

Original Article

The Effect of Mandala Coloring on Postoperative Stress and Psychological Well-Being: A Randomized Controlled Trial

Nursen Kulakac, RN, MSc, PhD

Assistant Professor Gumushane University Faculty of Health Sciences, Nursing Department, Gumushane, Turkey

Aylin Aydin Sayilan, RN, MSc, PhD

Associate Professor Kırklareli University Faculty of Health Sciences, Nursing Department, Kırklareli, Turkey

Tuba Yilmazer, RN, MSc, PhD

Associate Professor Ankara Yıldırım Beyazıt University Faculty of Health Sciences, Nursing Department, Ankara, Turkey

Correspondence: Aylin Aydin Sayilan, RN, MSc, PhD, Associate Professor Kırklareli University Faculty of Health Sciences, Nursing Department, Kırklareli, Turkey e-mail: aylin.sayilan@klu.edu.tr

Abstract

Objective: This study investigated the effect of mandala coloring on postoperative stress and psychological well-being.

Method: This randomized pretest-posttest controlled experimental study was conducted with a sample of 60 patients in the surgical clinics of a hospital in western Turkey between June and December 2024. Using a simple randomization method, participants were randomly assigned to either the experimental or control group. Patients in the experimental group engaged in mandala coloring before and after surgery. Data were collected using a descriptive information form, the Psychological Well-Being Scale, and the Visual Analog Scale.

Results: This study identified a significant difference in postoperative stress levels between the experimental and control groups, with mandala therapy demonstrating a moderate effect in stress reduction (Cohen's $d = 0.649$). Additionally, postoperative patients in the experimental group exhibited significantly higher psychological well-being scores than those in the control group ($p < 0.001$).

Conclusion: Mandala coloring is an effective intervention for reducing postoperative stress and enhancing psychological well-being.

Keywords: Mandala; Surgical intervention; Stress; Psychological well-being.

Introduction

Despite significant advances in surgery, prehospital care, anesthesia, diagnostic methods, intensive care, genetics, and molecular medicine, patients continue to experience preoperative and postoperative stress, which adversely affects their psychological well-being (Gillis et al., 2022). The surgical process elicits a range of physiological and immunological responses to maintain homeostasis and sustain life. The extent of tissue damage directly correlates with the magnitude of the trauma response, thereby proportionately determining the severity of surgical stress (Demirgag, 2021). Surgical stress is defined as the impact of a surgical procedure on the human body. Its

intensity is determined by multiple variables, including the severity of the injury, patients' pre-existing conditions, genetic predisposition to adverse outcomes, the expertise of operating room staff, anesthesia management, the surgeon's experience, and the type of intervention performed, patient age, and the availability of social support (Chrouser et al., 2018). Regardless of its origin, surgical stress can result in adverse outcomes such as prolonged hospitalization, increased complication rates, and delayed return to work. Therefore, effective strategies to reduce surgical stress are crucial for improving both clinical outcomes and patient psychological well-being (Burton et al., 2019; Oz & Demirci, 2024).

In numerous studies, interventions such as music therapy, stress ball usage, aromatherapy, and painting therapy have been explored to alleviate stress and anxiety and increase harmony (Goli et al., 2022; Karatas and Gezgin, 2023; Mengqin et al., 2024). Among these methods, mandala painting therapy, which has gained considerable popularity in recent years, is defined as a creative and exploratory process aimed at facilitating the expression of memories, feelings, and emotions, enhancing self-reflection, and fostering the development of new coping skills.

Mandala painting therapy is not just a work of art, but also a psychological tool. People turn to drawing when they are stressed. Therefore, mandala painting therapy can be easily applied to patients. It has positive effects such as improving focus, increasing creativity, and lowering cortisol levels. Due to its many positive effects, mandala painting therapy is preferred over other methods (Mengqin et al., 2024).

This therapeutic approach employs various fine arts modalities including painting, drawing, sculpture, and clay modeling to support individuals in managing anxiety, stress, and adjustment challenges. Mandala painting therapy was reported to enhance emotion regulation and self-awareness in patients, enabling them to express their emotions more effectively (Abbing et al., 2018; Mengqin et al., 2024).

