant women exhibiting insecure attachment were recruited from health centers in western Tehran through multi-stage cluster sampling and were randomly divided into an experimental group (20 participants) and a control group (20 participants). Data collection involved the use of the Maternal Fetal Attachment Scale (MFAS; Cranley), the Collins and Read Revised Adult Attachment Scale (RAAS), and a demographic information survey. The experimental group underwent four sessions of training focused on prenatal attachment behaviors. Findings reveal that the implementation of a prenatal attachment behavior training program significantly enhances mother-fetus attachment along with its components (such as interaction with the fetus, acceptance of maternal roles, and attributing characteristics to the fetus) while also promoting secure attachment styles among participants in the experimental group.

Keywords: Maternal Fetal Attachment, Attachment style, Prenatal training in attachment behaviors

Introduction

Attachment during pregnancy is characterized by a process wherein pregnant women experience various emotions toward their fetuses, engage in interactions with them, cultivate a maternal identity throughout gestation, and prepare for motherhood [1]. The bond between mother and child initiates not at birth but rather during fetal development and persists throughout life. This relationship is recognized as one of the most fundamental forms of human intimacy and signifies the early internalized presence of the fetus that both parents experience during pregnancy. The quality of this relationship plays an essential role in influencing subsequent cognitive and emotional development in children [2]. Attachment facilitates infant health and security by ensuring closeness to the mother; thus, Bowlby posits that the need for attachment is a primary necessity for human infants [3]. Various studies have identified prenatal attachment as an emotional connection between pregnant mothers and their fetuses [4]. The mother's attachment style significantly impacts child development as well as her ability to fulfill maternal roles.

A secure attachment style in mothers correlates directly with mother-infant bonding. Attachment styles represent operational patterns transmitted from caregivers to offspring that shape mother-child relationships [5]. Negative emotions linked with insecure attachment often contribute to disorders that prompt families to seek therapeutic interventions; furthermore, insecure parental attachments can lead to distress and anxiety in children [6]. One of the fundamental roles of mothers during pregnancy involves ensuring security and fostering feelings of safety for both themselves and their fetuses [7], which underscores the importance of mothers possessing secure attachment styles.

The advantages associated with Maternal-Fetal Attachment for mothers encompass improvements in physical health as well as motivation towards engaging in activities conducive to fetal well-

being [8]. These include adopting more positive behaviors during pregnancy such as abstaining from smoking or alcohol use, maintaining a nutritious diet, establishing regular sleep routines, exercising regularly, using seat belts appropriately while driving, and seeking medical assistance when necessary [9]. Furthermore, after childbirth, these factors contribute to enhanced maternal involvement within family dynamics alongside increased positivity in mothers while decreasing susceptibility to postpartum depression [10]. According to attachment theory principles, adult attachment patterns can create secure environments that help address developmental challenges faced by children or conversely may serve as sources of anxiety for them. Effective parent-child communication systems are crucial for improving childcare standards [11]. Within this theoretical framework, maternal behaviors toward their children are influenced by their attachment styles; these responses are shaped by childhood experiences with their parents which ultimately contribute to defining their children's personalities [12]. Thus, maternal roles hold particular significance in fostering communication skills among children.

Enhancing attachment can be achieved through training in attachment behaviors, which activates maternal emotions and prompts mothers to undertake actions that foster interactions with their fetuses [13]. Existing research indicates that education focused on prenatal attachment can lead to significant improvements in Maternal-Fetal Attachment [14, 15], boost maternal-fetal bonding [14, 16], alleviate postpartum anxiety and depression [10], and enhance the mental well-being of pregnant women [13].

The implications of prenatal attachment for maternal and fetal health have been explored across various cultures in developed nations such as China, Sweden, Germany, and Japan; however, this subject remains under-researched in developing countries [17]. Studies within the domain of prenatal attachment suggest that heightened Maternal-Fetal Attachment increases mothers' motivation to adopt health-promoting practices—such as refraining from alcohol and tobacco use, ensuring proper nutrition, engaging in physical activity, and attending prenatal check-ups—all contributing positively to the health outcomes of both mothers and infants [11]. Consequently, this research is vital for fostering greater maternal involvement in health-related behaviors while minimizing engagement in risky practices.

