The interaction of anthropometric measurements, stress, and fatigue among cancer survivors[1]

A interação das medidas antropométricas, estresse e fadiga entre os sobreviventesde câncer

La interacción de las medidas antropométricas, el estrés y la fatiga entre los supervivientes de cáncer

[Research Article]

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Received: Septembder 14, 2023

Accepted: October XX, 2023

Cite as:

Medina Britto, L., Veras de Jesus, E., Pereira Bezerra, J. C., & Martin Dantas, E. H. (2023). La interacción de las medidas antropométricas, el estrés y la fatiga entre los supervivientes de cáncer. *Cuerpo, Cultura Y Movimiento*, *14*(1). https://doi.org/10.15332/2422474X.9894

Abstract

Cancer, one of the most prevalent conditions globally, stands out as a significant cause of death, especially breast cancer, which affects millions of women. This article explored the connection between anthropometric measurements, stress levels and fatigue in

[1] Scientific research article partially funded by the Coordination for the Improvement of Higher Education Personnel - Brazil (CAPES) - Funding code 001 and affiliated with the research group of the Laboratory of Human Motor Biosciences, Tiradentes University, Aracaju, Sergipe, Brazil. Research start date: : Septembder 2023; Research end date: October 2023;

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survivors of breast cancer. Twenty women undergoing treatment took part and their physical characteristics, stress (using the Stress Perception Scale) and fatigue (using the FACIT-F Fatigue Questionnaire) were assessed. The results revealed inverse associationsbetween body mass index (BMI), waist-to-hip ratio (WHR) and body fat percentage (%BF) with fatigue, emphasizing the importance of maintaining a healthy anthropometric profile. The regular practice of physical exercise has proved fundamental in mitigating the side effects of treatment and improving the quality of life after cancer. These findingshighlight the need for integrated approaches in the treatment of breast cancer, taking intoaccount physical and psychological factors to optimize treatment outcomes.
Keywords: anthropometry, depression, cancer pain, fatigue**,** survivors.

Resumo

O câncer, uma das condições mais prevalentes globalmente, destaca-se como uma causa significativa de morte, especialmente o câncer de mama, que afeta milhões de mulheres. Este estudo explorou a conexão entre medidas antropométricas, níveis de estresse e fadiga em sobreviventes de câncer de mama. Participaram vinte mulheres em tratamento, sendo avaliadas suas características físicas, estresse (usando a Escala de Percepção de Estresse) e fadiga (usando o Questionário de Fadiga FACIT-F). Os resultados revelaram associações inversas entre índice de massa corporal (IMC), relação cintura-quadril(WHR) e percentual de gordura corporal (%BF) com fadiga, enfatizando a importância de manter um perfil antropométrico saudável. A prática regular de exercícios físicos mostrou-se fundamental para mitigar os efeitos colaterais do tratamento e melhorar a qualidade de vida pós-câncer. Essas descobertas destacam a necessidade de abordagens integradas no tratamento do câncer de mama, considerando fatores físicos e psicológicospara otimizar os resultados do tratamento.
Palavras-chave: antropometria, depressão, dor do câncer, fadiga, sobreviventes.

Resumen

El cáncer, una de las condiciones más prevalentes a nivel mundial, se destaca como una causa significativa de muerte, especialmente el cáncer de mama, que afecta a millones de mujeres. Este estudio exploró la conexión entre medidas antropométricas, niveles de estrés y fatiga en sobrevivientes de cáncer de mama. Participaron vinte mujeres en tratamiento, evaluándose sus características físicas, estrés (utilizando la Escala de Percepción de Estrés) y fatiga (utilizando el Cuestionario de Fatiga FACIT-F). Los resultados revelaron asociaciones inversas entre el índice de masa corporal (IMC), la relación cintura-cadera (WHR) y el porcentaje de grasa corporal (%BF) con la fatiga, enfatizando la importancia de mantener un perfil antropométrico saludable. La práctica regular de ejercicio físico se mostró fundamental para mitigar los efectos secundarios del tratamiento y mejorar la calidad de vida después del cáncer. Estos hallazgos resaltan la necesidad de enfoques integrados en el tratamiento del cáncer de mama, considerando factores físicos y psicológicos para optimizar los resultados del tratamiento.
Palabras clave: antropometría, depresión, dolor de cáncer, fatiga, sobrevivientes.

