




The Effects of e-Mobile Training and Consultancy Services on Bariatric Surgery Patients: A Randomized Clinical Trial

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Abstract

Purpose This study was conducted as a randomized controlled trial to determine the effects of e-mobile training and consultancy services on self-care agency, body image, and quality of life in patients undergoing bariatric surgery.

Material and Methods This study was conducted as a randomized controlled interventional study. The sample of the study consisted of 51 patients who met the sample selection criteria and volunteered to participate in the study in the Obesity Center of a City Hospital. The patients in the experimental group received e-mobile training and consultancy services with a mobile application developed specifically for bariatric surgery that started before the operation and lasted for 3 months after the operation. CONSORT checklist was used to report the current study.

Results A statistically significant difference was found in the mean scores of Self-Care Agency Scale, Body Image Scale, Moorehead-Ardelt Quality of Life II, and BMI of the patients in the experimental and control groups according to the processes ($p < 0.05$). There was no statistically significant difference between the groups in terms of preoperative, 1st, 2nd, and 3rd months of Self-Care Agency, Body Image, and Quality of Life scale mean scores ($p > 0.05$). There was a statistically significant difference between the groups in favor of the experimental group in terms of the 1st, 2nd, and 3rd month BMI averages ($p < 0.05$).

Conclusions The findings indicate that e-mobile training and consultation services given to patients undergoing bariatric surgery were effective in BMI measurements, but not on self-care agency, body image, and quality of life.

Trial Registration ClinicalTrials.gov Identifier: NCT05278767.

Keywords Bariatric surgery · Consultation · Patient education · Nursing, Mobile application

Key Points

- It is beneficial to provide planned trainings including home care after discharge starting from the preoperative period to patients who are planned for bariatric surgery and to provide counseling services in line with patient needs.
- It is beneficial to use mobile health applications for effective weight loss after bariatric surgery.
- Mobile health applications should be used to ensure that patients have access to accurate and reliable information after bariatric surgery and to increase the quality of care.

This study was conducted under the supervision of the second author as a doctoral thesis in the Nursing Department of Health Sciences Institute of Cukurova University.

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Introduction

Obesity, which is the second most common preventable cause of death, is defined as body weight exceeding the desired level in relation to height, occurring as a result of excessive fat accumulation in the body [1]. According to the 2016 data of the World Health Organization (WHO), more than 1.9 billion adults are overweight, and 650 million people are obese [2].

Obesity has negative effects on every system of the body and brings together many health problems [3]. In addition, obesity, which limits daily activities, also decreases self-care agency, affects quality of life negatively with associated health problems [4, 5], and results in displeasure in body image by creating a dissonance between body image and self-image [6, 7]. Therefore, obesity should be considered as a chronic disease and should be treated. Methods such as medical nutrition therapy, exercise, behavior change therapy,

and medical therapy can be used to treat obesity [8]. In cases where these methods do not yield results, bariatric surgery is chosen as the most effective method [1].

Although bariatric surgery is the most effective method for obesity treatment, successful results are only possible if patients gain the necessary knowledge, skills, attitudes, and behaviors after the surgery [9]. In this context, it is very important to provide consultancy services to patients who are scheduled for bariatric surgery, in line with the planned training and patient needs starting from the preoperative period [1, 10–12].

Today, mobile devices such as smartphones and tablets, which have become an integral part of our daily lives, have undoubtedly influenced health care delivery [13]. The increasing use of mobile devices in health care delivery has also increased the interest in mobile health applications [14, 15]. With mobile health applications that provide ease of access at any place and time, individuals can access health information, as well as monitor and share various health indicators [13]. In addition, reliable information and self-help strategies provided by these applications support individuals in adopting healthy lifestyle behaviors and increase their self-care agency and quality of life [16, 17].

Studies in the literature with bariatric surgery patients emphasize that mobile health applications used after surgery facilitate adaptation process of the individuals to a new life [18–22]. However, the mobile applications used in these studies focus on mobile health applications used to achieve nutritional goals (weight loss, calorie counting, food diary, etc.) and to increase physical activity after bariatric surgery. In addition to monitoring nutrition and physical activity, no studies were found where mobile health applications specific to bariatric surgery were used that include comprehensive trainings and live consultancy services to manage the surgery process. Therefore, the main objective of this research is to increase quality of life, self-care agency, and body image satisfaction of the individuals by providing mobile-based training and consultancy services that enable them to easily access the right information at any time and place, to prevent possible complications that may occur after bariatric surgery, and to adopt healthy lifestyle behaviors.

