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# Investigation of the Effect of Pilates Exercises on Pregnancy Stress

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## Abstract

**Purpose**: The aim of this study is to investigate the effect of pilates exercise during pregnancy on pregnancy stress.

**Materials and Methods**: 40 pregnant individuals were included in the study. The groups of the study were composed of the study group who volunteered and accepted to do pilates exercise and the control group who did not do pilates. Pilates exercises were applied by a physiotherapist for a total of 16 sessions, 2 sessions per week, for 8 weeks. No application was made to the control group. "Demographic Assessment Form" and "Pregnancy Stress Scale (GSDS)" were used as data collection tools in the study. It was evaluated in two groups before and after the study, and the scores were recorded in the patient files.

**Results:** As a result of the evaluation, the pregnancy stress of the pregnant women in the pilates group after the study (37.10±1.88) decreased compared to before and in the control group, and this decrease was statistically significant ($p<0.05$).

**Conclusion**: This study stated that pilates exercises performed during pregnancy reduce pregnancy stress.

**Keywords:** Pregnancy, Pilates, Pregnancy Stress, Exercise During Pregnancy, Pilates and Stress

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## INTRODUCTION

Pregnancy is a normal and natural event in which women experience physiological, psychological and anatomical changes. In addition to these changes, it also brings with it a social and psychological adaptation process. While some pregnant women can easily adapt to this process, some cannot easily adapt to this process due to social pressure, family problems or an existing history of depression. It has been stated that during this period, mothers are concerned about the baby's health and survival (Karataş Baran et al., 2020). Stress is defined as the reaction and physical events that individuals experience when they experience psychological and physiological stress (Durmuş, 2015). The causes of stress experienced during this period are evaluated as social and psychological. Factors such as the fear of not being a good mother resulting from social pressure, the thought that it will endanger the baby's and their own health, difficult working conditions, and financial inadequacies may cause expectant mothers to feel anxiety and worry during this period. The stress factor affects individuals not only psychologically but also physically. Stress-related muscle tension and pain may occur, which affects the quality of daily life of individuals. Studies have revealed that stress factors increase the likelihood of miscarriage during pregnancy by 2-3 times. Nausea, vomiting, edema in the hands and feet, and hormonal changes, which are common and natural during pregnancy, can also be a cause of stress for individuals (Olah and Barry, 2014). It has been observed that sleep problems and decreased sleep quality towards the end of pregnancy increase the perceived stress level in pregnant women (Pınar et al., 2014). Stress reduces the quality of life of individuals in every sense and negatively affects the health of pregnant women and babies.

It has been reported that physical activity and exercise give positive results during pregnancy and reduce possible complications, and pregnant women who exercise are psychologically better than pregnant women who do not (Kesim et al., 2019). Pilates exercises are the most preferred type of exercise during the birth process, which includes breathing and relaxation techniques that provide body control and spinal stabilization, strengthen weak muscles, and relax tense muscles. Studies have shown that breathing and relaxation techniques reduce the level of perceived stress (Oğuz et al., 2019). Pilates exercises not only help pregnant women during pregnancy, but also help individuals quickly return to their normal pre-pregnancy bodies. Pilates strengthens many muscles of the body, but also exercises and strengthens the abdominal and pelvic floor muscles. The development and strengthening of the pelvic floor muscles will reduce the risk of incontinence that may occur in the post-pregnancy period (Göker, 2012). In order for individuals to have a physically and mentally healthy pregnancy, methods that will minimize the stress level need to be analyzed and implemented. There are limited studies in the literature on the benefits of pilates on mental health. In this study; This study was conducted to investigate and compare the effect of pilates exercises on perceived stress level.

MATERIALS AND METHODS

The study was conducted with pregnant women who participated voluntarily at Istanbul FizyoMarin Healthy Life Center between December 2023 and March 2024. 40 pregnant individuals were included in the study. The groups of the study were composed of the study group who volunteered and accepted to do pilates exercise and the control group who did not do pilates. Pilates exercises were applied by a

physiotherapist for a total of 16 sessions, 2 sessions per week, for 8 weeks. All individuals in the Pilates group were taught pre-exercise stabilization training and the principles of Pilates. Posture exercises, mat pilates exercises, breathing exercises, and strengthening exercises were varied to suit the pregnant woman and applied for 10 repetitions. No application was made to the control group.

In order to obtain statistically significant results with a Type I error level of 0.05, 95% power and effect size of 0.5, and 85% power, the total number of pregnant women was determined as 40 (20/20). The required sample size and power calculation for the study was made using the G*Power program.

