Development of Fertility Preparedness Scale for Women Receiving Fertility Treatment

Sevcan FATA[1]* • Merlinda ALUŞ TOKAT[2]

ABSTRACT

Background: Stress has a negative impact on fertility by suppressing the secretion of fertility hormones. Although it is known that stress reduces the probability of conception and affects fertility negatively, scales that are now widely used to evaluate fertility preparedness include negative items. Positive statements are crucial to relieving stress in women. Using positive items in assessments of fertility preparedness in women may help reduce related stress.

Purpose: This study was designed to develop the Fertility Preparedness Scale for women receiving fertility treatments.

Methods: A methodological study was conducted in four fertility clinics between December 2015 and March 2016. Two hundred thirty women who had been diagnosed with primary or secondary infertility were enrolled as participants. A personal information form and the Fertility Preparedness Scale were used to collect data.

Results: The Cronbach's alpha was .84 for the total scale and .76–.79 for the subscales. Factor analysis extracted three subscales that explained 52.93% of the total variance. The confirmatory factor analysis found a goodness of fit index of .80, a comparative fit index of .95, and a nonnormed fit index of .94.

Conclusions/Implications for Practice: This scale is valid and reliable for measuring the fertility preparedness of women who receive fertility treatment.

KEY WORDS
fertility, fertility preparedness, reliability, scale, validity.

Introduction

Infertility is a significant source of stress for most couples. Although some studies have found stress to play an important role in reducing the chances of conception by suppressing the secretion of fertility hormones (Behboodi-Moghadam, Salsali, Eftekhar-Ardabily, Vaismoradi, & Ramezanzadeh, 2013; Matthiesen, Frederiksen, Ingerslev, & Zachariae, 2011; Yusuf, 2016), others have found that stress has no effect on fertility outcomes (Anderheim, Holter, Bergh, & Möller, 2005; Cesta et al., 2018). Stress disrupts endocrine signaling in the hypothalamic–pituitary–gonadal axis. The pituitary gonadotropes are suppressed through receptors in the hypothalamus, and follicle development is disrupted in the ovaries. Consequently, the release of estrogen and progesterone is reduced (Whirledge & Cidlowski, 2010). In addition, it is known that, among women who are stressed, the number of healthy follicles, implantation rates, and pregnancy outcomes are affected more negatively (An, Sun, Li, Zhang, & Ji, 2013; Gourounti, Anagnostopoulos, & Vaslamatzis, 2011; Younis et al., 2012). Globally, women with fertility problems in many assisted reproduction centers are treated using only interventional procedures. During psychological assessments, the stress levels of these women are mostly evaluated using questions with negative meanings such as "Do you feel drained or worn out because of fertility problems?" and "Do you feel sad and depressed about your fertility problems?" (Boivin, Takefman, & Braverman, 2011). The process of answering the negative items on these scales may elevate perceive stress. However, during these psychological assessments, preparedness associated with fertility is not assessed. Women begin their fertility treatment without assessing whether they are psychologically prepared. Preparedness as a concept has been studied in terms of patients' ability to perform self-care to change lifestyles. Under this concept, preparedness is tied as much to learning as to appraising the situation and one's own abilities, considering available options, and rehearsing or trying out new solutions (Dalton & Gottlieb, 2003). It consists of several components, including an awareness phase, an appraisal phase, and a planning phase. The first phase is becoming aware of what needs to change. The second phase involves appraising the costs and benefits of changing and trying to envisage how life would be if they do change. The last phase is planning for action (Dalton, 1998).

Many healthcare providers explain the success or failure of a patient's willingness to change or to comply with a medical regimen as lack of preparedness. Higher preparedness is associated with better treatment results (Dalton & Gottlieb, 2003). Therefore, assessing women's preparedness is a very important step in fertility treatment. In the literature, no scale for measuring fertility preparedness has been published. Thus, the development of a related scale is needed to evaluate

[1]*PhD, Research Assistant Doctor, Gynecology & Obstetrics Nursing Department, Nursing Faculty, Dokuz Eylul University, Izmir, Turkey* • [2]*PhD, Associate Professor, Gynecology & Obstetrics Nursing Department, Nursing Faculty, Dokuz Eylul University, Izmir, Turkey.*

women's preparedness positively. At the same time, it is important to assess the positive aspects of change in the cost and benefits phase. Focusing on positive aspects accelerates preparedness (Dalton, 1998). If all of the items of the scale are positive items, it can contribute positively to the treatment process while the women are reading these scale items. For this reason, the aim of this study was to develop the "Fertility Preparedness Scale for Women Receiving Fertility Treatment," to evaluate fertility preparedness using only positive items.