Previous studies have primarily focused on the impact of mandala painting therapy on anxiety and its role in assessing the psychological state of psychiatric patients and mothers of children with special needs. However, limited research has examined its effects on stress and psychological well-being-factors that can significantly influence post-surgical recovery (Kim et al., 2018; Gulhacik et al., 2021; Ozsavran & Ayyildiz, 2023; Mengqin et al., 2024; Ozer et al., 2024). Therefore, this study evaluated the effect of mandala coloring on postoperative stress and psychological well-being.

Methods

Purpose and Type of Research: The study was designed as a randomized controlled pretest-post-test experimental study to evaluate the effect of mandala coloring on

stress and psychological well-being in patients undergoing surgical intervention.

Hypotheses

- **H₁:** Mandala therapy reduces postoperative stress levels.
- **H₂:** Mandala therapy increases postoperative psychological well-being levels.
- **H₃:** Mandala coloring duration affects increasing postoperative psychological well-being.
- **H₄:** Mandala coloring duration affects reducing postoperative stress.

Population and Sample: The study was conducted with 60 patients scheduled for surgery in the surgical clinics of a hospital in Turkey between August 1, 2024, and December 3, 2024. The required sample size was determined using the G*Power 3.1.9.7 program based on Cohen's (1988) standard effect size, with a Type I error level of 5%, a power of 80%, and an effect size of 0.70 (Cohen, 1988). Considering potential data loss, 30 patients were included in each group, and the study was completed with 60 participants. This study adhered to the Consolidated Standards of Reporting Trials (CONSORT) guidelines. The CONSORT flow diagram illustrating the study process is provided in Figure 1.

Inclusion and exclusion criteria: The inclusion criteria for the study were being between 18 and 70 years old, undergoing surgical intervention for the first time, and voluntarily consenting to participate. The exclusion criteria included having communication or perception difficulties, difficulty in understanding or speaking Turkish, a diagnosed psychiatric illness, or being on psychiatric medication.

Randomization and blinding: Eligible patients were randomly assigned to the experimental and control groups using a simple randomization method. The allocation sequence was generated using the randomize.org website. In this randomized controlled trial, blinding was not feasible, as the interventions for the experimental and control groups (mandala painting application and data collection) were administered by the researchers. Additionally, due to the nature of the study, blinding of participants was not possible. However, to minimize bias, a third party coded the data as Group A and Group

B before transferring them to the statistical software. The statistician responsible for data analysis was blinded to group assignments. This blinding procedure ensured the objectivity of statistical analysis and reporting. After the completion of data analysis and reporting, the group allocations were disclosed by the data entry personnel.

Data collection: The study data were collected by the researchers through face-to-face interviews. Patients who met the inclusion criteria and consented to participate during their hospitalization in the surgical clinic were administered the Introductory Information Form, the Psychological Well-Being Scale, and the Visual Analog Scale. Participants were randomly assigned to either the experimental or control group. Those in the experimental group received a 24-pack of dry paints and a mandala booklet designed by the researchers, and they were instructed to color the mandala both before and after their surgical intervention. The control group received no intervention beyond the standard hospital protocol. Before discharge, all patients were reassessed using the Psychological Well-Being Scale and the Visual Analog Scale.

Data Collection Tools: Data were collected using the Descriptive Information Form, Psychological Well-Being Scale, and Visual Analog Scale.

The Descriptive Information Form: The form consisted of nine items designed to assess the sociodemographic characteristics and medical history of the patients.

The Psychological Well-Being Scale: Developed by Diener, Scollon, and Lucas (2009), this eight-item scale measures key aspects of human functioning. All items are positively worded and rated on a 7-point Likert scale, ranging from strongly disagree (1) to strongly agree (7), with total scores ranging from 8 to 56. Higher scores indicate greater psychological well-being. The validity and reliability study conducted by Telef (2013) in Turkey reported a Cronbach's alpha internal consistency

coefficient of 0.87, while in the present study, the Cronbach's alpha coefficient was determined to be 0.952.

