DOI:10.34108/eujhs.1369955

SAĞLIK BİLİMLERİ DERGİSİ
JOURNAL OF HEALTH SCIENCES
Erciyes Üniversitesi Sağlık Bilimleri Enstitüsü Yayın Organıdır

Araştırma 2024; 33 (2): 208-216

# PERCEIVED EXERCISE BELIEFS AND BARRIERS AMONG BREAST CANCER SURVIVORS: A DESCRIPTIVE CROSS-SECTIONAL STUDY
# MEME KANSERİ SAĞKALIMLARINDA ALGILANAN EGZERSİZ İNANIŞLARI VE ENGELLERİ: TANIMLAYICI KESİTSEL BİR ARAŞTIRMA

**Alper TUĞRAL[1], Yeşim BAKAR[1] Murat AKYOL[2]**

*[1]Izmir Bakırçay University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Izmir, Türkiye*
*[2] Izmir Bakırçay University, Faculty of Medicine, Department of Medical Oncology, Izmir, Türkiye*

## ABSTRACT

Since the importance of the benefit of physical activity and exercise has been understood especially for cancer patients, efforts are taken to assess belief in exercise to adapt patients to a more physically active environment to create a sustainable health outcome. Thus, this study aimed to assess exercise beliefs and barriers by using a validated metric tool (Exercise Beliefs/Barriers Scale-EBBS) to evaluate beliefs in exercise in breast cancer survivors (BCS). In addition, it was also aimed to assess the relationships among EBBS, sociodemographic, and clinical variables of BCS. A total of 112 BCS were screened and invited to participate in this study. Clinical (type of surgery, adjuvant treatments, etc.), demographic data (age, medication use, etc.), and total sitting time were collected through a simple data form and 7th of the International Physical Activity Questionnaire-Short Form (IPAQ-SF), respectively. All patients were requested to fill out EBBS.96 BCS completed this study. Weak but significant correlations were found between time spent after surgery and perceived belief (r=. -273, p=0.009), and perceived barriers (r=-.239, p=0.022), respectively. Perceived barriers were also significantly correlated with age (r=-.212, p=0.042). No significant effects of the type of breast surgery and axillary procedure as well as medications (Tamoxifen) on perceived beliefs and barriers were found. Factors should be thoroughly investigated to provide a sustainable exercise behavior among BCS. Older BCS should be thoroughly monitored to gain regular exercise behavior. This study also highlighted the emerging need for sensitive, specific, and focused tools to assess beliefs in exercise among the cancer population.

**Keywords:** Breast cancer, exercise, exercise barriers, exercise beliefs, physical inactivity .

## ÖZ

Özellikle kanser hastaları için fiziksel aktivite ve egzersizin faydasının önemi anlaşıldığından, sürdürülebilir bir sağlık sonucu yaratmak için hastaları fiziksel olarak daha aktif bir ortama adapte etmek amacıyla egzersize olan inancı değerlendirmek için çaba gösterilmektedir. Bu nedenle, bu çalışma meme kanserinden kurtulanlarda egzersize olan inancı değerlendirmek için geçerliliği kanıtlanmış bir ölçme aracı (Egzersiz İnançları/Engelleri Ölçeği-EBBS) kullanarak egzersizin faydalarını ve engellerini değerlendirmeyi amaçlamıştır. Ayrıca, EBBS ile hastaların sosyodemografik ve klinik değişkenleri arasındaki ilişkilerin değerlendirilmesi de amaçlanmıştır. Toplam 112 hasta taranmış ve bu çalışmaya katılmaya davet edilmiştir. Klinik (ameliyat tipi, adjuvan tedaviler, vb.), demografik veriler (yaş, ilaç kullanımı, vb.) ve toplam oturma süresi sırasıyla basit bir veri formu ve Uluslararası Fiziksel Aktivite Anketi-Kısa Formunun (IPAQ-SF) 7. maddesi aracılığıyla toplanmıştır. Tüm hastalardan EBBS'yi doldurmaları istenmiştir. 96 hasta bu çalışmayı tamamlamıştır. Ameliyat sonrası geçirilen süre ile algılanan inanç (r=.-273, p=0.009) ve algılanan engeller (r=-.239, p=0.022) arasında anlamlı korelasyonlar bulunmuştur. Algılanan engeller yaş ile de anlamlı şekilde ilişkiliydi (r=-.212, p=0.042). Meme cerrahisi tipi ve aksiller prosedür tipinin yanı sıra ilaçların (Tamoksifen) algılanan inançlar ve engeller üzerinde anlamlı bir etkisi bulunmamıştır. Hastalar arasında sürdürülebilir bir egzersiz davranışı sağlamak için faktörler kapsamlı bir şekilde araştırılmalıdır. Yaşlı hastalar düzenli egzersiz davranışı kazanmak için kapsamlı bir şekilde izlenmelidir. Bu çalışma aynı zamanda kanser popülasyonu arasında egzersize yönelik inançları değerlendirmek için hassas, spesifik ve odaklanmış araçlara duyulan ihtiyacın altını çizmiştir.