Methods

Participants and Settings

This was a methodological study, conducted at four fertility clinics in Turkey between December 2015 and March 2016. The participants were 230 women who were (a) able to speak, read, and write Turkish; (b) diagnosed with primary or secondary infertility; and (c) without psychiatric illness. In Turkey, there is a wide variation in educational status among women. To ensure that the scale could be used efficaciously with women of all educational backgrounds, participants were selected according to their education status using a stratified sampling method with an optimum delivery method.

Steps of Developing the Scale

Item pool

An item pool (30 items) was prepared by reviewing the literature and the opinions of researchers and fertility experts (Buyukozturk, 2011). To assess the appropriateness of item contents, 10 nurses and doctors who were infertility experts in either a clinical or an academic setting reviewed the items. They rated each item on a scale of 1 = *not suitable* to 4 = *quite suitable* for the evaluation of fertility preparedness. To examine the suitability of items of the scale and the ability of the scale to measure preparedness, the Item Content Validity Index (ICV-I) and Scale Content Validity Index were calculated, respectively. According to the literature, the ICV-I score should exceed .78 (Polit & Beck, 2006). The ICV-I in our results varied between .80 and 1.00. When all of the experts gave 4 points for any item, the ICV-I of that item was 1. To develop the scale from items that are reasonably suitable, those items with ICV-I < 1 were removed. The Scale Content Validity Index was found to be .96 (minimum recommended score is .90; Polit & Beck, 2006). As a result of this analysis process, the 25-item Fertility Preparedness Scale (FPS) was developed.

The 23-item Fertility Preparedness Scale

To confirm the ease of comprehension of items, a pilot study was performed with 30 women who met the previously mentioned inclusion criteria. The items were read to these participants, and they were asked to assess the comprehensibility of each. The two items that were not understood were removed because it was decided that the remaining items were sufficient to measure preparedness. In addition, minor changes were made to some items based on the participants' suggestions. After these changes, the final 23-item FPS was composed.

Data Collection

After informed consent procedures, the personal information form and 23-item FPS were completed by women who applied to fertility clinics. The data collection process took a maximum of 10 minutes to complete per participant. The personal information form contained 15 questions related to sociodemographic characteristics and fertility history. The 23-item FPS was scored using a 5-point Likert scale, with minimum and maximum scores of 23 and 115, respectively. The median of the scale score is 56 points, which was considered the cutoff value. A scale score of below 56 indicates that a participant is not sufficiently prepared for fertility, and a scale score of 56 or higher indicates sufficient fertility preparedness.

In this study, three bilingual experts translated the scale independently from Turkish into English. Back-translation from English into Turkish using blind back-translation procedures was completed by a lay person who had not seen the original Turkish version of the scale and who knew both languages, but whose native language was English.

Ethical Considerations

Ethical approval was obtained from the Dokuz Eylul University Ethics Committee for Noninterventional Studies (2015/22-16). Moreover, permission from each fertility clinic and written consent from participants were obtained.

Data Analysis

Sociodemographic characteristics and fertility history were analyzed using descriptive statistics. For FPS, validity and reliability analyses were performed. SPSS Version 15.0 (SPSS, Inc., Chicago, IL, USA) and linear structural relations were used for analysis.

Validity analysis

The factor structure of the instrument was tested using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). EFA is used to identify the factor structure for a set of variables based on data instead of theory. In contrast, CFA is generally based on a strong theoretical and empirical foundation that allows an investigator to specify a hypothesized factor structure in advance and then test it. Thus, CFA may be used to determine how well a proposed model fits the data (Tabachnick & Fidell, 2007).

EFA was performed as a part of determining construct validity. To measure sampling adequacy for EFA, the Kaiser–Meyer–Olkin (KMO) procedure was used, and normal distribution was determined using Bartlett's test of sphericity. Moreover, principal component analysis with varimax rotation was used to develop the subscales.

CFA was the second part of establishing construct validity. CFA allowed the researcher to test the hypothesis of a relationship between the observed variables and the subscales developed. A structural equation model was performed, and chi-square degrees-of-freedom statistics (χ^2/df), root mean square error approximation (RMSEA), goodness of fit index (GFI), comparative fit index (CFI), normed fit index (NFI), and nonnormed fit index (NNFI) were calculated.