The sample of the study consisted of pregnant women between the ages of 18-40 who were not diagnosed with a risky pregnancy, completed the 12th week of pregnancy, were physically and perceptually competent to exercise, and did not have any communication disorders and volunteered to participate in the research.

Approval of Istanbul Aydin University Non-Interventional Clinical Research Ethics Committee dated 29.11.2023 and numbered 145 was received by the researchers. Institutional approval was obtained from the relevant institution where the research was conducted. Permission was obtained from volunteer pregnant women who agreed to participate in the study, along with an informed consent form. During the data collection process, the rules in the Declaration of Helsinki were followed. Participation in the study was voluntary, and the surveys and forms of the individuals who agreed to participate were prepared in advance and filled out by the researcher using the face-to-face interview technique before the study. This process took approximately 20-30 minutes.

Data Collection Tools

In the study, the "Sociodemographic Evaluation Form" and the Pregnancy Stress Scale (GSDS-36), prepared in accordance with the purpose of the study, were used as data collection tools.

Sociodemographic Evaluation Form

It is a form containing 19 questions that include information about the characteristics of all individuals participating in the study, such as age, height, weight, number of pregnancies, marital status, week of pregnancy, chronic diseases, medication used and surgical history.

Pregnancy Stress Scale (GSDS-36)

It consists of a total of 30 items developed by Chen et al. in 1983 to measure the level of stress perceived by pregnant women during pregnancy. Later, in 2015, birth and postpartum stressors were added and the final version was reduced to 36 items. Participants evaluated all items with a Likert-type scale. In the scoring, evaluations such as absolutely no (0), mild (1), moderate (2), severe (3), and very severe (4) were used. The sum of the scores of all items represents the prenatal stress score (Aksoy et al., 2019). In Aksoy et al.'s study "Adaptation of the Pregnancy Stress Assessment Scale into Turkish and Factor Analysis", the internal consistency coefficient was found to be 0.94, and it was concluded that it has a high degree of reliability and is an appropriate measurement tool to be used in evaluating the stress levels of pregnant women with high validity and reliability levels (Aksoy et al., 2019).

Statistical Analysis

Statistical analyzes were performed using the IBM SPSS 28 package program. Number and percentage were used for categorical parameters in the research, and mean and standard deviation values were used for numerical parameters. The normality assumption of numerical parameters was made with the Shapiro-Wilk test and it was determined that the parameters were in accordance with normal distribution. For this reason, parametric analysis methods were used in the study. "Dependent sample T-test" was used for inter-group comparison of numerical parameters. Chi-Square test and Fisher Exact test were used to compare categorical parameters according to groups. In evaluating all analyses, $p<0.05$ level was considered statistically significant.

FINDINGS

A total of 40 pregnant women were included in the study. The groups were divided into two groups, study and control groups, by randomization method. A total of 16 sessions of pilates exercises were applied to 20 pregnant women in the pilates group, 2 days a week, while no exercise program was applied to the control group. The distribution of pregnant women in the experimental and control groups in the study group according to socio-demographic characteristics is shown in Table 1.

**Tablo 1.** Demographic Characteristics

| | | **Pilates Group** (n=20) | **Control Group** (n=20) | **P** |
|---|---|---|---|---|
| | | **n (%)** | **n (%)** | |
| Educational Status | Primary | 2 (10) | 3 (15) | |
| | High School | 7 (35) | 8 (40) | |
| | Associate degree | 7 (35) | 4 (20) | 0,795[a] |
| | Licence | 4 (20) | 5 (25) | |
| Marital Status | Married | 20 (100) | 20 (100) | - |
| Chronic Disease | None | 20 (100) | 20 (100) | - |
| Smoking | Yes | 3 (15) | 4 (20) | 0,500[a] |
| | No | 17 (85) | 16 (80) | |
| Exercise | Yes | 2 (10) | 2 (10) | 1,000[a] |
| | No | 18 (90) | 18 (90) | |
| Social Security | Yes | 17 (85) | 15 (75) | 0,695[a] |
| | No | 3 (15) | 5 (25) | |
| | | **$\bar{X}$ ± SS** | **$\bar{X}$ ± SS** | |
| Age (Years) | | 28,05 ± 2,81 | 28,45 ± 2,39 | 0,631[c] |
| Size (cm) | | 164,45 ± 5,62 | 163,85 ± 6,18 | 0,750[c] |

| | | | |
|---|---|---|---|
| Weight (kg) | 57,15 ± 4,80 | 58,70 ± 2,91 | 0,225[c] |
| BKİ (kg/m²) | 24,86 ± 1,92 | 25,67 ± 2,01 | 0,202[c] |

