

# Evaluation of the impact of physical exercise on quality of life and clinical outcomes among women undergoing treatment for breast cancer

Avaliação do impacto do exercício físico na qualidade de vida e desfechos clínicos dentre mulheres sob tratamento de câncer de mama

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## ABSTRACT

To evaluate the association between the practice of physical exercises, quality of life and clinical outcomes in women diagnosed with and undergoing treatment for breast cancer. Cohort study, following-up women during 6 months after treatment beginning for breast cancer. A total of 149 participants were recruited for convenience in a private hospital with a specialized service for cancer treatment. Sociodemographic data, practice of physical exercise, duration of exercise per week and domains of quality of life were evaluated through specific questionnaires (EORTC-QLQ-C30/EORTC-QLQ-BR23), that aims to measure the following variables: daily tasks, physical, emotional, performance score, pain, fatigue, symptoms, treatment side effects, and global health status. The interviews with the patients were carried out during the diagnosis period and after six months of treatment. The average age of the study participants is 58.0 years old [IQ: 44.0-68.0], with the majority of white ethnicity (99.3%). After 6 months of treatment, it has been found that 52.3% of patients (n=78) were practicing some physical exercise. Patients who were practicing exercises during the treatment period had better scores in terms of emotional, social, functional performance, symptoms, global health status and the sum of quality of life scores six months after starting the treatment than those who did not exercise at all ( $p<0.05$ ). The weekly physical exercise period showed a significant direct correlation with some QoL scores. Finally, the regression analysis showed that women who have practiced physical exercise during treatment had better conditions in terms of physical and daily tasks performance and lower levels of fatigue. Women who have kept regular physical exercises during the treatment for breast cancer have had better health results. Physical exercise is an important activity that should be considered in order to have a healthy routine, as it improves all quality of life domains globally.

**Keywords:** Breast neoplasms; Quality of life; Exercise.

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## RESUMO

Avaliar a associação entre prática de exercícios físicos, qualidade de vida e desfechos clínicos em mulheres diagnosticadas e em tratamento para câncer de mama. Estudo de coorte, acompanhamento de mulheres durante 6 meses após o início do tratamento para câncer de mama. Um total de 149 participantes foi recrutado por conveniência em um hospital privado com serviço especializado para tratamento oncológico. Dados sociodemográficos, prática de exercício físico, duração do exercício por semana e domínios da qualidade de vida foram avaliados por meio de questionários específicos (EORTC-QLQ-C30/EORTC-QLQ-BR23), que visam medir as seguintes variáveis: tarefas diárias, físicas, emocionais, escore de desempenho, dor, fadiga, sintomas, efeitos colaterais do tratamento e estado de saúde global. As entrevistas com as pacientes foram realizadas durante o período de diagnóstico e após seis meses de tratamento. A idade média das participantes do estudo é de 58,0 anos [QI: 44,0-68,0], com a maioria de etnia branca (99,3%). Após 6 meses de tratamento, verificou-se que 52,3% das pacientes (n=78) praticavam algum exercício físico. As pacientes que praticaram exercícios durante o período de tratamento tiveram melhores escores em termos de desempenho emocional, social, funcional, sintomas, estado de saúde global e soma dos escores de qualidade de vida seis meses após o início do tratamento do que aqueles que não praticaram nenhum exercício ( $p<0,05$ ). O período de exercício físico semanal apresentou correlação direta significativa com alguns escores de qualidade de vida. Por fim, a análise de regressão mostrou que as mulheres que praticaram exercícios físicos durante o tratamento apresentaram melhores condições de desempenho físico e de tarefas diárias e menores níveis de fadiga. As mulheres que mantiveram exercícios físicos regulares durante o tratamento do câncer de mama tiveram melhores resultados na saúde. O exercício físico é uma atividade importante que deve ser considerada para uma rotina saudável, pois melhora globalmente todos as áreas da qualidade de vida.