Reliability analysis

Cronbach's alpha, split-half reliability, item–total correlation, and Hotelling's T^2 test were used to determine reliability. Internal consistency was examined using two approaches: Cronbach's alpha (coefficient alpha) and split-half reliability (Spearman–Brown test). The item–total correlations were used to explain the relationships among each item and the scale. Furthermore, the relationships among each item of the subscale and the overall subscale were evaluated in the same manner. In scale development, it is important to observe whether item means are equal or not, which was analyzed using Hotelling's T^2 test.

Results

Sample Characteristics

The mean age of participants was 32.1 (*SD* = 5.55) years, and 36.5% were employed. Regarding educational level, 33.5% had completed primary school, 33% had completed high school, and 33.5% had completed postgraduate studies. The average duration of fertility treatment was 2.22 (*SD* = 1.08) years, and 92.6% had primary infertility. Among the participants, 36.5% reported female infertility, 87.8% had experienced ovulation induction, 55.7% had received intrauterine insemination, and 49.6% had undergone in vitro fertilization.

Validity

In the EFA, the KMO coefficient was .898 and the result of Bartlett's sphericity test was χ^2 = 2.790E3, $p < .001$. In the principal component analysis, all item eigenvalues were greater than 1. In addition, three subscales were exposed to explanatory analysis: "hope and awareness," "positive feelings and thoughts," and "prepared body and brain." The subscales were composed of the components of preparedness concept (see Figure 1). These three subscales explained 52.93% of the total variance, which shows the power of the factor structure of the scale (see Table 1). Regarding the relationship between each item and the overall subscale, factor loading was calculated and only one item factor loading (Item 18) was found to be below the suggested levels, with a score of .24. The factor loadings for all other items were between .41 and .82.

In the CFA, the calculated values were as follows: χ^2/df = 2.85, RMSEA = .08, GFI = .80, CFI = .95, NFI = .92 and NNFI = .94. Correlations between subscales were between .67 and .75, and p value was < .001 (see Figure 1).

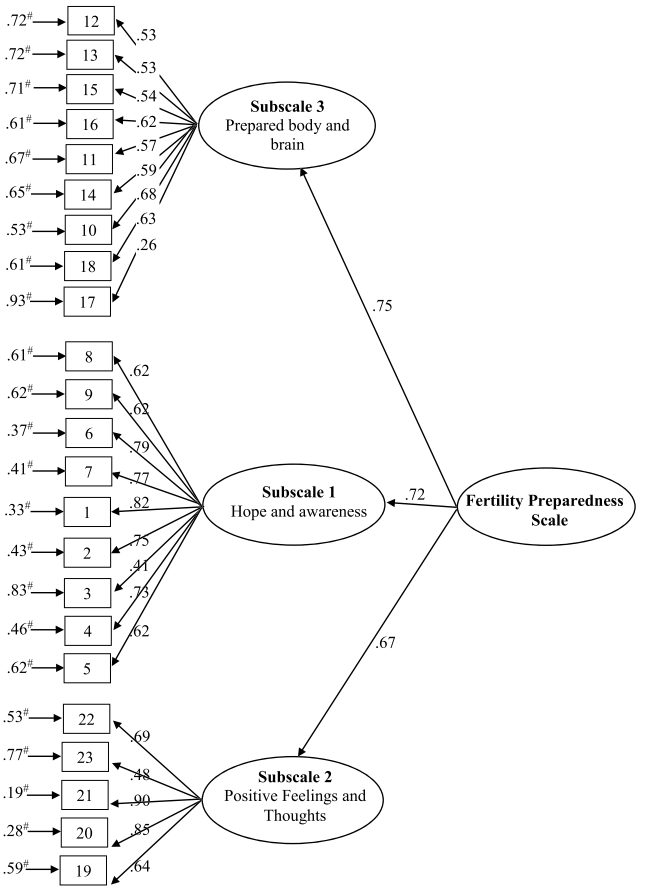

Figure 1. Confirmatory factor analysis of Fertility Preparedness Scale. *Error variance: the part of the total variance caused by irrelevant factors that were not experimentally controlled.

The relationship between the scale and the items (factor load) tested using EFA is shown in the table. The factor correlation and item correlation tested using CFA are given in the figure.

Reliability

The item–total score correlation coefficients ranged between .45 and .71. The Pearson correlation coefficients between subscale scores and scale total scores were between .80 and .83.

The total Cronbach's alpha was .84. The Cronbach's alpha coefficients of the subscales ranged from .76 to .79 (see Table 1). According to the Spearman–Brown analysis, the split-half correlation coefficient was .811. Item scores were different from each other (Hotelling's T^2 = 299.445, $p < .001$).