In light of the growing focus on prenatal relationships between mothers and their fetuses over recent years, this study seeks to implement training on attachment behaviors for first-time pregnant women exhibiting insecure attachment styles—who are at a higher risk compared to those with secure attachments. The study will subsequently assess the effects of this intervention on strengthening maternal attachment towards their fetuses as well as on their overall attachment styles.

Materials and Methods

This study employs an experimental design featuring a pre-test-post-test structure alongside a control group. The target population consisted of all first-time pregnant women aged 20 to 35 years residing in the western region of Tehran who were in their third trimester and had sought prenatal care at one of the local health centers. The sample comprised 40 first-time pregnant women exhibiting insecure attachment, within the age range of 20 to 35 years, who fulfilled the eligibility criteria for participation in the study. The sampling technique utilized was multi-stage cluster sampling. In this approach, the health center in western Tehran was initially selected, followed by the random selection of six health units operating under its jurisdiction. From among the first-time pregnant women with insecure attachment attending these centers, 40 participants were randomly chosen. After obtaining informed consent to partake in the study, these individuals were randomly assigned to either an experimental group (20 participants) or a control group (20 participants).

Research instruments

Maternal Fetal Attachment Scale (MFAS)

The Maternal Fetal Attachment Scale (MFAS), is recognized as the first instrument designed to assess Maternal-Fetal Attachment (MFA) among pregnant women. This self-report tool comprises 24 items evaluated on a five-point Likert scale, which measures maternal attachment toward their fetuses. The scale includes five subscales that assess maternal behaviors across various dimensions: 1) Acceptance of maternal role (4 items), 2) Interaction with the fetus (5 items), 3) Attributing characteristics to the fetus (6 items), 4) Differentiation between self and fetus (4 items), and 5) Self-sacrifice (5 items). Cranley initially reported a reliability coefficient of 0.85 for this scale, with its validity assessed at 0.83 (Cranley, 1984) [18].

Revised Adult Attachment Scale (RAAS)

Developed by Collins and Read in 1990, this scale encompasses self-evaluative measures regarding relationship-building skills as well as self-descriptive methods for establishing attachment relationships with significant others. It consists of 18 items assessed through a five-point Likert scale ranging from "not at all characteristic of me" 1 to "very characteristic of me" 5. The scale is divided into three subscales that align with secure, avoidant, and anxious attachment styles; each subscale contains six items. The anxiety subscale corresponds to anxious-ambivalent attachment styles, while the closeness subscale represents a bipolar dimension contrasting secure versus avoidant descriptions [19]. Pakdaman reported reliability coefficients for this test using Cronbach's alpha as follows: secure attachment style at 0.74, avoidant style at 0.52, and anxious-ambivalent style at 0.28 [19].

Following the administration of a pre-test and random assignment of participants into experimental and control groups,

group sessions focused on prenatal attachment behavior training commenced for those in the experimental group. No interventions were conducted within the control group during this period. After completing the intervention for the experimental group, both groups attended a two-hour session on routine prenatal care followed by another two-hour session dedicated to muscle relaxation training; pre-tests and post-tests were conducted for both groups throughout this process. Each session began with a review of prior content before introducing training related to maternal-fetal attachment behaviors through standardized educational materials that included clear definitions and practical examples. Participants were then encouraged to share insights regarding what they had learned during each session. At each conclusion, specific tasks were assigned for subsequent meetings. A comprehensive summary of these training sessions is presented in Table 1.