**Anahtar kelimeler:** Meme kanseri, egzersiz, egzersiz engelleri, egzersiz inanışları, fiziksel inaktivite.

**Correspondence Author:** PT, Ph.D., Lecturer, Alper TUĞRAL, alper.tugral@bakircay.edu.tr, : 0000-0002-8017-2384, Izmir Bakırçay University, Faculty of Health Sciences, Department of Physiotherapy and Rehabilitation, Izmir, Türkiye Phone:0090-2324930000/11259

**Authors:** PT, Ph.D. Professor, Yeşim BAKAR, yesim.bakar@bakircay.edu.tr, 0000-0002-5603-2891
MD, Professor. Murat AKYOL, dr-muratakyol@hotmail.com,0000-0003-0886-3559

Makale Geliş Tarihi : 02.10.2023
Makale Kabul Tarihi: 17.05.2024

## INTRODUCTION

Breast cancer (BC) is the most frequent type of cancer among women globally. The incidence of BC was reported to be 13%.[1] 2.3 million new female BC cases (11.7%) were reported as the leading type of cancer among women according to the GLOBOCAN data.[2] However, thanks to the advancements in screening, awareness, and treatment options in BC as well as early detection of BC lead to prolonged disease-free survival rates of up to nearly 80% for fifteen years.[3]

Breast cancer survivors (BCS) face many challenges through different aspects of survivorship issues in a wide variety of aspects from fat gain, bone and muscle loss, neuropathy, myalgia, arthralgia, and breast cancer-related lymphedema[4-6]. Therefore, there is a growing need to pay attention to manage of short and long-term side effects of the treatment of BC. Not only for the purpose of improving clinical outcomes and quality of life of BCS but also for optimizing the health care costs of BCS have been understood to be the key factors in the long term.[7] For instance, the estimated healthcare costs of BCS are above 20 billion $ in the care of BCS in which chronic care takes the lion's share.[8] Rashid et al.[9] also stated that nearly six hundred million dollars are spent on the treatment-related side effects of musculoskeletal problems among BCS.

There is a growing body of evidence that exercise plays a vital role in preventing side effects of BC treatment as well as improving treatment efficacy among BCS. Numerous positive effects of exercise on increased cardiopulmonary and functional capacity, muscle strength, self -esteem, and decreased fatigue have been well-known facts among BCS.[10, 11] In addition, it is a well-recognized fact that exercise has significant positive effects on anxiety, depression as well as sleep disorders in patients with breast cancer.[12-15] Although there is a high level of evidence as well as its proven safety and feasibility of exercise among BCS not only during the active treatment period but also afterward, the rate of meeting exercise recommendations according to the guidelines is dramatically low among BCS. To establish an improved continuity of care for BCS, a need for sustainable and regular physical activity and exercise habits is indisputable. Yet, there are lots of points underpinned that decreased participation in exercise and unsustainable physical activity among BCS are not only associated with treatment-related side effects but also other issues that should be thoroughly addressed.[16-19] Understanding the major factors that might play a role in decreased physical activity may create an efficient way toward achievable and sustainable exercise habits.

There are numerous studies associated with perceived exercise barriers and beliefs among cancer survivors. Yet, most of the studies solely rely on its qualitative nature instead of a quantitative design. There is an emerging need for studies in which perceived exercise barriers and beliefs are assessed and analyzed quantitatively. Therefore, we aimed to analyze perceived exercise beliefs and barriers among BCS as well as analyze their relationships with the clinical characteristics of BCS in this study. Our hypotheses were based on that age, time spent after primary treatment, and body mass index (BMI) would show significant relationships with perceived exercise beliefs and barriers.

## MATERIALS AND METHODS

### Study Design

This observational study was planned as a cross-sectional study and followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guideline.[20] A non-probability sampling method was used. This study was held between December 2019 and April 2021. All procedures and measurements were performed according to the 1964 Helsinki Declaration and approval was granted by the Ethics Committee of the University of Health Sciences with the protocol number 11092019/02. All participants were informed before the enrollment of this study and written informed consent was taken.

### Patients

Patients with BC were screened and invited to participate in this study. Aged over 18 years old, female gender, having completed their primary treatments (surgery, chemotherapy, and radiotherapy), and volunteered to participate in this study were set as inclusion criteria. Having mental/cognitive disorder (s), undergoing active chemotherapy and/or radiotherapy, and having orthopedic and/or neurological conditions and/or mild to moderate co morbidities that might impede engaging in exercise were set as exclusion criteria.

### Assessment

#### Demographic data form

The patients' clinical and socio-demographic data (age, BMI, type of surgery, axillary procedure, history of chemotherapy and/or radiotherapy, time spent after surgery (TSS), and medications) was gathered via a simple data form.

#### Physical inactivity level

Patients' physical inactivity level was assessed with the 7$^{th}$ question of the Turkish version of the International Physical Activity Questionnaire-Short Form (IPAQ-SF)[21] which evaluates the mean sitting time of the last seven days of respondents. The patients were asked to fill out only the 7$^{th}$ question of IPAQ-SF instead of the whole questionnaire.

#### Perceived exercise beliefs and barriers

Patients' perceived exercise beliefs and barriers was assessed with the Exercise Benefits/Barriers Scale (EBBS). The original version of the EBBS was developed by Sechrist et al.[22] in 1987. EBBS consists of a total of 43 items in which a total of 29 items assess perceived exercise benefits while the rest of 14 items assess perceived exercise barriers in a four-point Likert type scale from "Strongly disagree:1:" through "Strongly disagree:4". Scores can be used to depict perceived barriers (range 14-56), perceived benefits (range 29-116), or total score (range 43-156). However, many studies have used its core sub-features according to the exploratory factor analysis as follows: Life Enhancement (LE), Physical Performance (PP), Psychological Outlook (PO), Social Interaction (SI), and Preventive Health (PH) can be used to depict exercise beliefs, whereas Exercise Milieu (EM), Time Expenditure (TE), Physical Exertion (PE), and Family Discouragement (FD) can be used to depict perceived exercise barriers. Higher scores indicate a positive attitude toward perceived beliefs or barriers to exercise or vice versa.