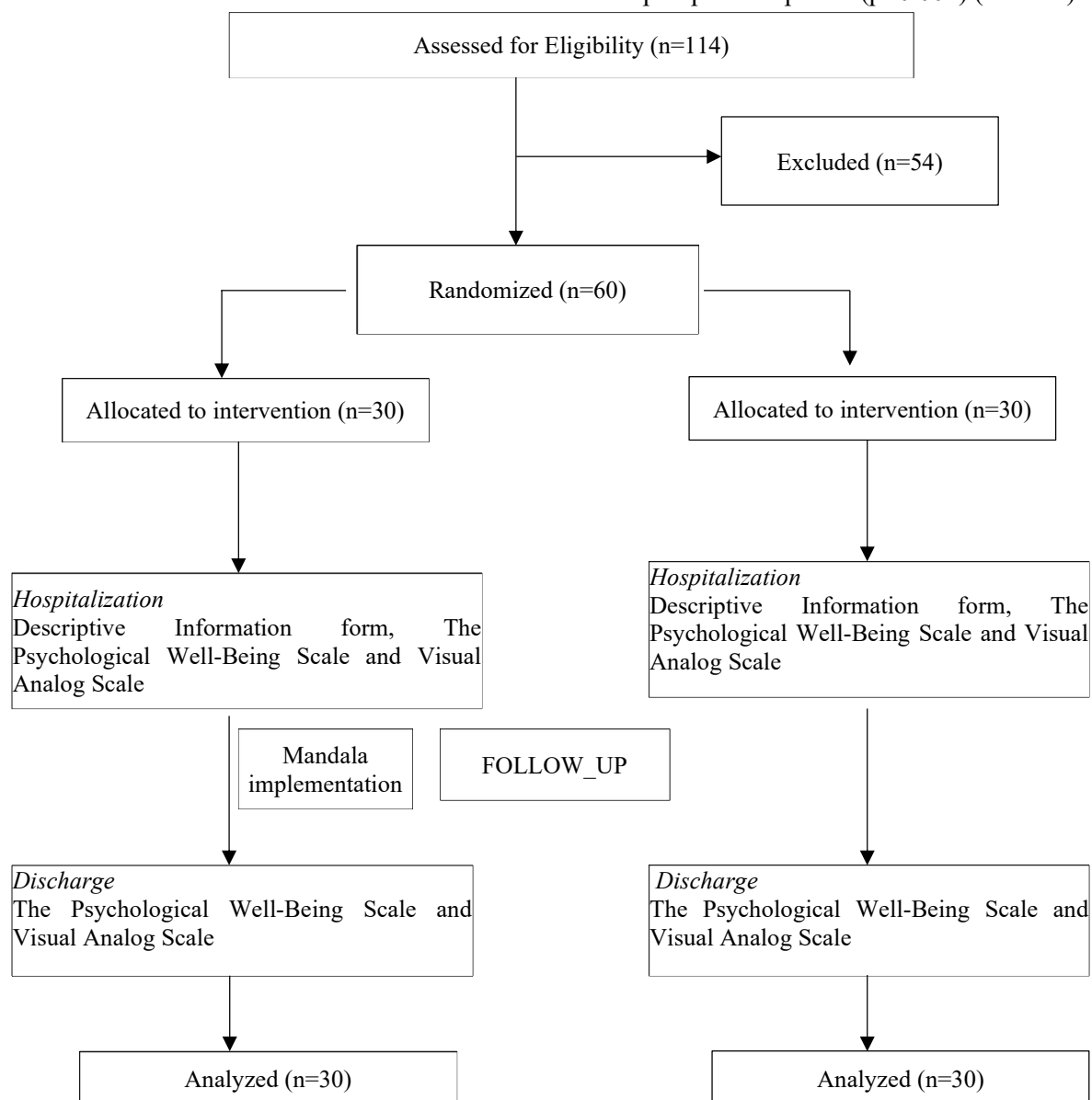
The Visual Analog Scale (VAS): The VAS consists of a 10 cm horizontal line ranging from "No Stress to Unbearable Stress," allowing patients to indicate the severity of their perceived stress by marking an app). Appropriate point on the line (Sung & Wu, 2018).

Ethical Considerations: Ethical approval for this study was obtained from the Gumushane University Scientific Research and Publication Ethics Committee on April 22, 2024 (Approval No: 2024/4, E-95674917-108.99-248141). Prior to participation, all patients were provided with detailed information regarding the study's purpose, methodology, and expected outcomes. Informed consent was obtained from each participant. The study was conducted following the principles outlined in the Declaration of Helsinki.