Method

Research Design

This study was conducted as a randomized controlled interventional study. The study complies with the guidelines of the Consolidated Standards of Reporting Trials (CONSORT). The CONSORT 2010 checklist of information to include when reporting a randomized trial is included in File S1.

The population of the study consisted of patients who underwent bariatric surgery in a public hospital between July 2020 and July 2021. The sample consisted of patients between the ages of 18 and 65, who were literate, able to understand and speak Turkish, had no hearing impairment, underwent bariatric surgery for the first time, had sleeve gastrectomy or gastric bypass operation with laparoscopic method, had no complications during the surgical intervention, could use a smart phone, and who agreed to participate in the study both verbally and in writing.

To calculate the sample size, power analysis was performed after collecting the data from 20 bariatric surgery patients ($n_1:10$; $n_2:10$). The results of the power analysis using the G*Power 3.0.10 program indicated that minimum sample size of 46 in total was sufficient ($n_1:23$; $n_2:23$) with 90% power, 5% margin of error, and $f=0.20$ effect size.

Patients were divided into experimental and control groups using a simple randomization methods. For all allocations, randomization was applied with a computer-generated randomization table containing unique identifier numbers assigned to the participants, which concealed allocation for the first researcher. The study was completed with a total of 51 patients, 26 of which were in the experimental and 25 in the control group (Fig. 1).

Data Collection

The data of the study was collected in light of the literature using Personal Information Form, Self-Care Agency Scale, Body Image Scale, and Moorehead-Ardelt Quality of Life Questionnaire II (MA-II).

Personal Information Form

The form, which was developed by the researchers in light of the literature, included information and questions such as patients' age, gender, weight, height, marital status, level of education, working status, chronic diseases, obesity and surgical history, and surgical method used.

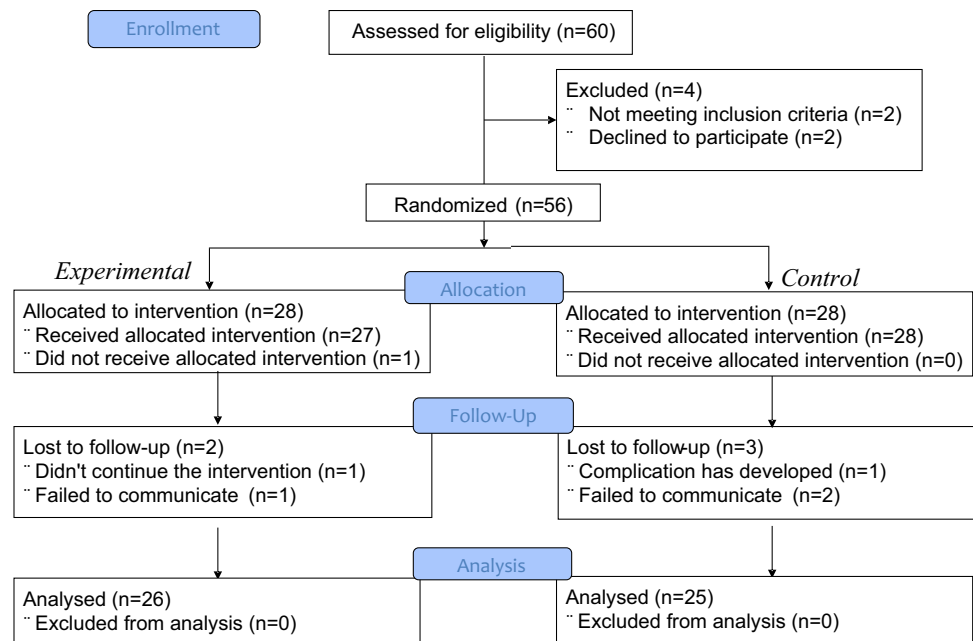
Self-Care Agency Scale

The Likert-type scale scores each statement between zero and four. The scale consists of 35 items and the highest obtainable score is 140. Self-care agency of the individual decreases closer it is to zero and increases closer it is to 140. Nahcivan found the Cronbach alpha of the scale to be 0.89 [23], and Cronbach's alpha was 0.85 in this study.