Introduction

Cancer stands as one of the most widespread conditions in today's world, servingas a leading cause of death, with nearly 10 million deaths resulting from complications associated with this condition in 2018. (Egue *et al*., 2019).

There are several oncological risk factors, such as: Obesity during adulthood, alcohol exposure, a family history of this condition, exposure to ionizing radiation, very dense breast tissue, and one of the primary factors being prolonged exposure to female hormones with early menarche and late menopause. (Inca, 2019).

Among the types of cancer, breast carcinoma stands out as one of the most common neoplastic conditions, especially in nations with high Human Development Index (HDI), while in developing nations, there is a steady rise in breast cancer cases throughout the years. (Kashyap *et al.*, 2022).

Breast cancer is the most widespread type of cancer among women globally. In 2018, approximately 2.1 million new instances were documented, corresponding to approximately 11.6% of all estimated cancer diagnoses. This equates to an approximate incidence rate of 55.2 cases per 100,000 women (Inca, 2019). In Brazil, it is the most prevalent cancer among the female population, not including non-melanoma skin cancers (WIlkinson, 2022).

Breast cancer is a cancerous growth that initially affects the breast tissue, often manifesting as nodules resulting mainly from genetic alterations in the breast cells. Its origin can be hereditary or, more commonly, the result of influences accumulated over a lifetime (Candido *et al.*, 2016).

As a heterogeneous neoplasm, breast cancer shows significant variations in its morphological characteristics and clinical responses (Inca, 2022). This heterogeneity has an impact on the therapeutic approaches used: clinical-biological heterogeneity between cancers of the same organ in different patients, between subpopulations of cancer cells within the same tumor, between cells of the tumor microenvironment and, finally, between a primary tumor and its recurrencesthe clinical-biological heterogeneity between cancers of the same organ in different patients, between subpopulations of cancer cells within the same tumor, between cells of the tumor microenvironment and, finally, between a primary tumor and its recurrences (Corallo *et al.*, 2023)

This diversity influences the choice of therapies, determining the need for surgery, radiotherapy, adjuvant chemotherapy, hormone therapy and anti-HER2 agents. It is worth

noting that the latter are less effective in patients with overexpression of the HER2 protein, which serves a pivotal role in the growth of cancer cells (Roulot *et al.*, 2016).

In breast cancer, there are various side effects related to both chemotherapy and radiotherapy, as the treatment is based on combating the rapid reproduction of cancer cells, but as the treatments are not selective, they tend to attack other cells in the human body together, thus causing various symptoms (Petrelli *et al*.,2012; Carvalho et.al., 2019). Fatigue is very common in cancer patients treated with radiotherapy or chemotherapy and is characterized by a lack of energy that does not improve after rest,impairing The well-being and personal contentment of individuals experiencing centraland peripheral modifications, and may also be related to the pathology itself (Juvet *et al*.,
2017).

Patients with this symptom persistently suffer from fatigue, even following the completion of treatment or the resolution of the illness, alongside many patients suffering from the physio-metabolic changes generated by the pathology and its fight against it, such as lack of conditioning and cachexia (Lam *et al.,* 2018).

At this point, the Body Mass Index enters the exploratory field in relation to the concept of body self-image among aesthetic professionals. The use of standardized silhouettes, which represent the perception of the body at different stages of life, is a research approach that allows comparison with anthropometric measures currently used as indicators of physical and psychological well-being in the population. This also applies to the Body Mass Index (BMI), which is widely used in daily practice by health professionals (Collazos *et al*., 2019).

Fatigue is a common clinical manifestation and commonly found in 80-90% of individuals with cancer receiving chemotherapy and/or radiation treatment, its characterization and mechanisms still challenge health professionals, This is considered to be a failure to maintain levels of strength and power or a decrease in them, with less energy in the muscle tissue (Borges *et al.*, 2018).