**p<0,05**; a=Fisher Exact test; b=Ki-Kare Test; c=Independent Simple T-test was used.

There is no statistical difference between the groups in the educational status of the pregnant women included in the study (p>0.05). There is no statistical difference between the groups in terms of regular exercise of the pregnant women included in the study (p>0.05). The average age of pregnant women in the Pilates group (28.05±2.81 years) is lower than the average age of pregnant women in the control group (28.45±2.39 years) and this difference is not statistically significant. There is no statistical difference in smoking among the pregnant women included in the study according to the groups (p>0.05).The results of the analysis conducted to determine whether the information regarding the gestational periods of pregnant women differs according to the Pilates group and the control group are shown in Table 2.

**Tablo 2.** Information on the Pregnancy Period

| | | **Pilates Group** (n=20) | **Kontrol Group** (n=20) | **P** |
|---|---|---|---|---|
| Psychological Support | Yes | 3 (15) | 2 (10) | 0,500[b] |
| | No | 17 (85) | 18 (90) | |
| Pregnancy Type | Planned | 14 (70) | 6 (30) | **0,011[a]** |
| | Unplanned | 6 (30) | 14 (70) | |
| Pregnancy Month | 1-3 Months | 9 (45) | 8 (40) | |
| | 3-6 Months | 7 (35) | 9 (45) | 0,841[a] |
| | 7*9 Months | 4 (20) | 3 (15) | |
| Number of Pregnancies | 1 Times | 10 (50) | 9 (45) | |
| | 2 Times | 8 (40) | 11 (55) | 0,463[a] |
| | 3 and Above | 2 (10) | 0 (0) | |
| Number of Children | None | 10 (50) | 10 (50) | |
| | 1 Child | 8 (40) | 10 (50) | 0,538[a] |
| | 2 Child | 2 (10) | 0 (0) | |
| Problem Pregnancy | Yes | 1 (5) | 2 (10) | 0,500[a] |
| | No | 19 (95) | 18 (90) | |

**p<0,05**; a=Fisher Exact test; b=Ki-Kare Test

There is no statistical difference between the groups in terms of whether the pregnant women included in the study received support during their pregnancy (p>0.05). There is no statistical difference between the groups in the gestational month of the pregnant women included in the study (p>0.05). There is no statistical difference in the number of pregnancies of the pregnant women included in the

study, according to the groups (p>0.05). There is no statistical difference in the number of children of the pregnant women included in the research, according to the groups (p>0.05). There is no statistical difference between the groups in terms of the problems experienced by the pregnant women included in the study (p>0.05).

The results of the analysis performed to determine whether there are differences between measurements in the study group are shown in Table 3.

**Tablo 3.** Comparison Between Measurements

| | | **Firs Measurement** | **Last Measurement** | **P** |
|---|---|---|---|---|
| | | **$\bar{X}$ ± SS** | **$\bar{X}$ ± SS** | |
| **Pilates Grub** | Pregnancy Stress | 50,35 ± 2,90 | 37,10 ± 1,88 | **0,001** |
| | Seeking Safe Process | 13,60 ± 1,27 | 8,65 ± 1,13 | **0,001** |
| | Bbay Care and Family Relationships | 10,90 ± 1,48 | 9,85 ± 1,46 | **0,003** |
| | Defing the Maternal Role | 7,05 ± 1,14 | 6,50 ± 1,14 | 0,053 |
| | Seeking Social Support | 4,10 ± 1,02 | 3,70 ± 0,73 | **0,002** |
| | Changing Physical Appearance and Function | 14,70 ± 1,13 | 8,40 ± 1,18 | **0,001** |
| **Kontrol Gub** | Pregnancy Stress | 49,35 ± 3,04 | 49,25 ± 3,05 | 0,347 |
| | Seeking Safe Process | 13,25 ± 1,37 | 11,10 ± 1,71 | **0,001** |
| | Baby Care and Family Relationships | 10,40 ± 1,09 | 10,10 ± 1,51 | 0,356 |
| | Defining the Maternal Role | 6,35 ± 1,42 | 6,20 ± 1,15 | 0,267 |
| | Seeking Social Support | 4,15 ± 0,98 | 4,20 ± 0,89 | 0,577 |
| | Changing Physical Appearance and Function | 15,20 ± 1,15 | 14,15 ± 1,18 | **0,001** |