Body Image Scale

The scale is a five-point Likert-type scale, and each statement is scored between one and five. The minimum score

Fig. 1 CONSORT flow diagram



obtainable from the 40-item scale is 40, and the maximum score is 200. As the scores of the individuals decrease, their satisfaction with body image decreases, and as their score increase, their satisfaction with body image increases. Hovardaoğlu found the Cronbach alpha coefficient of the scale to be 0.91 [1]. Cronbach's alpha of the scale in this study was 0.93.

Moorehead-Ardelt Quality of Life Questionnaire II (MA-II)

The questionnaire consists of six questions in total, and every item contains a picture related to the subject. Each item of the 10-point Likert-type scale has the same weight. The center of every item is zero, and each item's score increases by 0.10 points to the right and decreases 0.10 points to the left. The score obtainable from the scale varies between -3 and $+3$. Scores between $+2.1$ and 3 indicate a very good quality of life, and scores between -2.1 and -3 indicate a very poor quality of life. Ateş and Cebeci found the Cronbach alpha of the scale to be 0.83 [24]. Cronbach's alpha in this study was 0.82.

Mobile Training and Consultancy Application

The bariatric surgery mobile app, developed by the researchers, is based on Android operating system and can be downloaded free of charge from the Google Play Store. The app provides training and live consultation for patients who have undergone bariatric surgery.

The app includes care, nutrition, and exercise training for patients undergoing bariatric surgery, starting from the preoperative period, and covering the first 3 months after

surgery, as well as a food and an exercise diary, and weight tracking interfaces that will help patients develop healthy lifestyle behaviors while adapting to their new lives. In addition to these, there is a live consultation where patients can communicate with researchers and interfaces with questionnaires and answers to frequently asked questions by patients.

Experimental and Control Group

Written and oral consent was obtained from the patients with face-to-face interviews prior to the surgery, and the Personal Information Form was completed. The patients received a short (20–30 min) training about the mobile application, the mobile app was downloaded to the mobile devices of the patients, and a username and a password were set by the researcher to access the system. The patients were asked to fill out the data collection forms (BMI, Self-Care Agency Scale, Body Image Scale and MA-II), which were located in the questionnaires menu of the app, prior to the operation, and 1st, 2nd, and 3rd month after the operation. In addition, the features of the mobile app (live consultation, weight tracking, exercise, and food diary) were reminded every month. Also, as a part of the provided consultation, the importance of using the drugs and vitamins the doctors had prescribed, as well as implementation of the diet and exercise suggestions, was reminded and asked if they experienced a health problem related to the operation during this period. Control group patients received standard care and follow-up protocols during this period. Patients were thanked after the research for participating in the study.

Data Analysis

The statistical analyses of the study were made using IBM SPSS Statistics 24. The data was interpreted with frequency tables, descriptive statistics, independent samples *t*-test, and repeated measures test for normally distributed data and Mann–Whitney *U* and Friedman tests for data that was not normally distributed. In addition, χ^2 cross tabulation was used to analyze the relation between the two qualitative variables.

Ethical Considerations of the Study

To conduct the study, an approval from the Cukurova University's Non-Invasive Clinic Research Ethics Committee (Meeting no: 97 Decision no:9), a written approval from the Health Directorate of Province of Isparta, and approvals from the writers by e-mail to use the scales in the study were obtained. In addition, verbal and written consent was obtained from the patients after giving them information about the study.

Results

The groups are independent and homogenous in every descriptive characteristic ($p > 0.05$) (Table 1).

There was a statistically significant difference ($p < 0.05$) in the Self-Care Agency Scale scores between experimental and control groups in different stages. Findings regarding which group accounted for the statistical difference can be found in Table 2.

No statistically significant difference was found between experimental and control groups before the operation or 1st, 2nd, and 3rd month after the operation in Self-Care Agency Scale scores ($p > 0.05$, Table 2).

There was a statistically significant difference between experimental and control groups during different stages in scores of the Body Image scale ($p < 0.05$). Findings regarding which group accounted for the statistical difference can be found in Table 3.

There was no statistically significant difference between experimental and control groups before the operation and 1st, 2nd, and 3rd month after the operation in Body Image Scale scores ($p > 0.05$).