Data Analysis: The data collected were analyzed using the Statistical Package for the Social Sciences (SPSS) version 28.0 (IBM SPSS Statistics 25 Software). Categorical variables were expressed as frequency (n), percentage, and distribution, while continuous variables were reported as mean, standard deviation (SD), median, minimum, and maximum values. To assess the normality of the data distribution, skewness, and kurtosis values were examined. If they fell within the range of -2 to +2, the data were assumed to follow a normal distribution. The independent samples t-test was used to compare the Psychological Well-Being Scale and VAS scores of the experimental and control groups. Pearson correlation analysis was performed to examine relationships between continuous variables. Cohen's d was calculated to determine the effect size of significant differences observed in the independent samples t-test results. Statistical significance was evaluated at a 95% confidence interval (CI) with a significance level of $p < 0.05$.

(Cohen's $d = 0.649$). Additionally, both groups experienced a significant decrease in stress levels in the postoperative period compared to the preoperative period ($p < 0.001$) (Tablo 2).

Figure 1.



Results

No statistically significant difference was observed between the experimental and control groups in terms of sociodemographic and disease-related characteristics ($p > 0.05$) (Table 1). Preoperatively, there was no significant difference in stress levels between the groups ($p = 0.107$); however, postoperatively, stress levels in the experimental group were significantly lower than those in the control group ($p < 0.001$), indicating that mandala therapy had a moderate effect in reducing stress

Regarding psychological well-being, no significant difference was found in preoperative scores ($p = 0.065$), but postoperatively, the experimental group had significantly higher psychological well-being scores than the control group ($p < 0.001$), with a substantial effect size (Cohen's $d = 1.706$). In the intra-group comparison of preoperative and postoperative psychological well-being scores, both the experimental and control groups showed a significant increase in postoperative psychological well-being scores ($p < 0.001$) (Table 3).

Additionally, an examination of the relationship between postoperative stress, psychological well-being, and mandala painting time in the experimental group revealed a significant negative correlation between stress levels and

psychological well-being scores ($p < 0.001$). However, no significant relationship was found between the duration of mandala coloring and the stress levels or psychological well-being of the patients ($p > 0.05$) (Table 4).

Table 1. Sociodemographic characteristics of patients in the experimental and control groups (n=60)

Characteristics	Experimental Group (n=30)		Control Group (n=30)		Statistical Analysis
	n	%	n	%	
Gender					
Female	15	50	14	46.7	$\chi^2=0.067$
Male	15	50	16	53.3	p=0.796
Education level					
Primary school	15	50.0	14	46.7	$\chi^2=1.231$
High school	4	13.3	4	13.3	p=0.746
Associate degree	4	13.3	2	6.7	
University	7	23.3	10	33.3	
Occupation					
Housewife	8	26.7	8	26.7	$\chi^2=1.096$
Civil Servant	4	13.3	5	16.7	p=0.778
Retired	7	23.3	4	13.3	
Others*	11	36.7	13	43.3	
Income level					
Low	7	23.3	8	26.7	$\chi^2=0.089$
Moderate	23	76.7	22	73.3	p=0.766
Chronic disease					
Yes	15	50.0	13	43.3	$\chi^2=0.268$
No	15	50.0	17	56.7	p=0.605
Medical diagnosis					
Cholecystectomy	10	33.3	9	30.0	$\chi^2=0.731$
Appendectomy	9	30.0	7	23.3	p=0.866
Abdominal hernia	11	36.7	14	46.7	
Type of surgery					
Open	11	36.7	9	30.0	$\chi^2=0.300$
Laparoscopic	19	63.3	21	70.0	p=0.584
Anesthesia type					
General	20	66.7	21	70.0	$\chi^2=0.077$
Spinal	10	33.3	9	30.0	p=0.781
Age (mean ±SD)		49.03±8.74		46.23±9.33	2=26.000
					p=0.625

Table 2. Intragroup and intergroup comparison of mean stress scores of experimental and control groups (n=60)

Stress	Experimental Group (n=30)	Control group (n=30)	Z	p**	Cohen's d (%95 CI)
	$\bar{X} \pm SD$	$\bar{X} \pm SD$			