**Descritores:** Neoplasias da mama; Qualidade de vida; Exercício.

## INTRODUCTION

Breast cancer is a major health problem for women, due to its high incidence rate.<sup>[1]</sup> According to the National Cancer Institute (INCA), there are approximately 66,280 new cases of breast cancer every year.<sup>[2]</sup> Breast cancer is a multifactorial disease, and its main characteristic is a disordered and uncontrolled growth of cells in the mammary and axillary region.<sup>[3]</sup>

Physical exercise has been associated with a reduced risk of recurrence of certain neoplasms (breast cancer and colorectal cancer).<sup>[4]</sup> Its practice, within the treatment for breast cancer, helps in functional health, decreasing fatigue, and reducing depressive symptoms.<sup>[5]</sup> A cross-sectional study that evaluated the impact of physical exercise on the quality of life (QoL) in patients with breast cancer, for example, identified that women who practiced physical exercise on a regular basis had better QoL scores compared to sedentary women.<sup>[6]</sup>

In Brazil, a manual of physical activity recommendations has been developed, aiming to help health professionals to facilitate the population in

the prevention and control of cancer. Since this habit needs to be included in the treatment guidelines,<sup>[7]</sup> the American Society of Clinical Oncology (ASCO) recommends the practice of moderate physical exercise, around 150 minutes of exercise per week. The ASCO also recommends aerobic exercises with strength training, especially for patients who have fatigue after the treatment beginning.<sup>[8]</sup> Therefore, this study aims to evaluate the association between the practice of physical exercise, QoL and clinical outcomes in women diagnosed with and undergoing treatment for breast cancer.

## MATERIAL AND METHODS

This study has been carried out in the Clinical Outcomes Program at the Hospital Moinhos de Vento (HMV) in Porto Alegre. The program aims to evaluate the health outcomes of patients diagnosed with breast cancer inside HMV, a private and philanthropic institution in Porto Alegre, in southern Brazil, that is recognized for its excellent service for oncological needs.

This article has been written based on the criteria established by the protocol STrengthening the

Reporting of OBservational studies in Epidemiology (STROBE).

### Study design and sampling

This is a cohort, longitudinal, observational and prospective study, aiming to evaluate the impact of physical exercise in the oncological treatment of patients with breast cancer. The recruitment of participants for the study has been carried out by convenience, with the target population being patients participating in the Clinical Outcomes Program from HMV. The inclusion criteria for the present study were: women over 18 years old, with a confirmed diagnosis of breast cancer, without previous treatment and who started their cancer treatment at the institution of interest, which may be surgical, chemotherapy, radiotherapy or hormone therapy. There was no restriction on participation in the study by type of breast cancer, staging or type of treatment, as the clinical profile of patients treated at the hospital's oncology service is very heterogeneous and each patient receives an individualized treatment plan according to their needs and demands. In addition to that, it has been required for those patients to answer the questionnaire during the period of diagnosis, ongoing treatment and after 6 months of treatment. Foreign patients, patients who had already started treatment, relapses and rare tumors were excluded from the study.

### Data collection and procedures

The data collection period has been carried out between November 2018 and July 2022. Every time a patient meeting the inclusion and exclusion criteria was included in the Clinical Outcomes Program, a member of the assessment team was responsible for contacting them in order to verify their interest in participating in the study. The initial contact was carried out through telephone calls with the help of research assistants, and also in face-to-face appointments at the Nucleo Mama, by a nursing professional. If the patient manifests interest in participating in the study, the term of free and informed consent was provided, and the main study objectives and procedures were presented and discussed in detail. After signing the term, a trained member of the research team conducted the interview for data collection, the survey forms followed the International Consortium for Health Outcomes Measurement (ICHOM) methodology. All data was collected and stored by using the Research Electronic Data Capture (RedCap) software database.

The main data for the present study was collected through a semi-structured questionnaire, which has been validated using the ICHOM methodology.<sup>[9]</sup> This questionnaire presents the following measures:

1. Sociodemographic data, including age, sex, level of education, and marital status;
2. Physical exercise questions, containing the type of physical activity performed (if any),

weekly frequency of practices, and duration of physical exercise in minutes;

3. Assessment of QoL, clinical outcomes (pain, fatigue, physical and emotional consequences derived from cancer treatment) treatment side effects. These three contexts were evaluated through the application of EORTC-QLQ-C30/EORTC-QLQ-BR2 scale. This instrument was originally created by the European Organization Research and Treatment of Cancer (EORTC) and is widely used to measure QoL and related aspects among people with cancer. The questionnaire presents 47 questions that evaluate 12 clinical outcomes domains: daily activities functioning, physical functioning, emotional functioning, cognitive functioning, social functioning, total score of functioning, pain, fatigue, symptoms, treatment side effects, global health score, and total QoL score.<sup>[10]</sup> Treatment side effects considered nausea, hair loss, diarrhea, among others.

