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# The Effect of Chewing Gum on Stress in Women with Unexplained Infertility

## *Açıklanamayan İnfertil Kadınlarda Sakız Çiğnemenin Stres Üzerine Etkisi*

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**ABSTRACT**

**Introduction:** Infertile women may have difficulty coping with the stress caused by assisted reproductive methods.
**Aim:** It was aimed to investigate the effect of chewing gum on stress levels in women with unexplained infertility.
**Method:** Sixty - one women receiving in - vitro fertilization treatment in the tertiary care center were included in the study. A randomized controlled experimental design was established in the study. The group chewing gum for five minutes at least two times a day was called "Experimental Group - 1", the group chewing gum for 20 minutes at least two times a day was called "Experimental Group - 2", and the group not chewing gum was called "Control Group". Reproductive information and stress level data of infertile women were collected with the Descriptive Information Form and Fertility Problem Inventory.
**Results:** No statistically significant difference was found in comparing Fertility Problem Inventory total scores between the groups ($p > 0.05$). However, a statistically significant difference was found between the mean values of the denial of life without children, which was a subscale of the Fertility Problem Inventory score according to time in the Experimental Group - 2 group ($p < 0.005$).
**Conclusion:** We believe that the positive effect of chewing gum on coping with stress may be an alternative intervention that may contribute positively to coping with the infertility treatment process and should be supported by other interventions.

**Keywords:** Assisted reproductive techniques; chewing gum; infertility; stress.

**ÖZ**

**Giriş:** İnfertil kadınlar, yardımlı reprodüktif yöntemlerin neden olduğu stres ile baş etmekte zorlanabilmektedirler.
**Amaç:** Nedeni açıklanamayan infertil kadınlarda sakız çiğnemenin stres düzeyi üzerine etkisinin incelenmesi amaçlandı.
**Yöntem:** Üçüncü basamak bir merkezde in - vitro fertilizasyon tedavisi alan 61 kadın çalışmaya dahil edildi. Araştırmada randomize kontrollü deneysel bir tasarım oluşturuldu. Günde en az iki kez beş dakika sakız çiğneyen grup "Deney Grubu - 1", en az iki kez 20 dakika sakız çiğneyen grup "Deney Grubu - 2", sakız çiğnemeyen grup ise "Kontrol Grubu" olarak adlandırıldı. İnfertil kadınların üreme bilgileri ve stres düzeyleri verileri Tanıtıcı Bilgi Formu ve Fertilite Sorun Envanteri ile toplanmıştır.
**Bulgular:** Gruplara göre sosyodemografik ve infertiliteye özgü özellikler arasında istatistiksel olarak anlamlı bir fark bulunmamıştır. Gruplar arası Fertilite Sorunu Envanteri toplam puanlarının karşılaştırılmasında istatistiksel olarak anlamlı bir fark bulunamamıştır ($p > 0,05$). Ancak "Deney Grubu - 2" grubu zamanlara göre Fertilite Sorunu Envanteri alt ölçeklerinden çocuksuz yaşamın reddi ölçek puanı ortalama değerleri arasında istatistiksel olarak anlamlı bir fark bulunmuştur ($p < 0,005$).
**Sonuç:** Sakız çiğnemenin stres ile baş etmeye sağladığı olumlu etkinin, infertilite tedavisi sürecinde kadınların yaşadığı stres düzeyini azaltmada dolaylı olarak da olsa azalma sağladığı dolayısıyla infertilite tedavi süreci ile baş etme üzerine olumlu katkı sağlayabilecek alternatif bir girişim olabileceği ve başka girişimlerle desteklenmesi gerektiği düşünülmektedir.

**Anahtar Kelimeler:** Ciklet; infertilite; stress; yardımlı reprodüktif yöntemler.

## Introduction

Infertility is defined as the inability to achieve clinical pregnancy after 12 months or more of regular unprotected sexual intercourse and is one of the most critical health problems in the world (Rooney & Domar, 2022). Although infertility is not classified as a life-threatening disease, it is a life crisis that affects couples in psychological, familial, social, and cultural aspects (Goker, Yanikkerem, Birge & Kuscu, 2018). It has been reported that dealing with fertility problems and their treatment negatively affects the psychological health of many individuals (Royani et al., 2019), and these adverse effects may lead to varying degrees of depression, anxiety, stress, and isolation (Donarelli et al., 2015).