Discussion

Validity

A KMO value of between .80 and .90 is considered "very good." The KMO value of this scale was found to be .898,

TABLE 1.
Reliability and Validity Analysis of Fertility Preparedness Scale (N = 230)

Subscale	Percentage Variance	Cronbach's Alpha
Subscale 1: hope and awareness	20.91	.77
Subscale 2: positive feelings and thoughts	15.83	.79
Subscale 3: prepared body and brain	16.19	.76
Fertility Preparedness Scale	52.93	.84

Item	Factor Loading	Mean	*SD*	Item–Total Correlation
Subscale 1: hope and awareness				
8. Treatment will be beneficial to help me conceive.	.72	4.42	0.79	.67
9. I think positively about new medical options.	.76	4.39	0.77	.62
6. I think positively about traditional practices.	.47	3.76	1.14	.45
7. I am aware that balanced and regular nutrition increases my chance of pregnancy.	.78	4.33	0.83	.65
1. I am aware that regular exercise increases my chance of pregnancy.	.68	4.13	0.93	.60
2. Positive thoughts can be beneficial to my reproductive organs.	.71	4.22	0.86	.70
3. I look forward to future with the hope.	.62	4.33	0.89	.65
4. When I relaxed, more oxygen and blood go to my reproductive organs.	.58	4.00	0.96	.65
5. When I relaxed, hormones are regularly released.	.55	4.00	0.97	.65
Subscale 2: positive feelings and thoughts				
22. I can positively control my feelings.	.59	3.89	0.94	.65
23. I'm just focusing on positive thinking about becoming pregnant.	.81	4.04	0.95	.64
21. I try to increase my positive thoughts about pregnancy.	.82	3.98	1.01	.71
20. I only use positive words about pregnancy.	.58	4.02	0.93	.65
19. I just get positive messages about becoming pregnant.	.39	3.96	1.12	.56
Subscale 3: prepared body and brain				
12. My reproductive hormones are healthy and balanced.	.59	3.93	0.94	.68
13. I can feel comfortable while waiting for my test results.	.64	3.33	1.23	.59
15. My body works perfectly for becoming pregnant.	.73	3.71	1.03	.53
16. My uterus is now ready for pregnancy.	.63	3.95	0.92	.55
11. Listening to relaxing music will make it easier to conceive.	.56	3.51	1.10	.60
14. I do everything I can to feel relaxed during treatments.	.53	4.16	0.93	.54
10. I can feel comfortable while waiting control day.	.52	3.67	1.18	.66
18. I trust my body and mind.	.24	3.85	1.00	.67
17. I can positively impact my hormones.	.41	3.84	0.98	.62

which means that the sample size was suitable for the factor analysis. In the factor analysis, normality and linearity properties are also important, along with sample size. Whether the data follow a multivariate normal distribution is typically tested using Bartlett's sphericity test (Tavsancil, 2010). In this study, the result of this test was significant at an advanced level (χ^2 = 2.790E3, $p < .001$), showing that the correlation matrix is suitable for the factor analysis.

In the principal component analysis, items with an eigenvalue greater than 1 are significant for evaluating the main component of the scale (Akgul, 2005). The fact that eigenvalues of all of the items exceeded 1 in the FPS indicates that each item is suitable for measuring preparedness. In addition, the higher variance rates (52.93%) indicate the suitability of the subscales for explaining preparedness. Variance rates between 40% and 60% are accepted as sufficient (Sencan, 2005). To test whether an item is related to the subscale, it is necessary to check its factor loading (Sencan, 2005). Factor loadings ranging from .30 to .40 may be considered as the lower cutoff points to create the factor pattern (Tavsancil, 2010). Buyukozturk defined factor load values of greater than .60 as high, between .30 and .59 as medium, and .29 or below as low. At the same time, he indicated that the factor load values should be evaluated together with variance and

that items with low factor loads may be used (Buyukozturk, 2011). All items except one were within this value range, indicating that the quality of these items makes them suitable for inclusion in the subscales. The item with a factor loading of .24 was not excluded because the researchers decided that it was the basic item of the scale.

In the CFA, results were found to fit well with the EFA results. It is suggested in the literature that χ^2/df should be between 3/1 and 5/1 and that CFI, NFI, and NNFI values should be more than > .90. It has been generally reported that the RMSEA should be between 0 and 1, with lower scores showing a well-fitting model. The upper limit should be greater than .08. A GFI ranging between 0 and 1 or higher indicates a well-fitting model. The findings show that the model has good compliance (Kalayci, 2010; Ozdamar, 2009). It was found that the scale is suitable for measuring fertility preparedness. The CFA confirmed that the relationships among subscales were significant and positive, indicating that the subscales were compatible with each other in measuring fertility preparedness.