Six months after starting treatment, all included participants received a telephone call in order to reapply the same questionnaire. The follow-up times for each patient were described as T0 (data collected right after diagnosis of breast cancer) and T180 (data collected 6 months after initiation of treatment).

### Ethical considerations

The study protocol has been approved by the Ethics Committee (CEP) and all patients have had a free and informed consent form signed. The data collected from each patient has been used only for research purposes.

### Statistical analysis

Initially, the data were downloaded in Excel format, and submitted into SAV format, in order to carry out the statistical analyses using the SPSS software version 21.0 (IBM SPSS Statistics). The QoL questionnaire has been divided into scores for physical, emotional, social, cognitive, pain, fatigue, and cancer symptoms, creating scores for each health condition.

Qualitative variables have been described using absolute and relative frequencies. The distribution of continuous quantitative variables has been analyzed using the Shapiro-Wilk test, where all of them have shown an asymmetrical distribution. Therefore, these variables were described by median and interquartile range (IQ). For the general analyses, the study participants were divided into two groups: those without physical exercise after six months of treatment and those with physical exercise after six months of treatment. It has verified the difference in intragroup and intergroup scores at times of T0 and T180. Therefore, the comparison of clinical and QoL scores at T0 and T180 has been performed using the Wilcoxon test. The comparison of scores between

the group that has been performing physical exercise and the group that has not been performing physical exercise after six months of treatment was performed using the Mann-Whitney test. Afterwards, in order to identify factors associated with changes in the practice of physical exercise during cancer treatment, the participants have been divided into four groups: never exercised, stopped exercising during treatment, started exercising during treatment and always exercised. The comparison of scale scores between the four groups has been performed using the Kruskal-Walys test.

The correlation between the weekly physical exercise performed by the participants and the clinical scores, as well as QoL has been evaluated using Spearman's correlation test.

Finally, a multiple linear regression analysis has been performed in order to evaluate the association between average factors (age, instructional level, presence of comorbidities), practice of physical exercise and treatment systemic side effects as well as the outcome variables (scales functioning, fatigue and QoL).

All the analysis considered a significance level of 5%.

## RESULTS

### Sample sociodemographic and clinical characteristics

A total of 196 people agreed to participate in the study. As the research was being carried out, 150 answered the form when they were diagnosed (T0) and also 6-months after starting their treatment (T180). One patient was excluded from the study because he was male. Therefore, a total of 149 participants were included in this study, all female (100.0%), with an average age of 58.0 years old [IQ: 44-68], with the majority of white ethnicity (99.3%). In this regard, 51.7% of the participants had at least one comorbidity and 56.4% reported being in the postmenopausal period. Regarding the histological type of breast cancer, the most prevalent was invasive ductal carcinoma (n=108; 72.5%), and most women were in stage I of the tumor (TNM) (n=93; 62.4%). There was a wide combination of different treatments in the sample; however, the vast majority of participants underwent surgery (n=129; 86.6%), with the surgery being the only treatment resource used in 62 participants. A smaller group of participants received chemotherapy (34.2%) and radiotherapy (24.2%). This smaller group has also had other treatment strategies combined. The details of the other sociodemographic and clinical characteristics of the sample are presented in Table 1.

### Practice of physical exercise among women during treatment for breast cancer

Regarding physical exercise, considering 149 patients included in the study, 54.4% reported not doing any type of exercises in the period they

were diagnosed (T0). After six months of treatment, it has been found that 78 (52.3%) participants were practicing physical exercises and 71 (47.7%) participants did not exercise at all (Graph 1). In this sense, a total of 22 (14.8%) women stopped exercising during the treatment and 32 (21.5%) started practicing physical exercises during the treatment. Among the participants who reported practicing physical exercise six months after starting treatment, the average weekly time of physical activity was 150 minutes.

It was also collected, through direct information, the type of exercise practiced during this period, and 14.7% reported taking more walks. In the average time of practice of physical exercise, we can observe that the practice of running and tennis exercises were performed in an average time of 240 minutes (Table 2).