Infertile women use assisted reproductive techniques to realize their desire to have a baby (Campagne, 2006). Assisted reproductive techniques may cause stress that may negatively affect the treatment outcome (Sominsky et al., 2017). One of the most common reflexes used to cope with stress is chewing. Chewing gum is a product that is usually chewed to reduce stress (Smith & Woods, 2012). The beneficial effects of chewing gum on stress are based on very old studies (Hollingworth, 1939). More recent studies have reported differences in the results of chewing gum on stress reduction (Torney, Johnson & Miles, 2009; Zibell & Madansky, 2009; Smith, 2010; Smith & Woods, 2012; Weijenberg & Lobbezoo, 2015).

Due to the highly traumatic nature of infertility treatment, many researchers have reported that infertility related stress is high in women (Donarelli et al., 2015; Rooney & Domar, 2022). There is no study in the literature investigating the effect of chewing gum on infertility stress.

## Aim

The study aimed to examine the effect of chewing gum on stress levels in infertile women with unexplained infertility.

### Research Questions

1. What was the stress level of women receiving infertility treatment?

2. Was chewing gum effective in coping with the stress caused by infertility?

## Method

### Study Design

The randomized controlled experimental study was conducted in a tertiary care center between 22 September 2021 and 07 October 2022.

### Setting

The population of the research consisted of women with unexplained infertility who are being treated at the reproductive health center of Eskişehir Osmangazi University Health Practice and Research Hospital.

### Research Population and Sample

A power analysis was performed for the number of participants recruited in each group. While performing this analysis, Scholey et al. (2009) determined that at least 18 cases should be interviewed in total with 95% confidence (1-α), 95.1% test power (1-β), and d=0.81 effect size for Cortisol value considering the ratio of mood and cognitive performance of chewing gum. The simple randomization method was used to ensure the equality of the sample in each group. The randomization list was obtained by coding Experimental Group - 1, Experimental Group - 2, and Control Group numbers and entering the number of people as 60 in the "random number generation program" (Research Randomizer Software). The study was completed with 61 participants.

The group chewing gum for five minutes at least two times a day was called "Experimental Group - 1", the group chewing gum for 20 minutes at least two times a day was called "Experimental Group-2", and the group not chewing gum was called "Control Group".

### Data Collection Tools

Data were collected using a Descriptive Information Form and the Fertility Problem Inventory (FPI). The FPI includes five subscales (sexual problems, the need to be a parent, social problems, rejection of a childless lifestyle, and relationship problems) that assess stress in more specific areas related to infertility. The global stress score consists of scores obtained from 46 items. High scores indicate increased stress associated with infertility (Newton, Sherrard & Glavac, 1999; Eren, 2008).

### Ethical Consideration

Institutional permission was obtained from the Eskişehir Osmangazi University Health, Practice and Research Hospital where the study was conducted, and ethics committee approval was obtained from Eskisehir Osmangazi University Clinical Research Ethics Committee (Date: 17.12.2020 and No: 2020/35). Informed consent was obtained from all the infertile women who participated in the study.

### Data Collection

For each participant, the chewing gums were provided sugar free, and they were allowed to chew gum at any speed they wanted, at least two times throughout the day. Experimental Group - 1, Experimental Group - 2, and the Control Group were administered repeated scales at the first interview, in the 2nd week of the intervention, and in the 2nd week after the completion of the intervention (4th week of the study). The detailed flow is shown in Figure 1.

### Data Analysis

Data were analyzed using the Statistical Package for the Social Sciences Version 23.0 (IBM Corp., Armonk, NY, USA). Compliance with normal distribution was analyzed by Shapiro-Wilk tests. Pearson's Chi-square test was used to compare categorical data according to groups, and multiple comparisons were analyzed with Bonferroni corrected Kruskall Wallis test. Kruskall Wallis H test was used to compare non-normally distributed data according to groups of three or more. One - way analysis of variance was used to compare normally distributed data according to groups of three or more. Repeated - measures analysis of variance was used to compare normally distributed data within groups according to three or more times, and multiple comparisons were analyzed by the Bonferroni test.