### Statistical analysis

The data were reported as means and standard devia-

tion, median and interquartile range (IQR), or number and percentage depending on the type of data, whether continuous or categorical. Normality was assessed with Kolmogorov Smirnov-Shapiro Wilk tests as well as skewness and kurtosis. If the assumptions of normality were met, independent samples t-tests or in case of violation of normal distribution, Mann-Whitney U tests were used to analyze the data in two different groups such as between patients who underwent MRM or BCS or between patients who underwent ALND or SLNB. Bivariate correlations were analyzed according to the normality assumptions and presented by Pearson's r or Spearman's rho correlation coefficients according to the normal distribution and non-normal distribution, respectively. Correlation coefficients are interpreted as follows: r<.20 poor, .21<r<.40 fair, .41<r<.60 moderate, .61<r<.80 good and .81<r<.1 excellent.[23]Missing data were handled with the mean of nearby points. The p-value below .05 was accepted as statistically significant. Statistical analysis was performed with IBM SPSS v.20 (IBM Corp, NY).

## RESULTS

A total of 112 BCS were screened to participate in this study. 16 BCS were excluded due to several reasons according to the predefined inclusion and exclusion criteria. A detailed participation process is shown in Figure 1 as a flow chart.

96 BCS (Mean age and BMI: 52.00±10.05 years and 27.77±3.75 kg/m$^2$) fulfilled all assessments. A total of 5 patients' (5.2%) weight and/or height data could not be retrieved from the data form, therefore, the median of nearby points was used to replace the missing data for further analysis. The mean TSS was 2.32±1.74 (min-max 0.5-9.75) years. After categorization, above half the half of the BCS' time spent after surgery (54 out of 96 BC patients, 56.3 %) was between 1 and 3 years. The detailed clinical characteristics of patients are shown in Table 1.

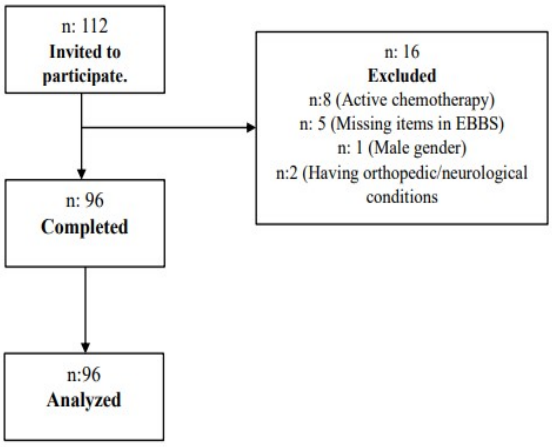


**Figure.1** Flow chart of the study participation process.

**Table 1:** Clinical and sociodemographic characteristics of patients

| Characteristics n=96 | Min | Max | Mean (SD) |
|---|---|---|---|
| **Age (years)** | 33 | 76 | 52.00±10.05 |
| **BMI (kg/m$^2$)** | 19.96 | 38.01 | 27.77±3.75 |
| **Time spent after surgery (years)** | 0.5 | 9.75 | 2.32±1.74 |
| **Time spent after surgery** | **n** | **%** | |
| 0-1 year | 21 | 21.8 | |
| 1-3 years | 54 | 56.3 | |
| 3-5 years | 14 | 14.6 | |
| 5 years or more | 7 | 7.3 | |
| **Marital Status** | | | |
| Married | 84 | 87.5 | |
| Single/divorced | 12 | 12.5 | |
| **Type of Surgery** | | | |
| Conservative | 68 | 70.8 | |
| MRM | 28 | 29.2 | |
| **Type of axillary procedure** | | | |
| SLNB | 16 | 16.7 | |
| ALND | 80 | 83.3 | |
| **Grade** | | | |
| 1 | 23 | 23.9 | |
| 2 | 47 | 48.9 | |
| 3 | 25 | 26.1 | |
| 4 | 1 | 1.1 | |
| **History of chemotherapy** | | | |
| Yes | 82 | 85.4 | |
| No | 14 | 14.6 | |
| **History of radiotherapy** | | | |
| Yes | 92 | 95.8 | |
| No | 4 | 4.2 | |
| **Tamoxifen use** | | | |
| Yes | 44 | 45.8 | |
| No | 52 | 54.2 | |
| **Aromatase Inhibitor use** | | | |
| Yes | 43 | 44.8 | |
| No | 53 | 55.2 | |

**SD**: Standard deviation, **BMI**: Body mass index, **MRM**: Modified radical mastectomy, **SLNB**: Sentinel lymph node biopsy, **ALND**: Axillary lymph node dissection

The mean scores of perceived exercise benefits and barriers as well as sub dimensions of EBBS, and total sitting time are shown in Table 2. The median value of the perceived barriers and benefits scale were found as 33.5 (31-36) and 90(88-93.75) respectively. The details of the scores of EBBS and its sub-dimensions as well as the mean sitting time are shown in Table 2.