Reliability

The correlation coefficients of the scale items were high and statistically significant. A high item–total correlation shows that items exemplify similar behaviors and that the internal consistency of the test is high (Buyukozturk, 2011). In the literature, Pearson's correlation coefficient has been classified as follows: .26–.49, weak; .50–.69, moderate; .70–.89, high; and .90–1.00, very high (Sencan, 2005). Items with a high item–total correlation distinguish individuals very well. Item–total score correlations under .25 indicate no correlation between items and the scale and that these items cannot be used in distinguishing individuals (Akgul, 2005). In our results, the item–total score correlation coefficients ranged between .45 and .71, showing that every item evaluates fertility preparedness. Pearson correlation coefficients between subscale and total scale scores (.80–.83) showed that subscales are able to distinguish individuals in terms of preparedness.

On the basis of the literature, Cronbach's alpha coefficients between $.60 \leq \alpha \leq .80$ and $.80 \leq \alpha \leq 1.00$ are evaluated as "quite reliable" and "highly reliable," respectively (Simsek, 2007). This study shows that the FPS is highly reliable. It was detected that Subscales 1 and 2 were "quite reliable" and that Subscale 3 was "highly reliable." These findings show that items of the scale are homogenous and that they measure the same feature.

The split-half coefficient should be at least .70 (Sencan, 2005). In this study, it was determined to be above .70 and was found that, when the scale was randomly divided into two halves, it was still reliable in measuring fertility preparedness.

In methodological studies, it is important to assess whether the mean scores of items are similar (Simsek, 2007). It was detected through Hotelling's T^2 test that the items of the FPS are perceived by women in the same way.

Infertility is seen as an important problem in Turkish culture. Part of being a woman is giving birth to children. So, women want to have children for their spouse and family rather than for their own purposes. It is thought that assessing psychological preparedness before fertility treatment positively affects the treatment process. As the scale contains only 23 items, it may be easily applied in practice and also easily answered by women. Its other positive aspect is its providing positive messages to women during fertility treatment. When women read positive items, they may take a more positive perspective on fertility treatment (Gilbert, 2013). Because the treatment process is expensive and stressful, if a woman starts well prepared in this process, financial loss may be prevented and the treatment success may be improved. It would be useful to measure the preparedness of women by applying this scale in clinics before treatment.

Conclusions and Recommendations

In conclusion, the FPS is valid and reliable for measuring the fertility preparedness of women who receive fertility treatment. It may be used before or during fertility treatment. The scale is clinically feasible, short, and cost free, which are crucial factors in daily practice for both healthcare professionals and patients. We expect that future applications of this scale will enable health professionals to assess preparedness and plan necessary initiatives.

Author Contributions

Study conception and design: All authors
Data collection: SF
Data analysis and interpretation: All authors
Drafting of the article: All authors
Critical revision of the article: All authors

Accepted for publication: May 7, 2019
*Address correspondence to: Sevcan FATA, Nursing Faculty, Gynecology & Obstetrics Nursing Department, Dokuz Eylul University, Bahcelerarasi Street, Haydar Aliyev Boulevard, Inciralti, Balcova, Izmir 35340, Turkey. Tel: +90 232 412 69 75; E-mail: sevcan_fata@hotmail.com
The authors declare no conflicts of interest.

Cite this article as:
Fata, S., & Aluş Tokat, M. (2020). Development of fertility preparedness scale for women receiving fertility treatment. *The Journal of Nursing Research, 28*(3), e95. https://doi.org/10.1097/jnr.0000000000000369

References

Akgul, A. (2005). *Statistical analysis SPSS practices techniques in medical research* (3rd ed., p. 384). Ankara, Turkey: Emek Ofset. (Original work published in Turkish)

An, Y., Sun, Z., Li, L., Zhang, Y., & Ji, H. (2013). Relationship between psychological stress and reproductive outcome in women undergoing in vitro fertilization treatment: Psychological and neurohormonal assessment. *Journal of Assisted Reproduction & Genetics, 30*(1), 35–41. https://doi.org/10.1007/s10815-012-9904-x