**Table 1: Characteristics of the Participants and Comparison by Group at Baseline**

| | Experimental Group-1 (n = 21) | | Experimental Group-2 (n = 20) | | Control Group (n = 20) | | Test statistics | p |
|---|---|---|---|---|---|---|---|---|
| **Characteristics** | **Mean ± SD** | **Median (Min-Max)** | **Mean ± SD** | **Median (Min-Max)** | **Mean ± SD** | **Median (Min-Max)** | | |
| Age (Year) | 29 ± 3.8 | 30 (22 - 35) | 31.45 ± 4.3 | 32 (24 - 40) | 31.55 ± 5.02 | 32.5 (23 - 39) | 2.235† | 0.116 |
| Age at Marriage (Year) | 23.05 ± 3.83 | 23 (17 - 31) | 25.3 ± 4.14 | 26 (18 - 33) | 25.2 ± 5.48 | 23 (18 - 35) | 1.630† | 0.205 |
| Duration of Marriage (Year) | 6.18 ± 3.33 | 5.42 (3 - 13) | 6.32 ± 3.16 | 6.17 (2 - 16) | 6.91 ± 4.58 | 5.29 (2 - 20) | 0.161‡ | 0.923 |
| **Characteristics** | **n** | % | **n** | % | **n** | % | **Test statistics** | **p** |
| **Education Status** | | | | | | | | |
| ≤ 8 years | 6 | 28.57 | 5 | 25.0 | 4 | 20.0 | | |
| High School | 4 | 19.05 | 5 | 25.0 | 8 | 40.0 | 2.514†† | 0.252 |
| Undergraduate and above | 11 | 52.38 | 10 | 50.0 | 8 | 40.0 | | |
| **Employment** | | | | | | | | |
| Unemployment | 7 | 33.33 | 9 | 45.0 | 7 | 35.0 | 2.444†† | 0.833 |
| Employment | 14 | 66.67 | 11 | 55.0 | 13 | 65.0 | | |
| **Income Status** | | | | | | | | |
| Income Equals Expenditure | 8 | 38.10 | 10 | 50.0 | 5 | 25.0 | | |
| Income Less than Expenditure | 4 | 19.04 | 2 | 10.0 | 6 | 30.0 | 3.758†† | 0.440 |
| Income Exceeds Expenditure | 9 | 42.86 | 8 | 40.0 | 9 | 45.0 | | |

† One-way variance test; ‡ Kruskall Wallis H test, ††Pearson's chi-square test; SD: standard deviation; Min: minimum; Max: Maximum

Friedman's test was used to compare the non-normally distributed data within the group according to three or more times. The results of the analyses were presented as mean ± standard deviation and median (minimum-maximum) for quantitative data and frequency (percentage) for categorical data. The significance level was taken as $p < 0.05$.

## Results

Evaluation of the sociodemographic data of the study and comparisons between the groups are shown in Table 1. No statistically significant difference was found between the mean values of age, age at marriage, and duration of marriage ($p > 0.05$). No statistically significant differences were found between education, employment and income status of the participants according to the groups ($p > 0.05$) (Table 1).

The findings related to the evaluation of infertility related data between the study groups are presented in Table 2. There was no statistically significant difference between the median values of the time they wanted to have children and the time they received infertility treatment according to the groups ($p > 0.05$). No significant difference was found between Experimental Group - 1, Experimental Group - 2, and Control Group regarding knowledge, support mechanisms, and their reactions to the infertility diagnosis and treatment process (Table 2).

The findings of the intragroup and intergroup comparisons of the questioning results according to the FPI scale are reported in Table 3. A statistically significant difference was found between the mean values of the rejection of a childless lifestyle score according to time in Experimental Group - 2 ($p = 0.002$). This difference was due to the difference between the rejection of a childless lifestyle score at the first interview and the rejection of a childless lifestyle scores at the 2nd week of the intervention and the 2nd week after the completion of the intervention. In the first interview, the mean rejection of a childless lifestyle score was 32.5 ± 8.55; in the second week of the intervention, the mean rejection of a childless lifestyle score was 29.4 ± 10.08; and in the second week after the completion of the