### Comparison of clinical outcomes and quality of life scores between participants with and without physical exercise six months after starting treatment for breast cancer

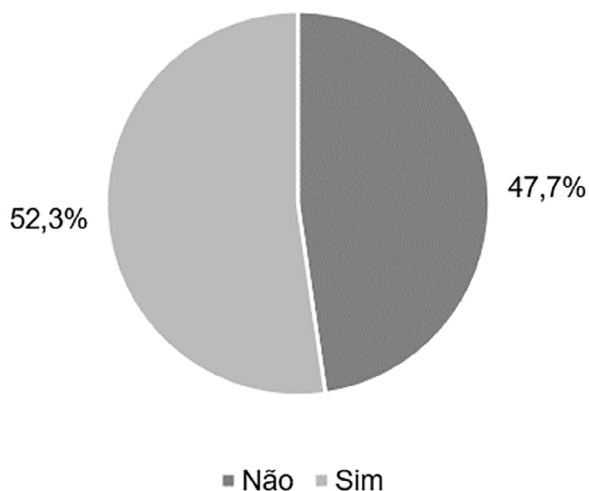
When intragroup differences were found in QoL scores and clinical outcomes at T0 and T180, it has been observed that the group that were not exercising after six months of treatment presented worse results (T180) for physical performance scores, pain and treatment side effects (Table 3). In emotional, cognitive and functional performance scores, the group showed improvement, and in daily tasks, social, symptoms, fatigue and global health status scores, there was no significant change among the groups. The group that was practicing physical exercise six months after starting treatment showed improvement (T180) for emotional, social, functional performance scores, symptoms, global health status and final QoL score. The scores for physical performance, daily tasks, cognitive, symptoms, fatigue, pain and treatment side effects did not show any significant changes (Table 3). Lastly, comparing the scores between the group that practiced and the group that did not practice exercises, it was possible to observe that the group practicing exercises presented better results in all domains, with the exception of the cognitive and social performance score.

### Impact of changing or keeping physical exercise practices during breast cancer treatment on clinical outcomes and quality of life scores in the sample

To verify the impact of changes in physical exercise behavior during treatment on clinical outcomes, the two groups were subdivided into four groups, namely: never exercised (n=49), stopped exercising during treatment (n=22), started exercising during treatment (n=32) and always did physical exercise (n=46). Comparison between groups for each of the QoL domains are presented in Figure 1.

**Table 1.** Sociodemographic and clinical characteristics of the women with breast cancer included in the sample (n=149).

<b>Categorical variables</b>	<b>n=149</b>	<b>%</b>
<b>Gender</b>		
Female	149	100.0
<b>Level of Education</b>		
Complete Elementary complete	6	4.0
Intermediate incomplete	4	2.7
Intermediate complete	22	14.8
Higher incomplete	13	8.7
Higher complete	101	67.7
Unknown	3	2.0
<b>Marital Status</b>		
Single	22	14.8
Married and/or Common-law partner	93	62.4
Separated and/or Divorced	15	10.1
Widowed	19	12,8
<b>Menopause</b>		
Premenopausal	28	18.8
Postmenopausal	84	56.4
Medication-induced amenorrhea	37	24.8
<b>Presence of at least one comorbidity</b>		
No	72	48.3
Yes	77	51.7
<b>Breast cancer staging in T0</b>		
0 (In situ)	1	0.7
I	93	62.4
II	19	12.8
III	7	4.7
IV	3	2.0
Unknown in T0	26	17.4
<b>Carcinoma histotype classification in T0</b>		
In situ ductal carcinoma	14	9.4
Invasive ductal carcinoma	108	72.5
Invasive lobular carcinoma	24	16.1
Invasive ductal and lobular carcinoma	3	2.0
<b>Type of treatment</b>		
Surgery	129	86.6
Radiotherapy	36	24.2
Chemotherapy	51	34.2
Hormone therapy	23	15.4
<b>Combination of treatments</b>		
Only surgery	63	42.3
Surgery and other treatment types	66	44.3
One treatment type other than surgery	10	6.7
Two treatment types other than surgery	9	6.0
<b>Numerical variables</b>	<b>Median</b>	<b>IQ</b>
<b>Age</b>	58.0	[44.0 - 68.0]



**Graph 1.** Relation of physical exercise practice among women with breast cancer six months after starting treatment.

The scores for physical, social, emotional performance, daily tasks and the sum of the scores showed that those who have always exercised had better results, followed by those who had started exercises during treatment, those who never exercised and finally those who stopped exercising during the treatment. The scores for pain, fatigue and cancer symptoms showed that adverse reactions were higher in those who stopped physical activities during treatment, followed by those who never started any type of physical activities, those who started it during treatment and finally those who had regular physical activities.