There was a statistically significant difference between the MA-II mean scores of experimental and control groups during different stages ($p < 0.05$). Findings regarding which group accounted for the statistical difference can be found in Table 4.

There was no statistically significant difference between experimental and control groups prior to the operation and 1st, 2nd, and 3rd month after the operation regarding MA-II scores ($p > 0.05$, Table 4).

There was statistically significant difference in BMI (kg/m^2) mean scores of experimental and control groups during different stages ($p < 0.05$). Findings regarding which group accounted for the statistical difference can be found in Table 5. There was a statistically significant difference between the groups during 1st, 2nd, and 3rd month BMI (kg/m^2) mean scores ($p < 0.05$). Experimental group had statistically significantly lower BMI (kg/m^2) mean scores in 1st, 2nd, and 3rd months compared to the control group (Table 5).

Discussion

There are many studies suggesting that training and consultation provided to individuals increases self-care agency [1, 25, 26]. In a study by Çıray Gündüzoğlu and associates (2019), where determining self-care agency of individuals with obesity was aimed at, individuals who received training regarding obesity had higher self-care agency than individuals who did not [4]. In another study by Güven and Akyolcu (2020), training and consultation that started from preoperative period and followed 3 months after the surgery, and which was implemented using a training booklet, increased self-care agency of bariatric surgery patients [1]. In this study, 1st, 2nd, and 3rd month self-care agency mean scores of the experimental group were higher than the scores of the control group but the difference was not statistically significant ($p > 0.05$), Table 2). It is possible that these findings result from the technology literacy of the participants, which may not be sufficiently developed, as well as from the inability to effectively use the interfaces of the mobile application. In addition, collecting the data during the COVID-19 global pandemic, and trainings on health, hygiene, and cleaning given from various channels to improve and maintain health during this period, may have also increased self-care agency of the patients in both the experimental and control groups.

Usta and Aygin (2020) reported in their study that 6 months of comprehensive training and consultation services using a post-bariatric surgery training booklet and a video CD, significantly increased body image satisfaction [10]. In this study, the 1st, 2nd, and 3rd month mean scores of the Body Image Scale of the patients in the experimental group, who were given e-mobile training and consultation services for three months after bariatric surgery, were higher than the patients in the control group, but the difference was not statistically significant ($p > 0.05$, Table 3). This can be a consequence of the fact that the rapid change in body shape

Table 1 Comparison of descriptive characteristics of the patients ($N=51$)

	Experimental group ($n=26$)		Control group ($n=25$)		Test
	$\bar{X} \pm SD$	Median [min–max]	$\bar{X} \pm SD$	Median [min–max]	
Age	37.73 \pm 12.97	36.5 [19.0–66.0]	39.88 \pm 11.88	42.0 [20.0–66.0]	$t = -0.617^a$ $p = 0.540$
BMI (kg/m ²)	41.40 \pm 3.62	41.2 [35.4–48.7]	44.54 \pm 5.34	42.7 [37.4–54.9]	$Z = -2.265^b$ $p = 0.063$
	<i>n</i>	%	<i>n</i>	%	
Sex					
Male	6	23.1	5	20.0	$\chi^2 = 0.071^c$
Female	20	76.9	20	80.0	$p = 0.789$
Education level					
Primary school	9	34.6	9	36.0	$\chi^2 = 0.033^c$
High school	10	38.5	9	36.0	$p = 0.984$
University	7	26.9	7	28.0	
Working status					
Yes	11	42.3	10	40.0	$\chi^2 = 0.028^c$
No	15	57.7	15	60.0	$p = 0.867$
Economical situation					
Income less than expenses	9	34.6	10	40.0	$\chi^2 = 0.012^c$
Income equal to expenses	17	65.4	15	60.0	$p = 0.914$
Marital status					
Married	18	69.2	14	56.0	$\chi^2 = 0.472^c$
Single	8	30.8	11	44.0	$p = 0.492$
Presence of child					
Yes	19	73.1	18	72.0	$\chi^2 = 0.007^c$
No	7	26.9	7	28.0	$p = 0.931$
Chronic disease					
Yes	12	46.2	9	36.0	$\chi^2 = 0.204^c$
No	14	53.8	16	64.0	$p = 0.651$
Surgery experience					
Yes	17	65.4	16	64.0	$\chi^2 = 0.011^c$
No	9	34.6	9	36.0	$p = 0.918$
Obesity history					
< 10 years	3	11.5	2	8.0	$\chi^2 = 0.180^c$
> 10 years	23	88.5	23	92.0	$p = 0.671$
Bariatric surgery method					
Gastric bypass	18	69.2	18	72.0	$\chi^2 = 0.047^c$
Sleeve gastrectomy	8	30.8	7	28.0	$p = 0.828$