**Table 2: Comparison of the Characteristics of the Groups According to Infertility**

| | Experimental Group-1 (n = 21) | | Experimental Group-2 (n = 20) | | Control Group (n = 20) | | Test statistics | p |
|---|---|---|---|---|---|---|---|---|
| **Characteristics** | **Mean ± SD** | **Median (Min-Max)** | **Mean ± SD** | **Median (Min-Max)** | **Mean ± SD** | **Median (Min-Max)** | | |
| How long have you wanted to have a child? (Year) | 4.47 ± 2.8 | 3.5 (2-13) | 3.83 ± 1.86 | 4 (1-7) | 6.17 ± 4.45 | 5 (1-20) | 3.407§ | 0.182 |
| How long have you been treated for infertility? (Year) | 4.04 ± 3.23 | 2.42 (1-13) | 3 ± 1.3 | 3 (1-6) | 4.52 ± 2.96 | 3.67 (0-11) | 2.510§ | 0.285 |
| **Characteristics** | **n** | % | **n** | % | **n** | % | **Test statistics** | **p** |
| **Have you received knowledge about infertility?** | | | | | | | | |
| Yes | 15 | 71.43 | 16 | 80.0 | 16 | 80.0 | 0.572§ | 0.751 |
| No | 6 | 28.57 | 4 | 20.0 | 4 | 20.0 | | |
| **If you received knowledge, what is your source of knowledge?** | | | | | | | | |
| Health Personnel | 14 | 66.66 | 13 | 65.0 | 13 | 65.0 | 0.586§ | 0.717 |
| Other | 7 | 33.34 | 7 | 35.0 | 7 | 35.0 | | |
| **Did you use contraception before you decided to have a child?** | | | | | | | | |
| Yes | 11 | 52.38 | 9 | 45.0 | 8 | 40.0 | 0.496§ | 0.6 58 |
| No | 10 | 47.62 | 11 | 55.0 | 12 | 60.0 | | |
| **Who are the people who supported you during this process?** | | | | | | | | |
| Spouse | 13 | 61.91 | 15 | 75.0 | 11 | 55.0 | | |
| Family | 5 | 23.81 | 3 | 15.0 | 5 | 25.0 | 0.596§ | 0.787 |
| Other | 3 | 14.28 | 2 | 10.0 | 4 | 20.0 | | |
| **Do you find the support adequate?** | | | | | | | | |
| Yes | 13 | 61.91 | 12 | 60.0 | 14 | 70.0 | 0.491§ | 0.782 |
| No | 8 | 38.09 | 8 | 40.0 | 6 | 30.0 | | |
| **Have you ever felt under pressure because of not having children?** | | | | | | | | |
| Yes | 8 | 38.09 | 7 | 35.0 | 4 | 20.0 | 1.770§ | 0.413 |
| No | 13 | 61.91 | 13 | 65.0 | 16 | 80.0 | | |
| **How has not having children affected you?** | | | | | | | | |
| I am very unhappy | 3 | 14.28 | 3 | 15.0 | 4 | 20.0 | | |
| I feel very sad | 11 | 52.38 | 11 | 55.0 | 13 | 65.0 | 3.842§ | 0.698 |
| Nothing's changed | 7 | 33.34 | 6 | 30.0 | 3 | 15.0 | | |
| **Do you feel the need to hide the fact that you don't have a child from your close circle?** | | | | | | | | |
| Yes | 5 | 23.81 | 6 | 30.0 | 5 | 25.0 | 0.226§ | 0.893 |
| No | 16 | 76.19 | 14 | 70.0 | 15 | 75.0 | | |

§ Pearson's chi-square test; SD: standard deviation; Min: minimum; Max: Maximum

intervention, the mean rejection of a childless lifestyle score was 27.7 ± 10.22. The mean child-free lifestyle rejection score decreased in each measurement ($p < 0.05$). But also there was a significant difference between the all interview of the control group according to the mean child-free lifestyle rejection scores.

No statistically significant difference was found between the sub-scales scores of the FPI according to time and within groups ($p > 0.05$). However, the total mean score of the FPI decreased gradually in Experimental Group - 1 and Experimental Group - 2 in each measurement. This decrease was not statistically significant.