Preoperative	4.43±1.10	4.86±0.86	-1.610	0.107
Postoperative	2.96±0.55	3.86±0.73	-4.485	<0.001
Z*; p	-4.343; <0.001	-4.148; <0.001		-1.387 (-1.947, -0.817)

*: Wilcoxon test, **: Mann Whitney U test

Table 3. Intragroup and intergroup comparison of mean psychological well-being scores of experimental and control groups (n=60)

Stress	Experimental Group (n=30)	Control group (n=30)	Z	p*	Cohen's d (%95 CI)
	$\bar{X} \pm SD$	$\bar{X} \pm SD$			
Preoperative	40.70±4.47	38.83±3.30	-1.843	0.065	
Postoperative	44.56±4.89	37.66±4.19	-4.823	<0.001	1.706 (0.858, 2.542)
Z*; p	-4.638; <0.001	-4.823; <0.001			

*: Wilcoxon test, **: Mann Whitney U test

Table 4. The relationship between postoperative stress, psychological well-being and mandala coloring time of the patients in the experimental group

	(1)	(2)	(3)
1. Stress	1		
2. Psychological well-being	r=-0.569 p<0.001	1	
3. Mandala coloring time	r=-0.061 p=0.642	r=0.118 p=0.369	1

Discussion

Surgical interventions are known to inherently induce stress in patients, leading to complications such as ischemia/reperfusion injury, sympathetic nervous system activation, inflammation, systemic hypercoagulability, and immunosuppression (Chen et al., 2019). In this study, no significant difference was found between the preoperative stress levels and psychological well-being of the experimental and control group patients. Previous research has shown that patients experience stress during surgery regardless of the procedure's type or size, with variations in stress levels influenced by factors such as age, weight, frailty, and fear of death (Helander et al., 2019; Shinall et al., 2020). The lack of difference between the groups indicates that all patients experienced stress.

Mandala therapy has gained attention in recent years as a potential intervention for stress and anxiety, and its application frequency has increased. In this study, postoperative stress levels in the experimental group were significantly lower than in the control group, with mandala therapy

demonstrating a moderate effect size in stress reduction. A systematic review of 11 studies involving 405 participants found that mandala therapy improved hope and alleviated certain physiological effects of stress, as well as reducing negative symptoms (Zhang et al., 2024). In a study conducted by Liu et al. (2020) to examine the effects of mandala coloring on subjective well-being, spirituality, and mindfulness, findings indicated that mandalas enhanced awareness, positively influenced spirituality and well-being, and increased overall happiness (Liu et al., 2020). Similarly, a prospective, parallel group controlled study conducted among hemodialysis patients reported that mandala coloring is an effective coping strategy for stress reduction (Ozer et al., 2024). These findings align with our study, which demonstrates the effectiveness of mandalas as a supportive therapy method for reducing stress.

In our study, postoperative psychological well-being scores were significantly higher in the experimental group than the control group, consistent with a study involving 126

female gynecologic cancer patients experiencing psychological distress, where mandala therapy was found to have a positive effect and was recommended as a supportive approach (Mengqin et al., 2024). In a study investigating the effect of mandala therapy on fatigue and psychological well-being in hemodialysis patients, mandala painting significantly improved psychological well-being and enhanced coping capacities (Ozer et al., 2024). Similarly, a study involving 50 cancer patients—comprising those with breast cancer (44%), gastrointestinal cancer (22%), hematologic malignancy (18%), and other cancer types (22%)—reported that art therapy significantly improved emotional distress, depression, anxiety, and pain at all time points (Elimimian et al., 2020). These findings are consistent with the literature, demonstrating the effectiveness of mandala therapy in enhancing psychological well-being.

Regarding the relationship between postoperative stress in the experimental group, psychological well-being, and the duration of mandala painting, it was observed that as the stress levels decreased, psychological well-being improved. However, no significant difference was found in the duration of painting time. These results support existing research showing that stress negatively impacts psychological well-being (Ozer et al., 2024; Mengqin et al., 2024). This finding suggests a parallel relationship between stress levels and psychological well-being.