Another very common symptomatology seen in breast cancer patients is the emotional conflicts generated by this diagnosis, profoundly changing family relationships, thus generating stress levels that are often measured by physical parameters such as heart rate and blood pressure. (Ribeiro, 2018).

Stress, as well as quality of life and mental health, can also be improved by physical activity (Levin *et al.*, 2015 Patsou *et al*., 2018). Patients who practice physical exercise regularly exhibit an improvement in self-esteem and social integration, along

with a decrease in the levels of stress they encounter due to this diagnosis. (Ricci *et al.*, 2018; Ungar *et al*., 2015).

Hence, it is crucial to have comprehensive interdisciplinary assistance during and after cancer treatment, since in order to protect against this symptom the most recommended thing is to maintain physical activity (Juvet *et al.*,2017).

Physical exercise, even after the first session of chemotherapy, already begins to reduce the symptoms of treatment. In addition, physical exercise has shown great leads to a reduction in fatigue among individuals who have successfully overcome breast cancer, as seen in patients with a training regimen that combines aerobic activities and resistance training (Johnsson *et al.*, 2019).

It is essential that there is no sudden increase in the intensity of training, whether for people with obesity or those who are not used to exercise, it can be linked to temporary immune disorders, including inflammation, oxidative stress and possibly muscle damage, which can interfere with the ability to maintain a regular routine of exercise (Pérez *et al.*, 2021).

It is essential to establish and follow an exercise regimen during or after cancer treatment, which improves the well-being of the patient, including relief from cancer-related pain, anxiety, depression and fatigue, so the diagnosis should not result in a cessation of physical activity (Camargo, 2015).

Against this background, the aim of the study was to investigate the possible connection among anthropometric measures, stress levels, and fatigue in breast cancer survivors.

Methodology

This was a quantitative, cross-sectional and analytical study.

Universe and Sample

The sample comprised 20 female volunteers who had been diagnosed with breast cancer and undergoing radiotherapy, recruited by a Non-Governmental Organization (NGO) providing social and health care to people with cancer, the Association of Friends of Oncology - AMO, in the state of Sergipe.

Ethical aspects

The study adhered to the provisions of Resolution 466/12 of the National Health

Council dated December 12, 2012 (NHC, 2012), which deals with the norms for conducting research with human participants, as well as the Helsinki Declaration (World Medical Association) (WMA, 2008).

The project was presented to the Ethics and Research Committee (CEP) Carried out on human subjects at Tiradentes University before it began and was approved, according to the following opinion nº 4.264.002 — CAE: 23682219.0.0000.5371.

Experimental procedures

After preliminary measures had been taken to obtain and screen the sample and to comply with the study's ethical precautions, the study's variables were evaluated.

Diagnostic Assessment

The physical characteristics of the sample group, including Body Mass, Height, Body Mass Index, Waist to Hip Ratio and percentage of fat , were determined in adherence to the established guidelines by The International Society for the Advancement of Kinanthropometry (ISAK). To ensure the accuracy and consistency of the measurements, the assessors were trained according to ISAK standards (SILVA E VIEIRA, 2020).

The measurements were collected using standardized anthropometric techniques, guaranteeing the reliability and validity of the data obtained. This ensured that the physical characteristics of the sample group were determined according to internationally recognized standards, providing a solid and reliable basis for the analysis of the relationships between these characteristics, habitual exercise and levels of stress and fatigue in people who have survived cancer.

To assess stress, the participants in the study were given the Stress Perception Scale (SPS), which has 10 questions with response choices ranging from zero to four (0=never; 1=almost never; 2=sometimes; 3=almost always; 4=always). The questions with a positive tone (4, 5, 7, 8) have their scores are summed in reverse, as follows: 0=4, 1=3, 2=2, 3=1 and 4=0. The remaining questions (1, 2, 3, 6, 9, 10) are negative and ought to be added straightforwardly.

The total of the scale is calculated by adding the scores of these 14 questions and can range from 0 to 40 (COHEN; KAMARCK; MERMELSTEIN, 1983; Luft *et al.*, 2007; REIS; HINO; AÑEZ, 2010).