Table 1. Summary of Sessions

Session 1	- Introduction and getting to know each other among participating mothers, along with stating the objectives of the sessions. - Providing information about physiological changes during pregnancy, discussing physical and psychological needs, the impact of these changes on the mother's body and mind, and strategies for better adaptation to pregnancy changes, such as attachment behaviors towards the fetus, the benefits of maternal-fetal attachment, and how to engage in these behaviors.
Session 2	- Presenting definitions of Maternal-Fetal Attachment and explaining how it develops. - Providing information about the various stages and processes of fetal development during different weeks of pregnancy. - Assisting mothers in identifying the position of the fetus and its movements through abdominal palpation. - Engaging in conversation with the fetus, including reading poetry and lullabies.
Session 3	- Regularly counting fetal movements and focusing on these movements while expressing feelings associated with them. - Educating mothers about the fetus's sensitivity to maternal experiences. - Planning for newborn feeding and envisioning oneself breastfeeding the baby. - Guiding mothers in mental imagery regarding holding their newborn and imagining their baby's face. - Visualizing ways to soothe the fetus through abdominal touch.
Session 4	- Involving fathers in the session to inform them about their pregnant partner's physical and psychological needs. - Assisting fathers in expressing positive feelings towards their partners, touching their bellies, and talking to the fetus. - Helping mothers establish a support system. - Connecting mothers with mental health services to address their psychological needs.

The data were analyzed using SPSS software, version 21.

Results and Discussion

This section presents a description of the sample under study according to its demographic characteristics and related questions, utilizing descriptive statistics such as frequency, mean, and standard deviation, which are organized in tables.

Table 2. Comparison of Mean Maternal Age and Gestational Age of Participants in Experimental and Control Groups

Variables	Groups	N	Mean (M)	Standard Deviation (SD)	T-value	Degrees of Freedom (d.f.)	Significance Level (P)
Gestational Age	Experimental	20	28.65	3.602	-0.1430	38	0.8870
	Control	20	28.80	3.002			
Maternal Age	Experimental	20	27.65	4.891	0.1380	38	0.8910
	Control	20	27.45	4.261			

Table 2 presents a comparison of the means for maternal age and gestational age among participants in both the experimental and control groups. To assess whether there are significant differences between the two groups concerning their mean ages and gestational ages, an independent samples t-test was conducted. The results indicate that, due to the absence of statistical significance ($P > 0.05$), the means for both groups are nearly identical. Consequently, a statistical comparison between these two groups is justified.

Table 3. Results of Covariance Analysis for the Difference in Mean Scores of Maternal-Fetal Attachment in Experimental and Control Groups

Variable	Status	Degrees of Freedom	Mean Squares	F Value	Significance Level	Effect Size	Statistical Power
Maternal-Fetal Attachment	Pre-test	1	3.672	88.834	0.001 (**)	0.7060	1
	Group Membership	1	1.470	35.554	0.001 (**)	0.4900	1

(**) Significance at the 0.01 level

Table 3 demonstrates a statistically significant difference in Maternal-Fetal Attachment between the groups ($P < 0.001$). Consequently, it can be concluded that a difference exists between the experimental and control groups. Moreover, the

effect size of the intervention related to group membership is 49%. This indicates that participants in the experimental group exhibited a 49% increase in maternal-fetal attachment compared to those in the control group. Additionally, a statistical power value closer to one suggests a stronger effect of the intervention. Therefore, the hypothesis asserting that prenatal attachment behavior training positively influences Maternal-Fetal Attachment among first-time pregnant women with insecure attachment styles has been validated.

Table 4. Results of Covariance Analysis for the Difference in Mean Scores of Maternal-Fetal Attachment in Experimental and Control Groups

Variable	Status	Degrees of Freedom	Mean Squares	F Value	Significance Level	Effect Size	Statistical Power
Maternal-Fetal Attachment	Pre-test	1	3.672	88.834	0.001 (**)	0.7060	1
	Group Membership	1	1.470	35.554	0.001 (**)	0.4900	1

(**) Significance at the 0.01 level

Table 4 demonstrates a statistically significant difference in Maternal-Fetal Attachment between the groups ($P < 0.001$). Consequently, it can be concluded that a difference exists between the experimental and control groups. Furthermore, the effect size of the intervention related to group membership is 49%, indicating that participants in the experimental group exhibited a 49% increase in Maternal-Fetal Attachment compared to those in the control group. Therefore, the findings support the assertion that training in prenatal attachment behaviors positively influences Maternal-Fetal Attachment among first-time pregnant women with insecure attachment styles.