## Discussion

Stress is a condition characterized by activating the autonomic nervous system and stimulating feelings of tension, anxiety, and irritability (Zibell & Madansky, 2009). One of the most common reflexes used to cope with stress is chewing. The fact that chewing gum may reduce stress was first discussed by Hollingworth in the 1930s. Chewing gum contributes positively to ignoring stress from external sources by improving cognitive functions and, on the other hand, to coping with stress by providing psychological relaxation (Scholey et al., 2009; Smith, Chaplin & Wadsworth, 2012; Yu, Chen,

**Table 3: Comparison of Fertility Problem Inventory Scores within and between Groups**

| Subscales | Experimental Group-1 (n = 21) | | Experimental Group-2 (n = 20) | | Control Group (n = 20) | | Test statistics | p |
|---|---|---|---|---|---|---|---|---|
| | Mean ± SD | Median (Min-Max) | Mean ± SD | Median (Min-Max) | Mean ± SD | Median (Min-Max) | | |
| Sexual problems – I'' | 22.86 ± 8.99 | 23 (11 - 41) | 24.5 ± 8.94 | 22.5 (11 - 39) | 21.05 ± 9.64 | 17.5 (10 - 42) | 1.833‡ | 0.400 |
| Sexual problems – II'' | 22.43 ± 9.83 | 20 (11 - 46) | 23.1 ± 9.29 | 21 (10 - 40) | 22.05 ± 9.86 | 19.5 (11 - 38) | 0.148‡ | 0.929 |
| Sexual problems – III'' | 21.95 ± 10.27 | 20 (10 - 40) | 23.95 ± 10.29 | 21 (10 - 44) | 21.25 ± 9.77 | 18 (10 - 38) | 0.811‡ | 0.667 |
| **Test statistics** | 0.644‖ | | 1.04‖ | | 0.203‖ | | | |
| **p** | 0.725 | | 0.595 | | 0.904 | | | |
| The need to be a parent – I'' | 42.76 ± 8.63 | 42 (30 - 66) | 43.1 ± 12.23 | 44,5 (23 - 65) | 40,6 ± 8,1 | 40 (23 - 55) | 0.384† | 0.683 |
| The need to be a parent – II'' | 40.14 ± 9.36 | 40 (25 - 65) | 44.1 ± 13.14 | 44 (23 - 68) | 39,45 ± 10,2 | 40 (13 - 54) | 1.047† | 0.358 |
| The need to be a parent – III'' | 40.1 ± 10.06 | 39 (21 - 58) | 43.95 ± 12.64 | 45 (22 - 67) | 40,1 ± 9,64 | 40,5 (17 - 55) | 0.848† | 0.434 |
| **Test statistics** | 1.658†† | | 0.26†† | | 0.474†† | | | |
| **p** | 0.203 | | 0.772 | | 0.626 | | | |
| Social problems – I'' | 19,67 ± 8 | 17 (9 - 36) | 20,55 ± 7,97 | 21,5 (8 - 34) | 19,35 ± 6,27 | 19,5 (10 - 30) | 0,162‡ | 0,922 |
| Social problems – II'' | 19,9 ± 7,8 | 19 (9 - 36) | 20,9 ± 9,84 | 21,5 (8 - 41) | 18,95 ± 6,79 | 19,5 (8 - 34) | 0,162‡ | 0,922 |
| Social problems – III'' | 20 ± 8,06 | 18 (9 - 35) | 21,1 ± 10,3 | 17,5 (9 - 39) | 18,85 ± 6,58 | 17 (10 - 35) | 0,265‡ | 0,876 |
| **Test statistics** | 0,086‖ | | 1,130‖ | | 0‖ | | | |
| **p** | 0,958 | | 0,568 | | 1,000 | | | |
| The rejection of a childless lifestyle – I'' | 28.24 ± 7.61 | 28 (13 - 43) | 32.5 ± 8.55[b] | 33 (17 - 51) | 30,55 ± 7[b] | 31,5 (19 - 45) | 1.558† | 0.219 |
| The rejection of a childless lifestyle – II'' | 28 ± 7.7 | 29(12 - 41) | 29.4 ± 10.08[a] | 27,5 (13 - 53) | 26,85 ± 7,51[a] | 26 (14 - 40) | 0.452† | 0.639 |
| The rejection of a childless lifestyle – III'' | 26.38 ± 8.51 | 25 (11 - 41) | 27.7 ± 10.22[a] | 26 (10 - 44) | 25,8 ± 8,92[a] | 27 (9 - 40) | 0.223† | 0.801 |
| **Test statistics** | 1.993†† | | 7.473†† | | 8.878†† | | | |
| **p** | 0.162 | | **0.002*** | | **0.004*** | | | |
| The relationship problems – I'' | 14.1 ± 4.53 | 14 (6 - 24) | 16.5 ± 4.59 | 16 (8 - 26) | 15.4 ± 4.97 | 14 (10 - 32) | 3.303‡ | 0.192 |
| The relationship problems – II'' | 13.81 ± 3.43 | 14 (6 - 19) | 15.35 ± 4.44 | 14 (10 - 24) | 15 ± 3.69 | 14.5 (10 - 23) | 0.394‡ | 0.821 |
| The relationship problems – III'' | 14.29 ± 4.44 | 15 (6 - 24) | 15.2 ± 5.17 | 13.5 (6 - 26) | 14.95 ± 3.4 | 15 (9 - 21) | 0.223‡ | 0.894 |
| **Test statistics** | 0.949‖ | | 0.206‖ | | 1.258‖ | | | |
| **p** | 0.622 | | 0.902 | | 0.533 | | | |
| Total Fertility Problem Inventory – I'' | 127.62 ± 29.29 | 122 (77 - 190) | 137.15 ± 33.41 | 134 (77 - 198) | 126.95 ± 26.2 | 125.5 (87 - 194) | 0.739† | 0.482 |
| Total Fertility Problem Inventory – II'' | 124.29 ± 30.57 | 118 (84 - 191) | 132.85 ± 37 | 125 (65 - 212) | 122.3 ± 29.87 | 125.5 (68 - 176) | 0.594† | 0.556 |
| Total Fertility Problem Inventory – III'' | 122.71 ± 32.44 | 109 (73 - 182) | 131.9 ± 38.66 | 126.5 (69 - 214) | 120.95 ± 30.43 | 123 (77 - 183) | 0.601† | 0.552 |
| **Test statistics** | 0.764†† | | 1.215†† | | 2.466†† | | | |
| **p** | 0.473 | | 0.308 | | 0.098 | | | |