The Functional Assessment of Chronic Illness Therapy – Fatigue (FACIT-F)

form was employed for the evaluation of cancer-related fatigue. The questionnaire was validated for Portuguese due to its proven applicability in several studies and because there are no validated instruments in Portuguese to measure fatigue in Brazil (Ishikawa, 2009).

Results

In this study, data was collected on various anthropometric, mental and physical health variables in order to understand the relationships between these factors.

Table 1: Summary of the Attributes Sampled: Age, BM[6] , Height, BMI[7], WHR[8], % BF [9], Stress, FACIT[10], with Descriptive Statistics and Confidence Intervals

	Age	*BM*	*Height*	*BMI*	*WHR*	*%BF*	*Stress*	*FACIT*
Lowest	34	53.50	1.500	20.561	0.680	14.978	7.0	14.0
Maximum	58	89.00	1.780	38.521	0.993	39.762	25.0	52.0
Average	51,1	66.02	1.628	25.083	0.789	26.198	17.4	39.8
S.D	6,0	8.80	0.085	4.336	0.077	7.672	4.8	11.2
S.E 95%	1,3	1.97	0.019	0.970	0.017	1.716	1.1	2.5
Average – S.E 95%	4.6	6.84	0.066	3.367	0.060	5.957	3.7	8.7
Average + S.E 95%	7.3	10.77	0.104	5.306	0.095	9.388	5.9	13.7
Median	51.5	64.30	1.630	23.826	0.769	26.913	17.5	40.5
Q.1(25%)	46.8	61.85	1.570	22.677	0.729	20.073	15.0	34.5
Q.2(50%)	51.5	64.30	1.630	23.826	0.769	26.913	17.5	40.5
Q.3(75%)	56.0	68.61	1.700	25.154	0.837	31.263	21.3	49.3

S.E (Standard Error 95%) - there is a 95% probability that the interval contains the meana

Source: Own Elaboration

As can be seen in Table 1, "Age" range spanned from 34 to 58 years, with a mean age of 51.1 years and a standard deviation of 6.0 years. BMI had a minimum of 20.561 and a maximum of 38.521, $\bar{X}$= 25.083 ± 4.336. These figures offer a summary of the ranges and distribution patterns of the variables in the group studied.

[6] BM: Body Mass
[7] BMI: Body Mass Index
[8] WHR: Waist-Hip-Ratio
[9] Body Fat Percentage

[10] Functional Assessment of Chronic Illness Therapy

The variables were subjected to the Shapiro-Wilk test for normality to check whether their distributions resemble the normal distribution, as shown in Table 2. The p-values of the tests have been reported. Some variables had non-normal distributions.

Table 2: Results of Normality Tests for Study Variables

AGE	*BM*	*Height*	*BMI*	*WHR*	*%BF*	*Stress*	*FACIT*
0.33	0.014	0.499	<0.001	0.175	0.333	0.369	0.031
Non-normal distribution	Non-normal distribution	*Normal distribution*	Non-normal distribution	*Normal distribution*	*Normal distribution*	*Normal distribution*	Non-normal distribution

Considered non-normal distribution when Sig.p < 0.05 and normal distribution when Sig.p ≥ 0.05.

Source: Own Elaboration

Continuing the analysis of the data collected, the classificatory distributions of "BMI", "WHR" and "%BF" were divided into categories, such as "Grade I Obesity", "High WHR", etc., and the absolute frequencies and percentages of each category were reported. This provides insights into the distribution of participants in the different categories of these variables..

Table 3 shows how the sample group is classified in relation to BMI.

Table 3: Body Mass Index classification of the sample

		Frequency Absolute	Percentage %
Valid	Grade II Obesity	1	5.0
	Grade I Obesity	1	5.0
	Overweight	2	10.0
	Ideal weight	216	80.0
	Total	**20**	**100.0**

Source: Own Elaboration

The prevalence of ideal weight can be seen in the group studied, which had a BMI of $\bar{X}$= 25.083 ± 4.336. Next, the sample's waist-to-hip ratio, an important cardiovascular risk factor, is analyzed in Table 4.