Table 5: Results of Covariance Analysis for the Difference in Mean Scores of Components of Maternal-Fetal Attachment in Experimental and Control Groups

Components of Maternal-Fetal Attachment	Status	Degrees of Freedom	Mean Squares	F Value	Significance Level	Effect Size	Statistical Power
Interaction with the Fetus	Pre-test	1	5.552	30.244	0.001 (**)	0.4500	1
	Group Membership	1	1.703	9.277	0.001 (**)	0.2000	0.8430
Differentiation between Self and Fetus	Pre-test	1	6.105	24.345	0.001 (**)	0.3970	0.9980
	Group Membership	1	0.726	2.894	0.0970	0.0730	0.3810
Self-Sacrifice	Pre-test	1	6.659	36.781	0.001 (**)	0.4990	1
	Group Membership	1	0.097	0.538	0.4680	0.0140	0.1100
Acceptance of Maternal Role	Pre-test	1	13.569	121.712	0.001 (**)	0.7670	1
	Group Membership	1	0.654	5.865	0.0200	0.1370	0.6550
Attributing Characteristics to the Fetus	Pre-test	1	5.316	22.974	0.001 (**)	0.3830	0.9970
	Group Membership	1	5.516	23.838	0.001 (**)	0.3920	0.9970

(**) Significance at the level of $P < 0.01$

Table 5 reveals that there are statistically significant differences between the groups concerning certain components of Maternal-Fetal Attachment, specifically acceptance of maternal role, interaction with the fetus, and attributing characteristics to the fetus ($P < 0.001$). Conversely, no significant differences were found for the components of differentiation between self and fetus or self-sacrifice. Furthermore, the effect size of the intervention related to group membership was found to be 20% for interaction with the fetus, 14% for acceptance of the maternal role, and 40% for attributing characteristics to the fetus. This indicates that participants in the experimental group experienced increases ranging from 14% to 40% in their interactions with the fetus, acceptance of their maternal roles, and attribution of characteristics to the fetus when compared to those in the control group. Consequently, it has been substantiated that training in prenatal attachment behaviors significantly influences various components of Maternal-Fetal Attachment (acceptance of maternal role, interaction with the fetus, attributing characteristics to the fetus, differentiation between self and fetus, and self-sacrifice) among first-time pregnant women who exhibit insecure attachment styles.

Table 6. Results of Covariance Analysis for the Difference in Mean Scores of Attachment Style (dependency) in Experimental and Control Groups

Variable	Status	Degrees of Freedom	Mean Squares	F Value	Significance Level	Effect Size	Statistical Power
Attachment Style (Dependency)	Pre-test	1	1002.154	309.652	0.001 (**)	0.8930	1
	Group Membership	1	1.228	0.3790	0.5420	0.0100	0.0920

(**) Significance at the level of P < 0.01

Table 6 demonstrates that there is no statistically significant difference in attachment style (dependency) between the groups (P > 0.05). Consequently, it cannot be concluded that a difference exists between the experimental and control groups. Thus, the null hypothesis of the study (H_0) is upheld, while the third hypothesis (H_A), which asserts that training in prenatal attachment behaviors influences attachment style (dependency) among first-time pregnant women with insecure attachment styles, is rejected.