^aIndependent sample-*t*, ^bMann-Whitney *U*, ^cPearson- χ^2

after bariatric surgery cannot be accompanied by psychological changes [27, 28]. Especially with individuals who have been obese their whole lives, cognitive reconstruction is slower than fast and excessive weight loss [6]. Therefore, 3-month period of follow-up/control might be too short for assessing body image changes after operation.

No statistically significant difference was found between experimental and control group patients prior to the operation and 1st, 2nd, and 3rd month after the operation in regards of the mean scores of MA-II ($p > 0.05$, Table 4). Similarly, Wild and associates (2015) found that 1-year-long training based on video conference provided to

patients who underwent bariatric surgery did not influence quality of life of the individuals [29]. Mangieri and associates (2019) demonstrated that mobile health applications used by bariatric surgery patients, who were followed for 24 months, were effective for improving and maintaining weight loss, but did not affect quality of life outcomes [21]. However, there are also studies in the literature demonstrating that face-to-face training and consultation given to individuals after bariatric surgery improves quality of life [1, 10]. These results suggest that, compared to face-to-face training, e-mobile training is inadequate in creating sufficient confidence in individuals and limits communication.

Table 2 Comparison of Self-Care Agency Scale of patients during different stages

Self-Care Agency Scale	Experimental group (<i>n</i> = 26)		Control group (<i>n</i> = 25)		Test
	$\bar{X} \pm SD$	Median [min–max]	$\bar{X} \pm SD$	Median [min–max]	
Preoperative ⁽⁰⁾	93.92 ± 16.23	96.5 [56.0–128.0]	90.64 ± 26.13	89.0 [11.0–130.0]	<i>t</i> = 0.537 ^a <i>p</i> = 0.595
1 st month ⁽¹⁾	102.69 ± 11.32	104.0 [84.0–122.0]	97.84 ± 17.83	99.0 [69.0–140.0]	<i>t</i> = 1.115 ^a <i>p</i> = 0.255
2 nd month ⁽²⁾	104.54 ± 9.29	106.5 [81.0–120.0]	98.08 ± 14.31	98.0 [70.0–126.0]	<i>t</i> = 1.314 ^a <i>p</i> = 0.196
3 rd month ⁽³⁾	104.35 ± 9.14	104.5 [80.0–117.0]	100.08 ± 18.53	101 [31.0–126.0]	<i>Z</i> = -1.481 ^b <i>p</i> = 0.139
Test	<i>F</i> = 9.211 ^c <i>p</i> = 0.000* [0–1,2,3]		χ^2 = 10.929 ^d <i>p</i> = 0.012* [0–3]		

* $\alpha < 0.05$ ^aIndependent sample-*t*, ^bMann-Whitney *U*, ^crepeated measures, ^dFriedman**Table 3** Comparison of body image scores of patients during different stages

Body image scale	Experimental group (<i>n</i> = 26)		Control group (<i>n</i> = 25)		Test
	$\bar{X} \pm SD$	Median [min–max]	$\bar{X} \pm SD$	Median [min–max]	
Preoperative ⁽⁰⁾	128.19 ± 24.68	125.5 [81.0–181.0]	131.24 ± 29.39	121.0 [94.0–196.0]	<i>Z</i> = -0.179 ^a <i>p</i> = 0.858
1 st month ⁽¹⁾	135.58 ± 25.88	128.0 [97.0–188.0]	128.92 ± 25.62	120.0 [98.0–185.0]	<i>Z</i> = -1.112 ^a <i>p</i> = 0.266
2 nd month ⁽²⁾	142.96 ± 25.42	138.5 [106.0–198.0]	129.84 ± 31.13	126.0 [44.0–188.0]	<i>t</i> = 1.652 ^b <i>p</i> = 0.105
3 rd month ⁽³⁾	148.58 ± 23.24	147.0 [112.0–199.0]	139.76 ± 26.48	131.0 [94.0–195.0]	<i>t</i> = 1.265 ^b <i>p</i> = 0.212
Test	<i>F</i> = 5.170 ^c <i>p</i> = 0.007* [0–2,3][1–2,3]		χ^2 = 15.585 ^d <i>p</i> = 0.001* [0,1–3]		