### Correlation of weekly physical exercise time during breast cancer treatment

The time of weekly physical exercise after six months of treatment showed a significant direct correlation with physical performance ( $p=0.288$ ,  $p<0.001$ ), daily tasks ( $p=0.288$ ,  $p<0.001$ ), emotional performance ( $p=0.206$ ,  $p=0.012$ ), performance score ( $p=0.213$ ,  $p=0.009$ ), global health status ( $p=0.209$ ,  $p=0.011$ ) and the sum of QoL scores

( $p=0.219$ ,  $p=0.007$ ), as shown in Table 4. There was a significant inverse correlation between physical exercise time and fatigue scores ( $p=-0.241$ ,  $p=0.003$ ), pain ( $p=-0.205$ ,  $p=0.012$ ) and symptoms ( $p=-0.275$ ,  $p<0.001$ ). The weekly physical exercise time did not present a significant correlation with the scores of cognitive performance ( $p=0.001$ ,  $p=0.987$ ) and social performance ( $p=0.059$ ,  $p=0.475$ ).

### Prediction analysis of clinical outcomes and quality of life, based on physical exercise practices and other variables

Through linear regression analysis, the association of sociodemographic variables, physical exercise practice, presence of comorbidities and systemic side effects was evaluated for treatment with the domains of physical performance, fatigue, daily tasks and the total QoL score, according to Tables 5 and 6. In regard to the systemic side effects of the treatment, symptoms of dry mouth, different taste than usual, irritated and/or painful eyes, hair loss, hot flashes and indisposition were evaluated. For analysis, complete primary education was presented as a reference in relation to secondary and higher education.

All models presented satisfactory parameters. The regression models performed for physical performance, fatigue, and daily tasks were able to explain 25.1%, 21.2%, and 17.2% of the outcome variance, respectively. In these three models, the significant variables for predicting the outcomes were the practice of physical exercise and systemic side effects of the treatment. As a result, it has been observed that the practice of physical exercise increases an average of 5.5 points in the physical performance scores ( $p=0.01$ ), and also increases an average of 8.2 points in the daily tasks scores ( $p=0.008$ ) and decreases an average of 5.3 points in fatigue scores ( $p=0.038$ ). In the model for QoL scores, physical exercise lost significance. On the other hand, treatment side effects showed significance ( $p<0.001$ ) in all regression models presented.

**Table 2.** Relation of the type of physical exercise and time mean of exercise practice (minutes) (n=149).

Type of physical exercise*	n=149	%	Weekly time mean of exercise practice (minutes)
Walking	22	14.7	116.2
Running	2	0.7	240.0
Strength training (weight training, crossfit)	18	12.1	221.3
Aerobic exercise plus strength training	21	14.1	182.5
Gym classes (bike, zumba)	10	6.7	112.5
Tennis	2	1.3	240.0
Swimming	2	1.3	120.0
None	71	47.7	0

\*2 subjects with the type of exercise missing.

**Table 3.** Comparison of quality of life scores at the beginning of treatment for breast cancer and after six months of follow-up between participants who had and who had not practiced physical exercise.

QoL scores	Without exercise (n=71)		p-value	With exercise (n=78)		p	Without exercise vs with exercise
	T0 [IQ]	T180 [IQ]		T0 [IQ]	T180 [IQ]		QoL scores (T180)
Physical functioning	100.0 [93.3-100.0]	93.3 [80.0-100.0]	<0.001	100.0 [100.0-100.0]	100.0 [100.0-100.0]	0.946	<0.001
Daily tasks	100.0 [100.0-100.0]	100.0 [83.3-100.0]	0.190	100.0 [100.0-100.0]	100.0 [100.0-100.0]	0.468	<0.001
Emotional functioning	66.7 [50.0-83.3]	91.7 [66.7-100.0]	<0.001	75.0 [50.0-83.3]	100.0 [83.3-100.0]	<0.001	0.008
Cognitive functioning	100.0 [66.7-100.0]	100.0 [100.0-100.0]	0.027	100.0 [83.3-100.0]	100.0 [100.0-100.0]	0.269	0.808
Social functioning	100.0 [100.0-100.0]	100.0 [83.3-100.0]	0.532	100.0 [83.3-100.0]	100.0 [100.0-100.0]	0.0331	0.161
Function score	85.0 [78.3-93.3]	90.7 [80.0-98.7]	0.024	90.8 [83.3-96.7]	98.7 [89.6-100.0]	<0.001	0.002
Fatigue	0 [0-22.2]	0 [0-22.2]	0.237	0 [0-11.1]	0 [0-2.8]	0.475	0.002
Pain	0 [0-16.7]	16.7 [2-33.3]	0.003	0 [0-4.2]	0 [0-16.7]	0.2	0.006
Symptoms	1.2 [1.1-1.4]	1.2 [1.1-1.4]	0.567	1.1 [1.0-1.3]	1.1 [1.0-1.23]	0.016	<0.001
Overall health status	83.3 [66.7-91.7]	83.3 [66.7-91.7]	0.03	83.3 [66.7-100.0]	83.3 [79.2-116.7]	0.003	0.028
Final sum QVQ	89.7 [66.7-96.1]	91.8 [86.7-97.3]	0.09	92.3 [87.8-92.3]	96.1 [90.9-100.0]	<0.001	0.002
Side effects of treatment	9.5 [0-19.0]	14.3 [4.8-28.6]	0.015	4.8 [0-9.5]	9.5 [0-14.3]	0.349	0.003