**Table 2.** The detailed mean scores of sitting time and perceived exercise barriers and benefits of patients.

| Characteristics n=96 | Min | Max | Median (IQR$^{25-75}$) |
|---|---|---|---|
| **Sitting time (hrs)** | 1 | 12 | 5.68 (4-6) |
| | **EBBS** | | |
| | **Min** | **Max** | **Median (IQR$^{25-75}$)** |
| **Perceived benefits (range)** | 70 | 121 | 90 (88-93.75) |
| LE (8-32) | 17 | 32 | 27 (26-27) |
| PP (8-32) | 18 | 28 | 21 (21-21.75) |
| PO (6-24) | 11 | 24 | 18 (17-19) |
| SI (4-16) | 4 | 15 | 11 (9-12) |
| PH (3-12) | 6 | 12 | 9 (8-9) |
| | **Min** | **Max** | **Median (IQR$^{25-75}$)** |
| **Perceived barriers (range)** | 22 | 46 | 33.5 (31-36) |
| EM (6-24) | 12 | 24 | 17 (15.25-18) |
| TE (3-12) | 5 | 12 | 9 (9-9) |
| PE (3-12) | 3 | 11 | 8 (7-9) |
| FD (2-8) | 3 | 8 | 6 (4-6) |

**Hrs**: Hours, **SD**: Standard deviation, LE: Life enhancement, **PP**:Physical performance, **PO**: Psychological outlook, **SI**: Social interaction, **PH**: Preventive health, **EM**: Exercise milieu, **TE**: Time expenditure, **PE**: Physical exertion, **FD**: Family discouragement, **IQR**: Interquartile range, **Min**: Minimum, **Max**: Maximum

When it comes to relationships between parameters, perceived exercise benefits subscales (LE, PP, PO, SI, and PH) were found to be significantly correlated from mild through higher levels in each other (data not shown). The same pattern was also observed in between some parameters of perceived exercise barriers subscales. The physical inactivity, as assessed via the 7th question of IPAQ-SF in which mean sitting time on a day was requested as hours or minutes, was not found to significantly correlate with all parameters of EBBS as well as other clinical and sociodemographic variables. Yet, there was a significant positive correlation between age and total sitting time at a fair level ($r$=.258, $p$=0.017). The TSS was also found to be significantly and negatively correlated fairly with PP (r=-.273, $p$=0.009), EM (r=-.239, $p$=0.022), and age (r=.349, p<0.001). TSS was also significantly correlated fairly with the type of surgery ($r$=.266, $p$=0.009), type of axillary procedure ($r$= -.209, $p$=0.041), history of RT (r=.224, $p$=0.028), and history of aromatase inhibitor use ($r$=.374, $p$<0.001) in point biserial correlations. Age had also a significant negative correlation with a history of tamoxifen use ($r$=. -497, $p$<0.001) and a history of aromatase inhibitor use ($r$=.438, $p$<0.001) in moderate levels. Details of correlation analyses among sociodemographic and clinical variables and subscales of EBBS are also shown in Table 3.

Although there were differences in the mean scores of the subscales of perceived beliefs and barriers between groups (MRM vs. conservative surgery; and ALND vsSLNB), these differences did not reach significance ($p$>.05).

## DISCUSSION

This study showed relatively acceptable and expectable levels of perceived exercise beliefs and barriers among BCS. Our findings are in parallel with the literature findings.[6,24] Notably, prolonged time spent after surgery was also noteworthy to take into consideration its effect on physical function and exercise milieu both in perceived exercise beliefs and barriers, respectively. Contrary to expected, the level of physical inactivity was not found to correlate significantly with any of the subscales as well as other clinical and sociodemographic characteristics of patients except for fairly with age. However, the main reason for this insignificant result might have originated from the assessment of physical activity only with a single question which directly covers total sitting time in a day.

Exercise has been reported to be the greatest option to manage short- and long-term consequences of treatment-related side effects such as fatigue,[25,26] anxiety,[12,15] cancer related cognitive impairment,[27] and cardiotoxicity[28] among cancer patients during treatment and chronic care. Despite the benefits of exercise being well known, adherence to exercise and/or physical activity is dramatically low among BCS according to the recommended level of weekly dosage of a minimum of 150 minutes of moderate physical activity.[29] It was also reported that nearly half of Taiwanese BC survivors did not exercise at all.[17]Chan et al.[30] reported that patients significantly lowered their physical activity level following the diagnosis of cancer. Notably, cancer itself does not impede adherence to physical activity since comparative studies showed that there is no significant difference between patients with and without cancer.[31] Although we assessed the patients' physical inactivity level by gathering total sitting time, it was seen that there was no regular exercise habit among our patients. We tried to use the mean total sitting time as physical inactivity level instead of physical activity. Although there is no report on whether physical activity and inactivity can be used interchangeably, assessment of physical inactivity usually focuses on "sitting time" during daily life. For instance, nearly half of the items of the Turkish version of the Sedentary Behavior Questionnaire (SBQ)[32] assesses physical inactivity by using the