* $\alpha < 0.05$ ^aMann-Whitney *U*, ^bindependent sample-*t*, ^crepeated measures, ^dFriedman**Table 4** Comparison of MA-II scores of patients during different stages

MA-II	Experimental group (<i>n</i> = 26)		Control group (<i>n</i> = 25)		Test
	$\bar{X} \pm SD$	Median [min–max]	$\bar{X} \pm SD$	Median [min–max]	
Preoperative ⁽⁰⁾	0.50 ± 1.28	0.5 [(-2.8)–(2.5)]	0.13 ± 0.124	-0.1 [(-2.5)–(3.0)]	<i>t</i> = 1.052 ^a <i>p</i> = 0.298
1 st month ⁽¹⁾	1.01 ± 1.09	1.3 [(-1.2)–(3.0)]	0.70 ± 1.34	1.0 [(-2.0)–(3.0)]	<i>t</i> = 0.902 ^a <i>p</i> = 0.372
2 nd month ⁽²⁾	1.47 ± 0.90	1.7 [(-0.5)–(2.8)]	1.17 ± 1.26	1.6 [(-2.0)–(3.0)]	<i>t</i> = 0.984 ^a <i>p</i> = 0.330
3 rd month ⁽³⁾	1.72 ± 0.87	1.9 [(-0.1)–(3.0)]	1.32 ± 1.42	1.7 [(-3.0)–(2.9)]	<i>Z</i> = -0.773 ^b <i>p</i> = 0.439
Test	<i>F</i> = 13.898 ^c <i>p</i> = 0.000* [0–2,3][1–3]		χ^2 = 37.423 ^d <i>p</i> = 0.000* [0–2,3][1–2,3]		

* $\alpha < 0.05$ ^aIndependent sample-*t*, ^bMann-Whitney *U*, ^crepeated measures, ^dFriedman

Table 5 Comparison of body mass index (kg/m²) mean scores of patients during different stages

BMI (kg/m ²)	Experimental group (n = 26)		Control group (n = 25)		Test
	$\bar{X} \pm SD$	Median [min–max]	$\bar{X} \pm SD$	Median [min–max]	
Preoperative ⁽⁰⁾	41.40 ± 3.62	41.2 [35.4–48.7]	44.54 ± 5.34	42.7 [37.4–54.9]	Z = -2.265 ^a p = 0.063
1 st month ⁽¹⁾	36.66 ± 3.69	36.1 [29.9–45.2]	40.36 ± 5.61	38.0 [33.9–52.8]	Z = -1.318 ^a p = 0.020*
2 nd month ⁽²⁾	33.95 ± 3.75	34.1 [27.7–42.5]	37.57 ± 5.42	34.5 [31.5–50.3]	Z = -2.101 ^a p = 0.036*
3 rd month ⁽³⁾	31.73 ± 3.68	31.6 [23.5–39.0]	35.35 ± 5.39	32.9 [28.8–48.2]	Z = -2.139 ^a p = 0.032*
Test	F = 233.768 ^b p = 0.000* [0–1,2,3][1–2,3][2–3]		$\chi^2 = 74.407^c$ p = 0.000* [0–1,2,3][1–2,3][2–3]		

* $\alpha < 0.05$ ^aMann-Whitney U, ^brepeated measures, ^cFriedman

In addition, the lack of face-to-face communication may cause limited consultation services.

Studies with bariatric surgery patients emphasize that mobile health applications used after surgery facilitate the adaptation process to a new life in individuals and, in parallel, support weight loss [18–22]. Mangieri and associates (2019) demonstrated in their study that mobile health applications that track diet and activity are effective in improving and maintaining weight loss with bariatric surgery patients that they followed for 24 months [21]. A systematic review (2020) examining 38 studies reported that mobile health applications used after bariatric and metabolic surgery were effective in providing weight loss and health-related behavior changes in individuals [20]. In this study, the 1st, 2nd, and 3rd month BMI (kg/m²) mean scores of the experimental group were found to be significantly lower than the control group ($p < 0.05$, Table 5). These results suggest that e-mobile training and consultation services, especially in relation to nutrition and exercise, are effective in weight loss after bariatric surgery. In addition, interfaces such as weight tracking, calorie counting, and food and exercise diaries that the experimental group patients used via the e-mobile application, may be beneficial.