† One-way variance test; ‡ Kruskall Wallis H test; ‖ Friedman test; †† Repeated variance test; I'': first interview; II'': 2nd week of the intervention; III'': 2nd week after the completion of the intervention; SD: standard deviation; Min: minimum; Max: Maximum

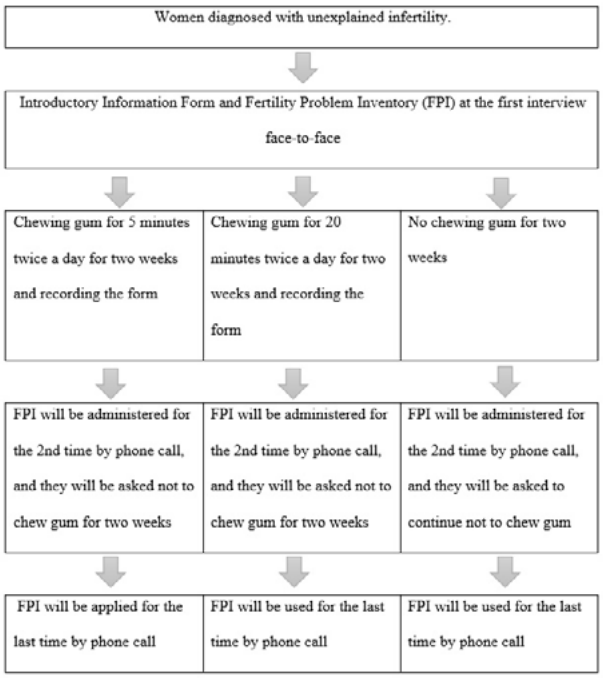


**Figure 1:** Study flow chart

Liu & Zhou, 2013). Studies have shown that chewing gum is an inexpensive, well-tolerated, safe, and effective way to reduce anxiety and stress (Smith & Woods, 2012; Luo, Xia & Zhang, 2022). On the contrary, some studies have shown that chewing gum cannot reduce acute stress or anxiety (Torney, Johnson & Miles, 2009; Johnson, Jenks, Miles, Albert & Cox, 2011).