**Table 3.** Correlations between subscales of EBBS and clinical-sociodemographic characteristics of patients

| | Perceived Benefits | | | | | Perceived Barriers | | | |
|---|---|---|---|---|---|---|---|---|---|
| **n=96** | **LE** | **PP** | **PO** | **SI** | **PH** | **EM** | **TE** | **PE** | **FD** |
| **Age** | r=.155 **p=.14** | r=.079 **p=.45** | r<0.01 **p=.99** | r=.117 **p=.26** | r=.116 **p=.27** | r=. -212 ***p=0.042** | r=-.018 **p=.86** | r=-.005 **p=.96** | r=.109 **p=.30** |
| **BMI** | r=.093 **p=.38** | r=-.040 **p=.70** | r=-.022 **p=.83** | r=.119 **p=.25** | r=.137 **p=.19** | r=-.037 **p=.72** | r=.035 **p=.74** | r=.129 **p=.22** | r=.265 ***p=0.011** |
| **Sitting Time** | r=-.070 **p=.50** | r=.001 **p=.99** | r=**.052** **p=.62** | r=-.003 **p=.97** | r=-.145 **p=.16** | r=.082 **p=.43** | r=-.053 **p=.61** | r=.059 **p=.57** | r=.078 **p=.45** |
| **Type of surgery** | r=.049 **p=.64** | r=-.031 **p=.77** | r=-.059 **p=.58** | r=.057 **p=.59** | r=.030 **p=.77** | r=-.124 **p=.23** | r=-.066 **p=.53** | r=.012 **p=.91** | r=-.028 **p=.79** |
| **Type of axillary procedure** | r=-.132 **p=.21** | r=-.026 **p=.80** | r=-.011 **p=.91** | r=-.193 **p=.06** | r=-.097 **p=.35** | r=-.006 **p=.95** | r=-.023 **p=.83** | r=.004 **p=.97** | r=-.149 **p=.15** |
| **History of radiotherapy** | r=.204 **p=.051** | r=.110 **p=.29** | r=.233 ***p=0.025** | r=.112 **p=.28** | r=.238 ***p=0.022** | r=-.018 **p=.86** | r=.140 **p=.18** | r=.073 **p=.49** | r=.029 **p=.78** |
| **Time spent after surgery** | r=-.078 **p=.45** | r=-.273 ***p=0.009** | r=-.175 **p=.09** | r=.141 **p=.18** | r=.011 **p=.92** | r=. -239 ***p=0.022** | r=-.037 **p=.72** | r=.059 **p=.57** | r=.022 **p=.83** |

**BMI**: Body mass index, **LE**: Life enhancement, **PP**: Physical performance, **PO**: Psychological outlook, **SI**: Social interaction, **PH**: Preventive health, **EM**: Exercise milieu, **TE**: Time expenditure, **PE**: Physical exertion, **FD**: Family discouragement**, NS:** Not significant, **r**: Spearman's rho, **p**<0.05, ***:** Significant at .05 level

word "while sitting". In our study, there was no significant relationship between the level of physical inactivity and perceived exercise beliefs and barriers except for age. Ottenbacher et al.[33] reported that change in perceived barriers was not associated with the change in physical activity among breast and prostate cancer survivors. Hsu et al.[17] also reported no significant relationship between exercise frequency and sociodemographic and clinical parameters among BC survivors. This insignificant relationship may be noteworthy to highlight that the perceived exercise beliefs and barriers are not directly linked to the level of physical activity. Yet, it might also be expectable to assume that higher perceived beliefs can lead to regular physical activity. Conversely, Gho et al.[19] reported being sufficiently or insufficiently physically active was found significantly correlated with the majority of domains of perceived exercise benefits and barriers. However, 61% of their sample was defined as "physically inactive". Nonetheless, age was found significantly correlated with the "Exercise Milieu" subscale of EBBS in which issues associated with reaching and performing exercise instead of the side effects of treatment are generally focused. This finding is important since the unmet rate of physical activity recommendations can originate from these perceived exercise barriers among older BCS. Our findings were also in parallel with the literature findings.[34,35] Hsu et al.[17] reported that the effect of social support was higher in the older age group compared to the younger ones. Similarly, Perry et al.[7] reported that the "lack of convenient exercise facilities" which is in parallel with the items of the EM subscale, was the main barrier to exercise among their patient cohort in which the mean age was above 70.

When it comes to the major perceived exercise barriers, treatment, and patient-related issues such as fatigue and feeling weak have been reported as the most remarkable ones.[16] Those are also understandable due to the side effects of the systemic therapy of cancer can last quite long even after years of the completion of primary treatment is a well-known point. Yet, lack of time and self-discipline, procrastination, and other factors such as enjoyment have also been reported as significant non-disease-specific barriers regarding exercise. In this manner, those barriers are also highlighted to be investigated in order to improve exercise and physical activity habits among the cancer population.[36] Due to the research design of our study, we did not investigate any theme or specific issue as barriers or beliefs. However, the "Physical Exertion" subscale, which is focused on tiredness and fatigue with a total of three items, was found relatively lower compared to the other subscales of perceived barriers in our study. When considering the perceived exercise beliefs, the "Life enhancement" subscale was higher by proportioning the mean score to the maximum score compared to the others. Our findings are compatible with the literature.[7,16] These findings can also be attributable to the time spent after surgery since the great majority of our sample had relatively below three years of the period after primary treatment. In addition, nearly half of our sample had a positive history of tamoxifen or aromatase inhibitor use, which has well-known side effects such as myalgia and arthralgia.[37]