Conclusions

The findings demonstrated that e-mobile training and consultation services given to patients undergoing bariatric surgery were effective in BMI measurements, but not on self-care agency, body image, and quality of life of the individuals. In line with these results, providing planned training to patients who are scheduled for bariatric surgery,

starting from the preoperative period, and including post-discharge home care, providing consultancy services in line with patient needs, and developing a mobile application and testing it by integrating it with hospital-based programs, are recommended. Mobile health applications should be used to ensure that patients have access to accurate and reliable information after bariatric surgery and to increase the quality of care. As for future research, conducting studies that will have a longer follow-up period to evaluate the effects of the mobile application, and to plan qualitative studies that evaluate the use of the mobile application, usage barriers, as well as positive and negative aspects, are recommended.

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Author Contribution Sevgi Deniz Doğan: conceptualization, methodology, software, formal analysis, investigation, resources, data curation, writing—original draft, visualization; Sevban Arslan: conceptualization, methodology, validation, writing—review and editing.

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Declarations

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Conflict of Interest The authors declare no competing interests.

References

1. Güven B, Akyolcu N. Effects of nurse-led education on quality of life and weight loss in patients undergoing bariatric surgery. *Bariatr Surg Pract Patient Care*. 2020;15:81–7. <https://doi.org/10.1089/bari.2019.0025>.
2. Vaamonde JG, Álvarez-Món MA. Obesity and overweight. *Med*. 2020;13:767–76. <https://doi.org/10.1016/j.med.2020.07.010>.
3. Tedik SE. Healthy life and role of nursing in the control of body weight. *Turkish J Diabetes Obes*. 2017;1:54–62. <https://doi.org/10.25048/tjdo.2017.9>.
4. Çıray Gündüzoğlu N, Kakı M, Tüzel A. Self care agency of obese individuals. *Int Ref Acad J Sport* 2019;0:0–0. <https://doi.org/10.17363/sstb.2019.30.5>.
5. Yıldız S, Çetinkaya F. Obesity and quality of life study in adults. *Ahi Evran Med J*. 2020;4:29–34. <https://doi.org/10.46332/aemj.782657>.
6. Lacerda RMR, Castanha CR, Castanha AR, et al. Perception of body image by patients undergoing bariatric surgery. *Rev Col Bras Cir*. 2018;45:1793. <https://doi.org/10.1590/0100-6991e-20181793>.
7. Yazdani N, Hosseini SV, Amini M, et al. Relationship between body image and psychological well-being in patients with morbid obesity. *Int J Comm Based Nurs Midwifery*. 2018;6:175–84. <https://doi.org/10.30476/ijcbnm.2018.40825>.
8. Heymsfield SB, Wadden TA. Mechanisms, pathophysiology, and management of obesity. *N Engl J Med*. 2017;376:1490–2. <https://doi.org/10.1056/nejmc1701944>.
9. Öztürk Gök S, Akçıl OM. Comparison of nutrition knowledge levels of obese individuals who have obesity surgery, use weight loss drugs and only diet. *BÜSBİD*. 2020;5:215–25.
10. Usta E, Aygin D. Prospective randomized trial on effects of structured training and counseling on depression, body image, and quality of life. *Bariatr Surg Pract Patient Care*. 2020;15:55–62. <https://doi.org/10.1089/bari.2019.0028>.
11. Yıldız E, Karagözoğlu Ş. The effects of nursing education constructed according to Roy adaptation model on adaptation process of patients undergoing bariatric surgery. *Bariatr Surg Pract Patient Care*. 2021;16:98–108. <https://doi.org/10.1089/bari.2020.0030>.