Table 7. Results of Covariance Analysis for the Difference in Mean Scores of Attachment Style (Closeness) in Experimental and Control Groups

Variable	Status	Degrees of Freedom	Mean Squares	F Value	Significance Level	Effect Size	Statistical Power
Attachment Style (Closeness)	Pre-test	1	92.729	33.175	0.001 (**)	0.4730	1
	Group Membership	1	12.808	4.582	0.039 (*)	0.1100	0.5500

(**) Significance at the level of P < 0.01

Table 7 demonstrates a statistically significant difference in attachment style (closeness) between the groups (P < 0.05). Consequently, it can be concluded that a difference exists between the experimental and control groups. Furthermore, the effect size of the intervention related to group membership is 11%. This means that participants in the experimental group exhibited a 75% increase in their attachment style (closeness) compared to those in the control group. Therefore, the hypothesis positing that training in prenatal attachment behaviors positively influences the increase in attachment style (closeness) among first-time pregnant women with insecure attachment styles has been validated.

Table 8. Results of Covariance Analysis for the Difference in Mean Scores of Attachment Style (Anxiety) in Experimental and Control Groups

Variable	Status	Degrees of Freedom	Mean Squares	F Value	Significance Level	Effect Size	Statistical Power
Attachment Style (Anxiety)	Pre-test	1	558.924	190.731	0.001 (**)	0.8380	1
	Group Membership	1	0.192	0.066	0.7990	0.0020	0.0570

(**) Significance at the level of P < 0.01

Table 8 demonstrates that there is no statistically significant difference in attachment style (anxiety) between the groups (P > 0.05). As a result, it cannot be concluded that a difference exists between the experimental and control groups. Therefore, the hypothesis suggesting that training in prenatal attachment behaviors influences attachment style (anxiety) among first-time pregnant women with insecure attachment styles has been rejected.

Regarding prenatal training in attachment behaviors and its impact on enhancing Maternal-Fetal Attachment among first-time pregnant women with insecure attachment styles, the results indicate a statistically significant difference between groups (P < 0.001). This p-value supports the conclusion that a difference exists between the experimental and control groups. Moreover, the effect size of the intervention was calculated at 49%, suggesting that the independent variable in this study has a substantial effect. These findings are consistent with those from previous research conducted in this field, including studies by Haghighat et al. (2014), Abbasi, Tafazoli, and Eamaili (2010), as well as Yang and Kim (2010) [20-22].

The explanation for these results suggests that training in attachment behaviors helps mothers who possess insecure attachment styles to cultivate their attachment to their fetuses while practicing motherhood within a safer and more stable context learned during educational sessions. Our primary hypothesis posits that insecure attachment correlates with negative emotions; thus, this educational intervention aimed to replace potential negative feelings about their relationship with both their fetuses and partners with positive emotions whenever possible. These positive feelings are expected to enhance maternal affection and interest, thereby increasing maternal attachment to their fetuses.

Concerning prenatal training in attachment behaviors and its effects on various components of Maternal-Fetal Attachment (acceptance of maternal role, interaction with the fetus, attributing characteristics to the fetus, differentiation between self and fetus, self-sacrifice) among first-time pregnant women

with insecure attachment styles, results indicate statistically significant differences between groups concerning specific components such as acceptance of maternal role, interaction with the fetus, and attributing characteristics to the fetus ($P < 0.001$). However, no significant differences were observed in other components like differentiation between self and fetus or self-sacrifice. Additionally, effect sizes for group membership were found to be 20% for interaction with the fetus, 14% for acceptance of the maternal role, and 40% for attributing characteristics to the fetus.

In justifying the significant increase observed in three components—interaction with the fetus, attributing characteristics to the fetus, and acceptance of the maternal role—it can be stated that interaction with the fetus encompasses behaviors that mothers engage in to communicate with their unborn child. Such behaviors may include talking to, reading poetry or stories for, and physically interacting with their abdomen. When a fetus moves within its mother's womb and she responds immediately, it reflects an effort to establish a reciprocal relationship. The training provided to mothers in this study emphasized encouraging these interactions significantly, which constitutes a core element of their education; thus, a notable increase in this area appears justified.