The chronicity of survivorship of BC may affect participation in exercise or regular physical activity. Hsu et al.[17] reported that exercise frequency gradually decreased over time among BCS. In our study, we found weak but significant negative correlations among TSS, the "Physical performance" subscale of perceived exercise beliefs, and the "Exercise Milieu" subscale of perceived exercise barriers, respectively. Although the correlation levels were weak, these findings deserve to be noted that BCS may think that the benefits of exercise would steadily lose their importance after the completion of primary treatment according to the perceived exercise beliefs. These findings need to be addressed in detail since Charlier et al.[6] reported that the desired physical activity level was already below in BC patients who were in the six months of the completion of their treatment. In addition, the TSS might have played an important role in perceived exercise barriers according to the significant relationship between EM and time spent after surgery. We think that this was a remarkable result since the participation level of physical activity during the chronic stage of survivorship might dramatically be affected by other factors such as procrastination and/or lack of time instead of treatment-related side effects. Ottenbacher et al.[33] reported that "being busy" and "no willpower" as significant major perceived barriers among breast and prostate cancer survivors. Since it is well known that insufficient patient education is a major contributor to the perceived exercise beliefs and barriers,[16] informing patients about the benefits of exercise in early settings carries a great opportunity to preserve the desired levels of physical activity among BCS. Rogers et al.[38] recently reported a significant improvement was achieved and preserved in the early physical activity intervention group compared to the usual care group at the 12$^{th}$ month. The importance of timing was also highlighted in the recently published systematic review in which the effect of the intervention of physical activity remained efficacious after several months yet its effect diminished over time.[39] It was also reported that a "lack of information" about exercise acted as a significant barrier among cancer survivors.[7,16,40] Nevertheless, it was stated that BCS wish to have exercise counseling in their routine cancer care.[7]Gjerset et al.[41] reported that 76% of patients from their sample with different kinds of cancer were interested in receiving exercise counseling during their treatment. On the other hand, Gho et al.[42] reported that "bra discomfort" was one of the perceived barriers among BCS irrespective of age and/or other parameters. Therefore, filling the gap in information about the exercise should also include clothing and/or other discomforts that may impede participation in regular physical activity or exercise.

This study has some strengths and limitations. Using a validated questionnaire, a homogenous sample of cancer types, and filling out a questionnaire in a real environment instead of an online survey may present the strengths of this study. Nevertheless, a cross-sectional nature of study design and recall bias, especially evaluating total sitting time which can be over or under-reported as stated in the literature,[43]may have limited the revealing of potential associations and/or effects on exercise beliefs and benefits. In addition, we might have failed to investigate the total sitting time by using only a

question which is quite vulnerable to being scored biased. For instance, Lee et al.[30] reported that IPAQ-SF typically overestimates physical activity by nearly 85%. In addition, nearly all our patients were white Caucasian women, and included from a single oncology setting might hinder results from being generalizable to all BC survivors. Besides, assessing anxiety and depression would have improved the interpretation of our findings in the context of implications for clinical practice. Further studies should consider these issues when addressing and evaluating the specific needs and barriers to exercise among BCS.

## CONCLUSION

Since the importance of physical activity is well understood among cancer patients, establishing sustainable, regular physical activity and exercise habits carries great importance. In this manner, addressing the specific needs, preferences as well as perceived beliefs and barriers upon exercise should be well documented to create a sustainable, long-lasting physical activity behavior among cancer populations. The findings of this study highlight the need for special attention to perceived barriers to exercise at higher ages. In addition, it might also be plausible to conclude that actions should be taken to prevent physical inactivity as much as earlier in the trajectory of breast cancer treatment according to the significant associations between time spent after surgery and perceived exercise beliefs and barriers.

**Ethics Committee Approval:** Ethical board approval was granted by the Ethics Committee of the University of Health Sciences with the protocol number 11092019/02.

**Informed Consent:** All participants were informed before the enrollment of this study and written informed consent was taken

**Author Contributions:** Concept-AT, YB, MA; Design-AT, YB; Supervision-AT, MA; Resources-AT, MA; Materials-AT, YB, MA; Data Collection and/or Processing-AT, MA; Analysis and/or Interpretation- AT, YB; Literature Search- AT; Writing Manuscript- AT, YB, MA;; Critical Review- AT, YB

**Declaration of Interest:** The authors declare that there is no conflict of interest.

**Funding**: The authors declare that no funds, grants, or other support were received during the preparation of this manuscript.

**Acknowledgements:** The Authors would like to thank patients who voluntarily participated in this study.

**Etik Kurul Onayı:** Etik kurul onayı Sağlık Bilimleri Üniversitesi Etik Kurulu tarafından 11092019/02 protokol numarası ile verilmiştir.

**Bilgilendirilmiş Onam:** Bu çalışmaya katılmadan önce tüm katılımcılar bilgilendirilmiş ve her hasta için yazılı bilgilendirilmiş onam alınmıştır.

**Yazar Katkıları:** Konsept-AT, YB, MA; Tasarım-AT, YB; Süpervizyon-AT, MA; Kaynaklar-AT, MA; Materyaller-AT, YB, MA; Veri Toplama ve/veya İşleme-AT, MA; Analiz ve/veya Yorumlama- AT, YB; Literatür Taraması-AT; Makale Yazımı- AT, YB, MA; Eleştirel İnceleme- AT, YB

**Çıkar çatışması:** Yazarlar herhangi bir çıkar çatışması olmadığını beyan ederler.

**Finansal destek:** Yazarlar, bu makalenin hazırlanması sırasında herhangi bir fon, hibe veya başka bir destek almadıklarını beyan ederler.