Anderheim, L., Holter, H., Bergh, C., & Möller, A. (2005). Does psychological stress affect the outcome of *in vitro* fertilization? *Human Reproduction*, *20*(10), 2969–2975. https://doi.org/10.1093/humrep/dei219

Behboodi-Moghadam, Z., Salsali, M., Eftekhar-Ardabily, H., Vaismoradi, M., & Ramezanzadeh, F. (2013). Experiences of infertility through the lens of Iranian infertile women: A qualitative study. *Japan Journal of Nursing Science*, *10*, 41–46. https://doi.org/10.1111/j.1742-7924.2012.00208.x

Boivin, J., Takefman, J., & Braverman, A. (2011). The fertility quality of life (FertiQol) tool: Development and general psychometric properties. *Fertility & Sterility*, *96*(2), 409–415.e3.

Buyukozturk, S. (2011). *Data analysis handbook for social sciences: Statistics, research design, SPSS practices and interpretation* (14th ed.). Ankara, Turkey: Pegem Academy. (Original work published in Turkish)

Cesta, C. E., Johansson, A. L. V., Hreinsson, J., Rodriguez-Wallberg, K. A., Olofsson, J. I., Holte, J., … Nyman Iliadou, A. (2018). A prospective investigation of perceived stress, infertility-related stress, and cortisol levels in women undergoing in vitro fertilization: Influence on embryo quality and clinical pregnancy rate. *Acta Obstetricia et Gynecologica Scandinavica*, *97*(3), 258–268. https://doi.org/10.1111/aogs.13280

Dalton, C. (1998). *Readiness to engage in health work: A concept analysis* (Unpublished master's thesis). School of Nursing, McGill University, Montreal, Canada.

Dalton, C. C., & Gottlieb, L. N. (2003). The concept of readiness to change. *Journal of Advanced Nursing*, *42*(2), 108–117. https://doi.org/10.1046/j.1365-2648.2003.02593.x

Gilbert, S. (2013). *Fertility support program*. Scottsdale, AZ: Hypnobirthing Institute.

Gourounti, K., Anagnostopoulos, F., & Vaslamatzis, G. (2011). The relation of psychological stress to pregnancy outcome among women undergoing in-vitro fertilization and intracytoplasmic sperm injection. *Women & Health*, *51*(4), 321–339. https://doi.org/10.1080/03630242.2011.574791

Kalayci, S. (2010). *SPSS applied multivariate statistical techniques* (5th ed., pp. 321–331). Ankara, Turkey: Asil Publication Distribution. (Original work published in Turkish)

Matthiesen, S. M., Frederiksen, Y., Ingerslev, H. J., & Zachariae, R. (2011). Stress, distress and outcome of Assisted Reproductive Technology (ART): A meta-analysis. *Human Reproduction*, *26*(10), 2763–2776. https://doi.org/10.1093/humrep/der246

Ozdamar, K. (2009). *Statistical data analysis with packet programs* (7th ed., pp. 274–275). Eskisehir, Turkey: Kaan Bookstore. (Original work published in Turkish)

Polit, D. F., & Beck, C. T. (2006). The content validity index: Are you sure you know what's being reported? Critique and recommendations. *Research in Nursing & Health*, *29*(5), 489–497. https://doi.org/10.1002/nur.20147

Sencan, H. (2005). *Reliability and validity in social and behavioral measurements* (1st ed.). Ankara, Turkey: Seckin. (Original work published in Turkish)

Simsek, O. F. (2007). *Introduction to structural equation modeling, basic principles and LISREL applications* (pp. 12–18). Ankara, Turkey: Cem Web Ofset. (Original work published in Turkish)

Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). New York, NY: Allyn & Bacon.

Tavsancil, E. (2010). *Attitude measurement and data analysis with SPSS* (4th ed.). Ankara, Turkey: Nobel Publication Distribution. (Original work published in Turkish)

Whirledge, S., & Cidlowski, J. A. (2010). Glucocorticoids, stress, and fertility. *Minerva Endocrinology*, *35*(2), 109–125.

Younis, A., Clower, C., Nelsen, D., Butler, W., Carvalho, A., Hok, E., & Garelnabi, M. (2012). The relationship between pregnancy and oxidative stress markers on patients undergoing ovarian stimulations. *Journal of Assisted Reproduction and Genetics*, *29*(10), 1083–1089. https://doi.org/10.1007/s10815-012-9831-x

Yusuf, L. (2016). Depression, anxiety and stress among female patients of infertility: A case control study. *Pakistan Journal of Medical Science*, *32*(6), 1340–1343. https://doi.org/10.12669/pjms.326.10828