12. Marshall S, Mackay H, Matthews C, Maimone IR, Isenring E. Does intensive multidisciplinary intervention for adults who elect bariatric surgery improve post-operative weight loss, co-morbidities, and quality of life? A systematic review and meta-analysis. *Obes Rev*. 2020;21:e13012. <https://doi.org/10.1111/obr.13012>.
13. Palacı H, Yazar O, Kuru İ, Yıldırım G. Evaluation of smart phone applications' validity, certification, security and users adoption perspective. *Med Technol Congr*. 2016;308–11.
14. Liu P, Astudillo K, Velez D, Kelley L, Cobbs-Lomax D, Spatz ES. Use of mobile health applications in low-income populations. *Circ Cardiovasc Qual Outcomes*. 2020;13:e007031. <https://doi.org/10.1161/CIRCOUTCOMES.120.007031>.
15. Kopmaz B, Arslanoğlu A. Mobile health and smart health applications. *Heal Care Acad J*. 2018;5:251–5. <https://doi.org/10.5455/sad.1543239549>.
16. Changizi M, Kaveh MH. Effectiveness of the mHealth technology in improvement of healthy behaviors in an elderly population—a systematic review. *MHealth*. 2017;3:51–51. <https://doi.org/10.21037/mhealth.2017.08.06>.
17. Özdemir C, Şendir M. Mobile health applications and change of health behavior. *J Heal Sci*. 2020;29:210–6. <https://doi.org/10.34108/eujhs.728647>.
18. Klasnja P, Rosenberg DE, Zhou J, et al. A quality-improvement optimization pilot of BariFit, a mobile health intervention to promote physical activity after bariatric surgery. *Transl Behav Med*. 2021;11:530–9. <https://doi.org/10.1093/tbm/ibaa040>.
19. Elvin-Walsh L, Ferguson M, Collins PF. Nutritional monitoring of patients post-bariatric surgery: implications for smartphone applications. *J Hum Nutr Diet*. 2018;31:141–8. <https://doi.org/10.1111/jhn.12492>.
20. Messiah SE, Sacher PM, Yudkin J, et al. Application and effectiveness of eHealth strategies for metabolic and bariatric surgery patients: a systematic review. *Digit Heal*. 2020;6:2055207619898987. <https://doi.org/10.1177/2055207619898987>.
21. Mangieri CW, Johnson RJ, Sweeney LB, et al. Mobile health applications enhance weight loss efficacy following bariatric surgery. *Obes Res Clin Pract*. 2019;13:176–9. <https://doi.org/10.1016/j.orcp.2019.01.004>.
22. Bond DS, Thomas JG. Measurement and intervention on physical activity and sedentary behaviours in bariatric surgery patients: emphasis on mobile technology. *Eur Eat Disord Rev*. 2015;23:470–8. <https://doi.org/10.1002/erv.2394>.
23. Nahcivan NO. A Turkish language equivalence of the exercise of Self-Care Agency Scale. *West J Nurs Res*. 2004;26:813–24. <https://doi.org/10.1177/0193945904267599>.
24. Ates D, Cebeci F. Adaptation and validation of Turkish version of the Moorehead-Ardelt Quality of Life Questionnaire II in bariatric patients. *Bariatr Surg Pract Patient Care*. 2019;14:165–71. <https://doi.org/10.1089/bari.2019.0004>.
25. Esmailshad B. The effectiveness of self-care training on quality of life, self-care behaviors and blood sugar in elderly without self-care behaviors. *Original Artic Aging Psychol*. 2020;6:1–11.
26. Serpici A, Gürsoy A. Nurse-led patient training improves deep vein thrombosis knowledge and self-care practices. *J Vasc Nurs*. 2018;36:53–63. <https://doi.org/10.1016/j.jvn.2018.03.002>.
27. Caltabiano ML. Translational aspects of body image research for obesity-related quality of life and weight loss maintenance post-bariatric surgery. *Ann Transl Med*. 2020;8:S2–S2. <https://doi.org/10.21037/ATM.2019.09.63>.
28. Bertoletti J, GalvisAparicio MJ, Bordignon S, et al. Body image and bariatric surgery: a systematic review of literature. *Bariatr Surg Pract Patient Care*. 2019;14:81–92. <https://doi.org/10.1089/bari.2018.0036>.
29. Wild B, Hünemeyer K, Sauer H, et al. A 1-year videoconferencing-based psychoeducational group intervention following bariatric surgery: results of a randomized controlled study. *Surg Obes Relat Dis*. 2015;11:1349–60. <https://doi.org/10.1016/j.soard.2015.05.018>.

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