**Teşekkür:** Yazarlar bu çalışmaya gönüllü olarak katılan hastalara teşekkür eder.

## REFERENCES

1. Society AC. How common is breast cancer? Breast Cancer Statistics 20190. 2020. https://www.cancer.org/cancer/types/breast-cancer/about/how-common-is-breast-cancer.html
2. Sung H, Ferlay J, Siegel RL, et al.Global cancer statistics 2020: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries. *CA Cancer J Clin.* 2021;71(3): 209-249. doi:10.3322/caac.21660.
3. Abraham HG, Xla Y, Mukherjee B, Merajver SD. Incidence and survival of inflammatory breast cancer between 1973 and 2015 in the SEER database. *Breast Cancer Res Treat.* 2021;185(1):229-238. doi:10.1007/s10549-020-05938-2.
4. Kikuuchi M, Akezaki Y, Nakata E, et al. Risk factors of impairment of shoulder function after axillary dissection for breast cancer. *Support Care Cancer*. 2021;29(2):771-778. doi:10.1007/s00520-020-05533-7.
5. Chrischilles EA, Riley D, Letuchy E, et al. Upper extremity disability and quality of life after breast cancer treatment in the Greater Plains Collaborative clinical research network. *Breast Cancer Res Treat*. 2019;175(3):675-689. doi:10.1007/s10549-019-05184-1.
6. Charlier C, Van Hoof E, Pauwels E, Lechner L, Spittaels H, De Bourdeaudhuij I. The contribution of general and cancerrelated variables in explaining physical activity in a breast cancer population 3 weeks to 6 months posttreatment. *Psychooncology*. 2013;22(1):203-211. doi:10.1002/pon.2079.
7. Perry CK, Ali W, Solanki E, Winters-Stone K. Attitudes and beliefs of older female breast cancer survivors and providers about exercise in cancer care. *Oncol Nurs Forum*. 2020; 47(1):56-69. doi:10.1188/20.ONF.56-69.
8. Mariotto A, Yabroff KR, Shao Y, Feuer EJ, Brown ML. Projections of the cost of cancer care in the United States: 2010-2020. *J Natl Cancer Inst*. 2011;103(2):117-128. doi:10.1093/jnci/djq495.
9. Rashid N, Koh HA, Baca HC, Lin KJ, Malecha SE, Masaquel A. Economic burden related to chemotherapy-related adverse events in patients with metastatic breast cancer in an integrated health care system. *Breast Cancer* (Dove Med Press). 2016;(8):173-181. doi:10.2147/BCTT.S105618.
10. Winters-Stone, K, Dobek J, Nail LM et al. Impact+ resistance training improves bone health and body composition in prematurely menopausal breast cancer survivors: a randomized controlled trial. *Osteoporos Int*. 2013;24(5):1637-1646. doi:10.1007/s00198-012-2143-2.
11. Winters-Stone K, Dobek J, Nail L, et al. Strength training stops bone loss and builds muscle in postmenopausal breast cancer survivors: a ran-

domized, controlled trial. *Breast Cancer Res Treat*. 2011;127(2):447-56. doi:10.1007/s10549-011-1444-z.
12. Kang DW, Fairey AS, Boulé NG, Field CJ, Wharton SA, Courneya KS. A randomized trial of the effects of exercise on anxiety, fear of cancer progression and quality of life in prostate cancer patients on active surveillance. *J Urol.* 2022;207(4):814-22. doi:10.1097/JU.0000000000002334.
13. Steindorf K, Wiskemann J, Ulrich CM, Schmidt ME. Effects of exercise on sleep problems in breast cancer patients receiving radiotherapy: a randomized clinical trial. *Breast Cancer Res Treat*. 2017;162(3):489-499. doi:10.1007/s10549-017-4141-8.
14. Kreutz C, Schmidt ME, Steindorf K. Effects of physical and mind–body exercise on sleep problems during and after breast cancer treatment: a systematic review and meta-analysis. *Breast Cancer Res Treat.* 2019;176(1):1-15. doi:10.1007/s10549-019-05217-9.
15. Ribeiro FE, Palma MR, Silva DTC, et al. Relationship of anxiety and depression symptoms with the different domains of physical activity in breast cancer survivors. *J Affect Disord.* 2020;1(273):210-214. doi:10.1016/j.jad.2020.03.110.
16. Clifford BK, Mizrahi D, Sandler CX, et al. Barriers and facilitators of exercise experienced by cancer survivors: a mixed methods systematic review. *Support Care Cancer.* 2018;26(3):685-700. doi:10.1007/s00520-017-3964-5.
17. Hsu HT, Dodd MJ, Guo SE, Lee KA, Hwang SL, Lai YH. Predictors of exercise frequency in breast cancer survivors in Taiwan. *J Clin Nurs.* 2011;20(13-14):1923-1935. doi:10.1111/j.1365-2702.2010.03690.x.
18. Bulmer SM, Howell J, Ackerman L, Fedric R. Women's perceived benefits of exercise during and after breast cancer treatment. *Women Health.* 2012;52(8):771-787. doi:10.1080/03630242.2012.725707.
19. Gho SA, Munro BJ, Jones SC, Steele JR. Perceived exercise barriers explain exercise participation in Australian women treated for breast cancer better than perceived exercise benefits. *Phys Ther.* 2014;94(12):1765-1774. doi:10.2522/ptj.20130473.
20. von Elm E, Altman DG, Egger M, Pocock SJ, Gøtzsche PC, Vandenbroucke JP. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement: guidelines for reporting observational studies. *Ann Intern Med.* 2007;147(8):573-577. doi:10.7326/0003-4819-147-8-200710160-00010.
21. Saglam M, Arikan H, Savci S, et al. International physical activity questionnaire: reliability and validity of the Turkish version. *Percept Mot Skills.* 2010;111(1):278-284. doi:10.2466/06.08.PMS.111.4.278-284.
22. Sechrist KR, Walker SN, Pender NJ. Development and psychometric evaluation of the exercise benefits/barriers scale. *Res Nurs Health*. 1987;10(6):357-365. doi:10.1002/nur.4770100603.
23. Schober P, Boer C, Schwarte LA. Correlation coefficients: appropriate use and interpretation. *Anesth Analg.* 2018;126(5):1763-1768. doi:10.1213/ANE.0000000000002864.
24. Miedema B, Hamilton R, Tatemichi S, et al. Predicting recreational difficulties and decreased leisure activities in women 6–12 months post breast cancer surgery. *J Cancer Surviv.* 2008;2(4):262-268. doi:10.1007/s11764-008-0068-8.
25. Ehlers DK, Du Bois K, Salerno EA. The effects of exercise on cancer-related fatigue in breast cancer patients during primary treatment: a meta-analysis and systematic review. *Expert Rev Anticancer Ther*. 2020;20(10):865-877. doi:10.1080/14737140.2020.1813028.
26. Belloni S, Arrigoni C, Caruso R. Effects from physical exercise on reduced cancer-related fatigue: a systematic review of systematic reviews and meta-analysis. *Acta Oncol.* 2021;60(12):1678-1687. doi:10.1080/0284186X.2021.1962543
27. Campbell KL, Zadravec K, Bland KA, Chesley E, Wolf F, Janelsins MC. The effect of exercise on cancer-related cognitive impairment and applications for physical therapy: systematic review of randomized controlled trials. *Phys Ther.* 2020;100(3):523-542. doi:10.1093/ptj/pzz090.
28. D'Ascenzi F, Anselmi F, Fiorentini C, Mannucci R, Bonifazi M, Mondillo S. The benefits of exercise in cancer patients and the criteria for exercise prescription in cardio-oncology. *Eur J Prev Cardiol.* 2021;28(7):725-735. doi:10.1177/2047487319874900.
29. Schmitz KH, Courneya KS, Matthews C, et al. American college of sports medicine roundtable on exercise guidelines for cancer survivors. *J Med Sci Sports Exerc.* 2010;42(7):1409-1426. doi:10.1249/MSS.0b013e3181e0c112.
30. Chan A, Ports K, Neo P, et al. Barriers and facilitators to exercise among adult cancer survivors in Singapore. *Support Care Cancer.* 2022;30(6):4867-4878. doi:10.1007/s00520-022-06893-y.
31. Eakin EG, Youlden DR, Baade PD, et al. Health behaviors of cancer survivors: data from an Australian population-based survey. *Cancer Causes Control.* 2007;18(8):881-894. doi:10.1007/s10552-007-9033-5.
32. Bakar Y, Tuğral A, Özel A, Altuntas YD, Yakut Y. Reliability and validity of sedentary behavior questionnaire in Turkish population: Evaluation of psychometric properties. *Middle East J Rehabil Health Stud.* 2018;5(2): e63576. doi:10.5812/mejrh.63576.
33. Ottenbacher AJ, Day RS, Taylor WC, et al. Exercise among breast and prostate cancer survivors—what are their barriers? *J Cancer Surviv.* 2011;5(4):413-419. doi:10.1007/s11764-011-0184-8.
34. Thraen-Borowski KM, Gennuso KP., Cadmus-Bertram L. Accelerometer-derived physical activity and sedentary time by cancer type in the United States. *PLoS One*. 2017; 12(8):e0182554. doi:10.1371/journal.pone.0182554.
35. Boyle T, Vallance JF, Ransom EK, Lynch BM. How sedentary and physically active are breast cancer