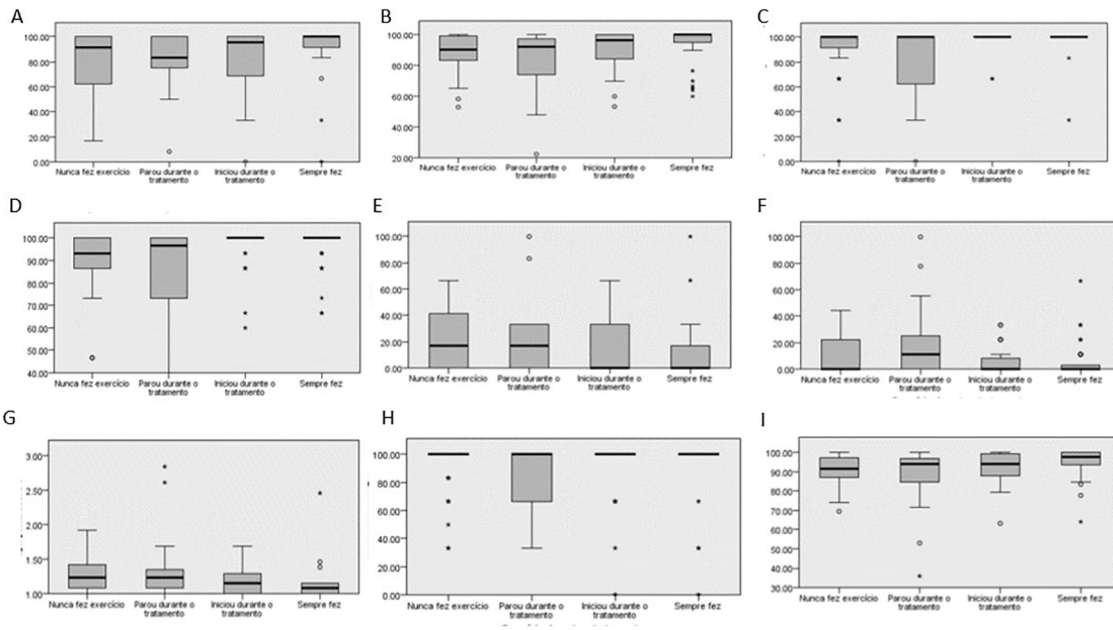
Caption: T0: data collected after diagnosis and initiation of treatment. T180: data collected six months after starting treatment.

## DISCUSSION

This study aimed to evaluate the impact of physical exercise on patients that are treating breast cancer. Through the results, it has been found that women who were practicing physical exercise after six months of treatment for breast cancer had better scores for several clinical and QoL domains. Furthermore, it has been possible to observe that the practice of physical exercise is positively associated with the participant's physical performance, daily tasks and fatigue, regardless of

age, level of education, presence of comorbidity and treatment side effects.

This study's findings are aligned with other studies, suggesting that the practice of physical exercises on a regular basis in patients with cancer is beneficial, and can be considered an adjuvant intervention to the treatment for breast cancer.<sup>[10]</sup> A study carried out in Ukraine compared groups of women diagnosed with breast cancer who were performing 3 different types of physical exercise (pilates, yoga and aquatic exercises). This study



**Figure 1.** Association of quality of life scores and clinical outcomes in the evaluated groups. Caption: A: Emotional functioning ( $p=0.012$ ); B: Functional functioning ( $p=0.003$ ); C: Daily tasks ( $p=0.001$ ); D: Physical functioning ( $p=0.001$ ); E: Pain ( $p=0.039$ ); F: Fatigue ( $p=0.013$ ); G: Symptoms ( $p=0.001$ ); H: Social functioning ( $p=0.021$ ); I: Total sum of quality of life scores ( $p=0.003$ ). Comparisons performed using the Kruskal-Wallis test.