In explaining why there was no significant impact on self-sacrifice and differentiation between self and fetus components, it should be acknowledged that scores for these components did rise in the post-test for the experimental group; however, these increases were not statistically significant. Initially, participants' scores for self-sacrifice were higher than those for other components, which rendered any educational need regarding this aspect somewhat artificial. This situation arises from the fact that becoming a mother inherently involves self-sacrifice from early pregnancy stages. Without such an inclination toward self-sacrifice, mothers would likely struggle to cope with the physical and psychological challenges posed by pregnancy; they might even hesitate to conceive altogether. Consequently, there was limited focus during educational sessions on directly enhancing this component, which may account for why training had no observable effect.

Regarding differentiation between self and fetus as a component, it may be pertinent to consider its cognitive dimension. A mother's capability to distinguish herself from her fetus is fundamentally cognitive and relates to her perceptions and interpretations. The training implemented in this study primarily addressed behavioral aspects by evaluating and teaching observable behaviors while engaging minimally with cognitive domains. Moreover, establishing this differentiation—accepting the fetus as an entirely independent entity—seems problematic while it remains within its mother's womb as part of her being, sharing intertwined emotions and feelings. This viewpoint contrasts with findings from research conducted by Suaad et al. (2012) [23].

The statistical results revealed that there was no statistically significant difference in scores among pregnant mothers in the groups regarding the avoidant attachment style subscale or dependency subscale. This study's findings are consistent with those of Moghadam Hosseini, Jafarnejad, and Soltanifar (2012) but inconsistent with research conducted by Heydari, Allahyari, and Azad Fallah (2012) [24, 25]. The insecure-avoidant attachment style exhibited by mothers shows an inverse relationship with maternal attachment to their infants. Hamilton posits that an individual's attachment style remains stable throughout life and is resistant to change. To explain why these results were rejected, it can be argued that an individual's attachment style comprises internalized patterns developed during childhood; thus, altering or treating it necessitates profound and long-term interventions. Consequently, its stability against brief educational interventions appears both reasonable and justifiable.

In terms of how prenatal training in attachment behaviors impacts the closeness aspect of attachment styles among first-time pregnant women with insecure attachments, results indicated a statistically significant difference between groups regarding closeness ($P < 0.05$). This finding supports the conclusion that differences exist between the experimental and control groups. Furthermore, the effect size for group membership was calculated at 11%, suggesting that participants in the experimental group experienced a 75% increase in closeness compared to those in the control group. These results are consistent with studies conducted by Warfa et al. (2014), Bramm (2014), Heydari, Allahyari, and Azad Fallah (2012), as well as Luz et al. (2014) [25-28]. In discussing why this hypothesis was confirmed, it can be noted that while secure attachment levels significantly increased among participants in the experimental group following the intervention, their predominant attachment styles did not change. This increase may stem from the positive nature of these training sessions which fostered a sense of comfort and security for pregnant mothers concerning themselves and their fetuses.

Regarding prenatal training in attachment behaviors' effects on anxiety-related attachment styles among first-time pregnant women with insecure attachments, findings indicated no statistically significant differences between groups concerning anxiety attachments ($P > 0.05$). Therefore, it cannot be concluded that differences exist between experimental and control groups; hence prenatal training does not influence anxiety-related attachments for first-time pregnant women with insecure attachments. Anxious or ambivalent attachments represent one form of insecure attachment typically arising from existing injuries related to attachments; they develop when an individual's attachment system becomes excessively activated—manifesting as clinginess within relationships, pursuit behaviors, or even aggressive attempts to elicit responses from significant others. Research by Heydari, Allahyari, and Azad Fallah (2012) suggests that psychotherapeutic interventions have not affected reducing ambivalent insecure attachments [25].

Conclusion

The findings from this study offer a clear and practical framework for counselors, psychotherapists, midwives, and all professionals engaged in the care of pregnant women. They can serve as a valuable experiential guide aimed at enhancing the relationship between mothers and their fetuses, especially for those pregnant women who encounter specific challenges that impact their attachment to the fetus. It is suggested that similar prenatal behavior training be implemented with multiparous mothers and that the outcomes be compared.

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