Studies have shown that the duration of mandala coloring therapy varies, ranging from 30 minutes to two hours, as well as extending over periods of one week, four weeks, and eight weeks (Yakar et al., 2021; Akbulak & Can, 2023; Ozer et al., 2024). In the study by Ozer et al. (2024), psychological well-being levels were initially similar among participants; however, a significant difference emerged between the experimental and control groups in the fourth and eighth weeks compared to the first week. In a quasi-experimental study employing a single-group pretest-posttest design, no immediate change was observed in well-being and anxiety levels, yet a significant difference was detected over time (Akbulak & Can, 2023). Similarly, in a study investigating the effects

of mandala and sudoku coloring on breast cancer patients, participants engaged in mandala coloring for two hours, but no significant effect was found concerning the duration of the activity (Cheraghi et al., 2024). These variations in findings across studies are likely influenced by differences in sample populations and mandala application duration.

Limitations of the Study: In this study has the sample of patients was limited to a single hospital and lack of long-term follow-up which prevents the generalization of the findings to all patients.

Conclusion: The study showed that mandala coloring therapy significantly reduced stress and enhanced psychological well-being. Given the potential financial and emotional complications associated with postoperative stress, the implementation of simple, cost-effective, and side-effect-free therapeutic interventions is crucial. Nurses should be attentive to this issue, and efforts should be made to enhance their awareness of activities that promote patients' psychological well-being. The mandala therapy can be an independent nursing intervention, as it is an art therapy, making it a powerful tool for nursing autonomy in surgical wards.

Future research should explore the effectiveness of other therapeutic methods in combination with mandala coloring therapy. Additionally, conducting studies with larger and more diverse samples using robust methodological approaches is recommended to strengthen the evidence base.

Acknowledgments: The authors are grateful to all participants.

References

- Abbing, A., Ponstein, A., van Hooren, S., de Sonnevile, L., Swaab, H., & Baars E. (2018). The effectiveness of art therapy for anxiety in adults: A systematic review of randomised and non-randomised controlled trials. *PLoS One*, 13(12), e0208716. <https://doi.org/10.1371/journal.pone.0208716>.
- Akbulak, F., & Can, G. (2023). Effectiveness of mandala coloring in reducing anxiety in women with early-stage breast cancer receiving chemotherapy for the first time. *Explore (NY)*, 19(1), 42-47.
- Burton, D., King, A., Bartley, J., Petrie, K.J., & Broadbent, E. (2019). The surgical anxiety