**Table 4.** Correlations between weekly physical exercise time six months after the start of treatment and clinical and quality of life

Scores	Correlation( $\rho$ )	$p$ -value
Physical functioning	0,288	<0,001
Daily tasks	0,288	<0,001
Emotional functioning	0,206	0,012
Cognitive functioning	0,001	0,987
Social functioning	0,059	0,475
Function score	0,213	0,009
Fatigue	-0,241	0,003
Pain	-0,205	0,012
Symptoms	-0,275	<0,001
Global health status	0,209	0,011
Sum QoV	0,219	0,007

evaluated these women 6 months after the surgical intervention, and as a result, they identified a significant improvement in QoL parameters, an increase in the emotional, physical, cognitive, social and functional health domains.<sup>[11]</sup> In this present study, the practice of physical exercise for patients who have started it after the cancer diagnosis was also positive for the improvement in clinical outcomes and QoL rates. Another study also found that physical exercise in patients who have started it after the cancer diagnosis helps to improve QoL and its prognosis, in addition to reducing the risk of mortality and morbidity from the disease.<sup>[12]</sup>

Fatigue is a common symptom in cancer patients<sup>[13]</sup> and physical exercise is an effective option to reduce fatigue, especially when the practice of exercise lasts until the end of the treatment.<sup>[14]</sup> A study carried out with 62 women who had already completed treatment for breast cancer analyzed domains

of fatigue and QoL. It was observed that physical exercise had positive effects in these domains, suggesting the development of exercise programs to improve the performance of these women.<sup>[15]</sup> In this present study, fatigue has been lower in participants who exercised regularly, followed by those who have started exercising throughout the treatment, those who have never exercised and those who stopped exercising during the treatment. Also, the time of physical exercise at T180 was inversely proportional to the fatigue scores, and, regardless of age, comorbidities presence, education level and the systemic effects of the treatment, exercising after six months of treatment decreases on an average of 5 points in the fatigue score.

A study carried out with 28 patients doing chemotherapy and radiotherapy, showed that the intensity and interference of pain in their daily lives decreased after 12 weeks of exercise



**Table 5.** Relation of Physical Functioning and Fatigue scores with sociodemographic variables, presence of comorbidity, practice of physical exercise and systemic side effects of treatment.

Variables	Physical functioning				Fatigue			
	B	CI95%	B standard	P	B	CI95%	B standard	P
Constant	99.348	87.678; 111.019	-	<0.001	5.399	-9.356; 20.153	-	<0.001
Age	-0.123	-0.272; -0.027	-0.130	0.106	0.006	-0.182; 0.195	0.006	0.946
Level of education (high school)	5.722	-1.936; 13.379	0.183	0.142	0.454	-9.227; 10.135	0.012	0.926
Level of education (higher education)	-4.235	; 9.809	0.099	0.434	0.503	-8.374; 9.381	0.014	0.911
Presence of comorbidity	-2.831	-6.918; 0.173	1.257 - 0.108	0.223	-4.945	; 5.391	0.007	0.932
Practice of physical exercise	5.306	1.305; 9.306	0.201	0.010	-5.346	-10.403; -0.288	-0.165	0.038
Systemic side effects of treatment	-0.287	-0.399; -0.176	-0.389	<0.001	0.358	0.217; 0.499	0.393	<0.001

**Table 6.** Relation of scores for Functioning of daily activities and Quality of life (total score) with sociodemographic variables, presence of comorbidity, practice of physical exercise and systemic side effects of the treatment.