survivors, and which population subgroups have higher or lower levels of these behaviors? *Support Care Cancer*. 2016;24(5):2181-2190. doi:10.1007/s00520-015-3011-3.
36. Cormie P, Zopf EM, Zhang X, Schmitz KH. The impact of exercise on cancer mortality, recurrence, and treatment-related adverse effects. *Epidemiol Rev*. 2017;39(1):71-92. doi:10.1093/epirev/mxx007.
37. Honma N, Makita M, Saji S, et al. Characteristics of adverse events of endocrine therapies among older patients with breast cancer. *Support Care Cancer.* 2019;27(10):3813-3822. doi:10.1007/s00520-019-04674-8.
38. Rogers, LQ, Courneya KS, Oster RA, et al. Physical activity intervention benefits persist months post-intervention: Randomized trial in breast cancer survivors. *J Cancer Surviv.* 2023; 17 (6):1834-1846. doi:10.1007/s11764-022-01329-2.
39. Goldschmidt S, Schmidt ME, Steindorf K. Long-term effects of exercise interventions on physical activity in breast cancer patients: A systematic review and meta-analysis of randomized controlled trials. *Support Care Cancer.* 2023;31 (2):130. doi:10.1007/s00520-022-07485-6.
40. Stonerock GL, Blumenthal JA. Role of counseling to promote adherence in healthy lifestyle medicine: strategies to improve exercise adherence and enhance physical activity. *Prog Cardiovasc Dis*. 2017;59(5):455-462. doi:10.1016/j.pcad.2016.09.003.
41. Gjerset G, Fossa SD, Courneya KS, Skovlund E, Jacobsen AB, Thorsen L. Interest and preferences for exercise counselling and programming among Norwegian cancer survivors. *Eur J Cancer Care (Engl).* 2011;20(1):96-105. doi:10.1111/j.1365-2354.2009.01161.x.
42. Gho SA, Munro BG, Jones SC, Steele JR. Exercise bra discomfort is associated with insufficient exercise levels among Australian women treated for breast cancer. *Support Care Cancer.* 2014;22 (3):721-729. doi:10.1007/s00520-013-2027-9.
43. Wagoner CW, Choi SK, Deal AM, et al. Establishing physical activity in breast cancer: self-report versus activity tracker. *Breast Cancer Res Treat.* 2019;176(2):395-400. doi:10.1007/s10549-019-05263-3.