- questionnaire (SAQ): development and validation. *Psychology & Health*, 34(2), 129-146.
- Chen, Z., Zhang, P., Xu, Y., Yan, J., Liu, Z., Lau, W.B., Lau, B., Li, Y., Zhao, X., Wei, Y., & Zhou, S. (2019). Surgical stress and cancer progression: the twisted tango. *Molecular Cancer*, 18(1), 132.
- Cheraghi, P., Hekmatpour, D., Rafiei, F., & Ansari, J. (2024). A comparison between effects of sudoku and mandala painting on anxiety of breast cancer patients undergoing chemotherapy. *Journal of Family Medicine and Primary Care*, 13(2), 431-437.
- Chrouser, K.L., Xu, J., Hallbeck, S., Weinger, M.B., & Partin, M.R. (2018). The influence of stress responses on surgical performance and outcomes: Literature review and the development of the surgical stress effects (SSE) framework. *American Journal of Surgery*, 216(3), 573-584.
- Cohen, J. (1988). *The analysis of variance. In Statistical Power Analysis for the Behavioral Sciences* (second ed.). Lawrence Erlbaum Associates, 274-287.
- Gulhacik, G.D., Durat, G., & Eren, N. (2021). Effects of activity groups, in which art activities are used, on resilience and related factors in families with disabled children. *Perspective in Psychiatric Care*, 57(1), 343-350.
- Demirgag, H. (2021). Music treatment in surgical patients. *Journal of Health and Life Sciences*, 3(2), 133-139.
- Diener, E., Scollon, C.N., & Lucas, R.E. (2009). The evolving concept of subjective well-being: The multifaceted nature of happiness. *Social Indicators Research Series*, 39, 67-100.
- Elimimian, E.B., Elson, L., Stone, E., Butler, R.S., Doll, M., Roshon, S., Kondaki, C., Padgett, A., & Nahleh, Z.A. (2020). A pilot study of improved psychological distress with art therapy in patients with cancer undergoing chemotherapy. *BMC Cancer*, 20(1), 899. <https://doi.org/10.1186/s12885-020-07380-5>.
- Gillis, C., Ljungqvist, O., & Carli, F. (2022). Prehabilitation, enhanced recovery after surgery, or both? A narrative review. *British Journal of Anaesthesia*, 128(3), 434-448.
- Goli, R., Arad, M., Mam-Qaderi, M., & Parizad, N. (2022). Comparing the effects of geranium aromatherapy and music therapy on the anxiety level of patients undergoing inguinal hernia surgery: A clinical trial. *Explore (NY)*, 18(1), 57-63.
- Helander, E.M., Webb, M.P., Menard, B., Prabhakar, A., Helmstetter, J., Cornett, E.M., Urman, R.D., Nguyen, V.H., & Kaye, A.D. (2019). Metabolic and the Surgical Stress Response Considerations to Improve Postoperative Recovery. *Current Pain and Headache Reports*, 23(5), 33. <https://doi.org/10.1007/s11916-019-0770-4>.
- Karatas, T.C., & Gezginci, E. (2023). The Effect of Using a Stress Ball During Endoscopy on Pain, Anxiety, and Satisfaction: A Randomized Controlled Trial. *Gastroenterology Nursing*, 46(4), 309-317.
- Kim, H., Kim, S., Choe, K., & Kim, J.S. (2018). Effects of Mandala Art Therapy on Subjective Well-being, Resilience, and Hope in Psychiatric Inpatients. *Archives of Psychiatric Nursing*, 32(2), 167-173.
- Liu, C., Chen, H., Liu, C.Y., Lin, R.T., & Chiou, W.K. (2020). Cooperative and Individual Mandala Drawing Have Different Effects on Mindfulness, Spirituality, and Subjective Well-Being. *Frontiers in Psychology*, 11, 564430.
- Mengqin, Z., Xing, L., Yan, H., & Jianhua, R. (2024). Does Mandala Art Therapy Improve Psychological Well-Being of Gynecological Cancer Patients During the Perioperative Period? A Quasi-Experimental Study. *Integrative Cancer Therapy*, 23, 15347354241259180.
- Oz, T., & Demirci, N. (2024). The Effect of Virtual Reality, Music Therapy, and Stress Ball Application on Pain and Anxiety During Outpatient Gynecological Procedures: A Randomized Controlled Trial. *Journal of Perianesthesia Nursing*, 39(6), 1034-1041.
- Ozer, Z., Bahcecioğlu Turan, G., Uyman, M., & Mollaoglu, M. (2024). The effects of mandala coloring on fatigue, psychological well-being, and coping with stress in patients receiving hemodialysis treatment. *Hemodialysis International*, 28(3), 367-376.
- Ozsavran, M., & Ayyildiz, T.K. (2023). The effect of mandala art therapy on the comfort and resilience levels of mothers who have children with special needs: A randomized controlled study. *Child: Care, Health and Development*, 49(6), 1032-1045.
- Shinall, M.C. Jr., Arya, S., Youk, A., et al., (2020). Association of Preoperative Patient Frailty and Operative Stress With Postoperative Mortality. *JAMA Surgery*, 155(1), e194620.
- Sung, Y.T., & Wu, J.S. (2018). The Visual Analogue Scale for Rating, Ranking and Paired-Comparison (VAS-RRP): A new technique for psychological measurement. *Behavior Research Methods*, 50(4), 1694-1715.
- Telef, B.B. (2013). Psychological well-being scale: Adaptation to Turkish, validity, and reliability study. *Hacettepe University Journal of Faculty of Education*, 28(3), 374-384.
- Yakar, H.K., Yilmaz, B., Ozkol, O., Gevher, F., & Celik, E. (2021). Effects of art-based mandala intervention on distress and anxiety in cancer patients. *Complementary Therapies in Clinical Practice*, 43, 101331.
- Zhang, M.Q., Liu, X., & Huang, Y. (2024). Does Mandala Art Improve Psychological Well-Being in Patients? A Systematic Review. *Journal of Integrative and Complementary Medicine*, 30(1), 25-36.