Variables	Daily tasks				Total Quality of Life score			
	B	95% CI	B standard	P	B	95% CI	B standard	P
Constant	83.895	66.419; 101.370	-	<0.001	92.846	85.352; 100.341	-	<0.001
Age	0.112	-0.111; 0.335	0.083	0.323	0.02	-0.076; 0.116	0.028	0.681
Level of education (high school)	8.723	-2.743; 20.190	0.194	0.135	-2.526	; 7.309	0.103	0.338
Level of education (higher education)	5.076	-5.439; 15.590	0.125	0.342	3.036	-1.473; 7.545	0.145	0.185
Presence of comorbidity	-4.894	-11.015; 1.227	-0.129	0.116	-0.486	-3.111; 2.140	-0.025	0.715
Practice of physical exercise	8.218	2.227; 14.208	0.217	0.008	1.281	-1.288; 3.850	0.066	0.326
Systemic side effects of treatment	-0.316	-0.483; -0.149	-0.297	<0.001	-0.348	-0.419; 0.276	-0.635	<0.001

training. In addition to decreasing pain, the study observed that the amount of oxygen, flexibility and strength increased, showing that physical training is very important and effective during this disease treatment.<sup>[16]</sup> Another study, which used the instrument to evaluate QoL (EORTC-QLQ-C30), has found that exercises positively helped in the domains of physical, social performance and QoL. The same study could also observe that most patients who have not exercised during this period have had an increase in fatigue.<sup>[17]</sup>

In regard to the QoL, pain and fatigue outcomes, it is important to consider the impact of cancer side effects and its treatment, which are quite common in patients with breast cancer.<sup>[11]</sup> In this present study, scores of treatment side effects were higher among women who have stopped exercising during the treatment; reason why they may have interrupted the physical exercise during the treatment. On the other hand, studies point out that the practice of physical exercise helps to reduce the side effects of the treatment,<sup>[18]</sup> which may be related to the fact

that the group that was exercising after six months of treatment have had lower scores of symptoms, side effects, pain and fatigue than the non-exercise group. Based on the data found in the present study, it should be noted that the treatment side effects are associated with the practice of physical exercise, and it can directly impact clinical and QoL outcomes in women during treatment for breast cancer.

It is important to consider that the present study has some limitations, including the fact that the sample was selected for convenience in a private hospital, with the study participants having a medium/high socioeconomic level. Other important factors to consider include losses during the treatment and the large number of confounding variables that can impact QoL scores and clinical outcomes, such as cancer staging and the choice of the appropriate treatment plan. For example, it is expected that patients who underwent invasive surgery procedures plus chemotherapy would present a longer recovery than those who underwent hormone therapy only; thus, this can influence QoL. Unfortunately, it has not been possible to control the analyses for these factors, given the wide oncological heterogeneity and treatment combinations (which are planned according to each patient's needs and demands) observed in the sample. On the other hand, this present study has the belief to have minimized the effect of these variables when including the scores of systemic treatment side effects in the analyses. Still, it is important to point out that some parameters, such as pain and fatigue, are subjective to the patient, and as they are a predictive factor. It has been considered the importance of comparing the evolution of parameters in the same patient, at the beginning and after six months of treatment, also relating to the different groups of physical exercise. Another important point to be highlighted is that most correlations found between time of exercise practice and clinical outcomes are weak correlations, although these variables are known as important factors for explaining the quality of life rate. As a strength, the present study has had a significant sample size, the use of international protocols for the outcome evaluation and the prospective design, which allows evaluating the temporality of the factors and outcomes studies herein.

## CONCLUSION

As this is a cohort study where patients were followed up for a period of six months, it can be observed that women who practiced physical exercise during six months after starting treatment for breast cancer, including those who have started exercising after the treatment began, have had better health results. Women who have not done physical exercises and the ones who have stopped exercises during treatment have had the worst results, which may be associated with a higher impact of treatment systemic side effects in this specific group. This present study has found that physical exercise could directly impact both the performance of a healthy routine and aspects of physical performance, daily activities, and fatigue. Also, the longer the duration

of physical exercises, the greater the benefits seem to be in the domains of quality of life. This study aims to emphasize the importance of physical exercises as an adjuvant treatment in breast cancer cases. The study suggests a guided practice by a multidisciplinary team always considering the needs and limitations of each patient.<sup>[10]</sup>

## AUTHORS' CONTRIBUTIONS

NMP	Collection and assembly of data, Conception and design, Data analysis and interpretation, Final approval of manuscript, Manuscript writing, Provision of study materials or patient
JNS	Collection and assembly of data, Conception and design, Data analysis and interpretation, Final approval of manuscript, Manuscript writing
MAF	Collection and assembly of data, Conception and design, Final approval of manuscript, Manuscript writing, Provision of study materials or patient
AAC	Collection and assembly of data, Provision of study materials or patient
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LAN	Provision of study materials or patient

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