**p<0,05**; Dependent sampla T-test was used.

Pregnancy stress of pregnant women after pilates (37.10±1.88) decreased compared to before (50.35±2.90) and this decrease is statistically significant (p<0.05). The stress of pregnant women regarding the search for a safe process after Pilates (8.65±1.13) decreased compared to before (13.60±1.27), and this decrease is statistically significant (p<0.05). The stress of pregnant women regarding baby care and changing family relationships after Pilates (9.85±1.46) decreased compared to before (10.90±1.48), and this decrease is statistically significant (p<0.05). Pregnant women's stress regarding the definition of their maternal role after Pilates (6.50±1.14) decreased compared to before (7.05±1.14), but this decrease was not statistically significant (p>0.05). Pregnant women's stress in seeking social support after Pilates (3.70±0.73) decreased compared to before (4.10±1.02), and this decrease was statistically significant (p<0.05). The stress of pregnant women regarding the changing physical appearance and function after Pilates (8.40±1.18) decreased compared to before (14.70±1.13), and this decrease is statistically significant (p<0.05).

## DISCUSSIONS

Studies in the literature indicate that more comprehensive research on pregnancy and exercise is needed. Although the physical activity levels of pregnant women during this period have increased recently, most pregnant women still have the perception that it would be more positive to remain inactive during this period. It has been reported that the possibility of women developing psychological disorders increases during pregnancy (Yılmaz and Yar.,2021). Anxiety disorders, stress and stress-related depression experienced during pregnancy can be ignored. Stress cannot be prevented in daily life, but it can be managed. Stress experienced during pregnancy has negative effects on the health of the pregnant woman and the baby, and stress should be managed well during this period. There are not many studies in the literature about stress and stress management during pregnancy. It is known that physical activity and regular exercise provide physical, psychological, social and mental benefits for pregnant women. In light of this information, this study was planned to investigate the effect of pilates exercises on stress on pregnant women. In a systematic review, it was reported that regular physical activity performed by pregnant women positively affected their mental health (Kesim et al., 2019). In our study, it was determined that pilates exercises applied for eight weeks significantly reduced the general stress of the pregnant woman. It is known that stress first affects the psychological state and harms the mental health of individuals (Sürme, 2019). This result we reached in our study revealed that pilates exercises have positive effects on stress and depression management in pregnant women.

The increased amount of weight and movement restrictions of pregnant women during this period may lead to some health problems during pregnancy and in the future. Changing physical appearance and weight gain cause stress in individuals. In our study, the stress of pilates exercises on the changing physical appearance and function of pregnant women decreased compared to before, and this decrease was found to be statistically significant. According to this result, we can say that pilates exercises reduce the stress level experienced by pregnant women due to their physical changes.

In a study, it was stated that as the stress levels of pregnant women increase, their perception of motherhood and body perception are negatively affected (Çoşkun et al., 2019). In our study, the stress of pregnant women regarding the definition of their maternal role after Pilates (6.50±1.14) decreased compared to before (7.05±1.14), but this decrease was not found to be statistically significant ($p>0.05$). This result shows that pilates exercises performed during pregnancy have a positive effect on stress, as well as the perception of motherhood.

As a result of a study, it was determined that the profession of pregnant women, their educational status, their desire to become pregnant, their need for social support in postnatal baby care, and experiencing problems during pregnancy affected the level of perceived stress during pregnancy (Çelik and Atasever., 2010). As a result of the study, it was recommended to conduct studies on methods of coping with stress. As a result of our study, the stress of pregnant women regarding baby care and changing family relationships after Pilates (9.85±1.46) decreased compared to before (10.90±1.48), and this decrease was found to be statistically significant ($p<0.05$). . In addition, the stress of pregnant women seeking social support after Pilates (3.70±0.73) decreased compared to before (4.10±1.02), and this decrease was found to be statistically significant ($p<0.05$).

Failure of individuals to adapt to the physiological and psychological variables experienced during pregnancy and failure to receive adequate social support during this process may cause individuals to become psychologically vulnerable. Factors such as stress and depression need to be recognized early in the pregnancy process and intervened for the health of pregnant women and the baby (Ölçer and Oskay., 2015). According to the results we found in our study, recommending pilates exercises to pregnant women during this period will be beneficial for both their general body health and mental health.

As a result, from the data obtained in this study, we conclude that pilates exercises performed during pregnancy have positive effects on the stress and anxiety disorders experienced by pregnant women and are beneficial for the mental health of pregnant women. Therefore, this shows that pilates exercises can be recommended during pregnancy even for those who do not participate in any exercise program.

There is not much research in the literature about stress experienced during pregnancy and alternative solutions. We think that our study will shed light on future studies in this direction. When exercise and pregnancy are evaluated together, a complex situation arises and the subject needs to be examined more comprehensively and in different dimensions.