Many studies have shown that chewing gum can help reduce perceived daily stress levels associated with specific emotions and potentially lead to increased feelings of calmness and relaxation (Ono et al., 2008; Zibell & Madansky, 2009; Smith & Woods, 2012; Weijenberg & Lobbezoo, 2015; Konno et al., 2016). In another study, adults were made to chew chewing gum for at least 5 minutes twice a day for 14 days, and measurements were made after two weeks. It was found that there was a decrease in anxiety, depression, fatigue, and confusion scores in the gum-chewing group compared to the Control Group, and there was no difference between the groups two weeks after the intervention was stopped (Sasaki-Otomaru et al., 2011). Chewing gum is thought to positively affect chronic stress rather than acute stress (Allen & Smith, 2015). In our study, no statistically significant difference was found in comparing the FPI scale scores between the groups. Still, a statistically significant difference was found between the mean values of the rejection of a childless lifestyle scale score in Experimental Group - 2 and Control Group ($p < 0.005$). The mean child-free life denial score decreased in each measurement. Since infertility treatment lasts for many years and failures are frequently experienced during the treatment process, infertility stress may last for a long time and may turn into chronic stress. In addition, despite the prevalence of infertility, the lack of social support (family, spouse, and friends) in most infertile women increases psychological vulnerability. Naturally, this can lead to feelings of inability to have children, shame, guilt, and low self-esteem. These negative feelings can lead to varying degrees of depression, anxiety, stress, and poor quality of life. Chewing gum can reduce this stress.

A literature review on the prevalence of psychological symptoms in infertility concluded that 25% to 60% of infertile individuals reported psychiatric symptoms and anxiety and depression levels were significantly higher than in fertile controls (De Berardis et al., 2014). Some studies have shown that the more stressed women are before and during treatment, the lower the pregnancy rates (Klonoff-Cohen, Chu, Natarajan & Sieber, 2001; An, Sun, Li, Zhang & Ji, 2013; Terzioglu et al., 2016), while other studies have not (Xu et al., 2017; Luo, Xia & Zhang, 2022). Our study found no statistically significant difference in comparing the groups according to infertility. However, in the linear regression model established between the groups, in the first interview, in the 2nd week of the intervention, and the 2nd week after the completion of the intervention, the total score of those who said that nothing changed in response to the question of how the lack of a child affected you between Experimental Group-1 and Experimental Group-2 groups was found to be less than those who said that they were depressed. Chewing gum intervention may effectively reduce the psychological distress of negative feelings and thoughts about infertility.

Chewing force affects salivary cortisol levels, a stress marker of the hypothalamic-pituitary-adrenal axis (Kubo, Iinuma & Chen, 2015). Chewing gum is thought to modulate cortisol levels, reducing anxiety and stress related to changes in cortisol levels (Luo, Xia & Zhang, 2022). While there are studies suggesting that chewing time is also a factor in cortisol (Scholey et al., 2009; Allen & Smith, 2015), there are studies reporting that intervention time is considered ineffective for anxiety and stress and that sample size has different effects (Luo, Xia & Zhang, 2022). It has been proved that long-term gum chewing is effective in reducing stress, anxiety, and depression and improving test scores in school nursing students (Yaman Sözbir, Ayaz Alkaya & Bayrak Kahraman, 2019). In our study, the total mean score of the FPI scale decreased gradually in Experimental Group - 1 and Experimental Group - 2 groups in each measurement. As chewing gum continued in Experimental Group - 1 and Experimental Group - 2 groups, the mean score of the scale gradually decreased, and a decrease was observed in terms of infertility stress, but this decrease was not statistically significant. Chewing gum may be an essential factor for infertility stress, but it is thought that it should be supported by other interventions.

## Conclusion

We believe that the positive effect of chewing gum on coping with stress may be an alternative intervention that may contribute positively to the success of infertility treatment. Still, it will not be sufficient alone and should be supported by other interventions.

**Ethical Considerations:** Ethical approval was obtained from the Clinical Research Ethics Committee of Eskişehir Osmangazi University for this study (Date: 17.12.2020 and No: 2020/35).

**Author Contribution:** Study Idea (Concept) and Design – TK, TT, YK; Data Collection / Literature Review – TK; Analysis and Interpretation of Data – TK, YT, BT; Preparation of the Article – TT, YK, NKB, YT; Approval of the Final Version to be Published – TK.

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