Table 4: Classification of cardiovascular risk by WHR

	Frequency Absolute	Percentage Fat percentage%

Valid	Very high	1	5.0
	high risk	7	35.0
	Moderate risk	6	30.0
	Low risk	6	30.0
	Total	**20**	**100.0**

Source: Own Elaboration

A ratio of $\bar{X}$= 0.789 ± 0.077 was observed, which characterizes an average sample in the low-risk range. Having exhausted the anthropometric variables, Table 5 analyses the body fat percentage of the sample group.

Table 5: Classification of the cluster in relation to body fat percentage

		Frequency Absolute	Percentage %
Valid	Below Average	3	15.0
	Adequate	3	15.0
	Good	3	15.0
	Excellent	2	10.0
	Average	1	5.0
	Very bad	4	20.0
	Bad	4	20.0
	Total	**20**	**100.0**

Source: Own Elaboration

It can be seen that the group is categorized in the first three classification groups, with $\bar{X}$= 26.198% ± 7.672This value is within the range considered "acceptable" by the WHO for adults. However, it is crucial to emphasize that the understanding of body fat percentage can vary according to a number of factors including age, gender, level of exercise, among others. Values in the "acceptable" range indicate that the person has an amount of body fat that is considered reasonable and it is not correlated with a heightened risk of health issues related to excess fat. However, full interpretation must take into account other health factors and individual assessment.

Spearman's correlations were calculated to examine the associations between the variables (Table 6). This non-parametric method is used when the variables do not follow a normal distribution.

Table 6: Variable Correlation Matrix with Significance Levels - Physical and Psychological Factors

Variables		AGE	BM	Height	BMI	WHR	%BF	Stress	FACIT
BM	**r**	0.059	1.000						
	Sig.p	0.805							
Height	**r**	-0.341	0.123	1.000					
	Sig.p	0.141	0,605						
BMI	**r**	0.441	.545*	-.662**	1.000				
	Sig.p	0.052	0.013	0.001					
WHR	**r**	.579**	0.161	-.651**	.743**	1,000			
	Sig.p	0.007	0.497	0.002	0.000				
%BF	**r**	0.247	.498*	-0.436	.647**	.476*	1.000		
	Sig.p	0.295	0.025	0.054	0.002	0.034			
Stress	**r**	0.103	-0.114	0.295	-0.114	-0.053	-0.360	1.000	
	Sig.p	0.665	0.632	0.207	0.633	0.823	0.119		
FACIT (fatigue)	**r**	-0.281	-0.291	.594**	-.652**	-.530*	-.783**	0.189	1.000
	Sig.p	0.229	0.213	0.006	0.002	0.016	0.000	0.425	

**The correlation is statistically significant at the 0.01 level, while * is statistically significant at the 0.05 level

Source: Own Elaboration

The variable "FACIT" (fatigue) has been found to have a negative correlation with BMI (r = -0.652, p = 0.002, medium-high correlation), WHR (r= -0.530, p= 0.016, medium correlation) and %BF (7 = -0.783, p>0.0001, medium-high correlation), indicating that the lower the BMI, WHR and %BF, the lower the levels of fatigue. This may suggest that fatigue is related to specific physical characteristics.

Statistical analysis has revealed several correlations between variables in a study. The observations include significant correlations between height and body mass index (BMI), indicating a negative relationship, since as height increases, BMI tends to decrease. In addition, BMI showed significant positive associations with waist-to-hip ratio (WHR) and body fat percentage (%BF), suggesting that a higher BMI is related to a higher WHR and %BF.

The waist-to-hip ratio (WHR) also showed significant correlations with several variables. Notably, WHR showed positive associations with age, BMI and body fat percentage (%BF), indicating that higher WHR is associated with higher age, BMI and %BF. In addition, fat percentage showed significant correlations with body mass (BM), height, BMI and WHR, indicating that a higher fat percentage is associated with greater BM, height, BMI and WHR.

In the context of fatigue, measured by the FACIT index, there were significant negative correlations with height, BMI, WHR and %BF. These correlations suggest that higher levels of fatigue are associated with lower height, BMI, WHR and body fat percentage. This inversely proportional relationship between secondary anthropometric variables (BMI, WHR, %BF) and fatigue is particularly relevant in cancer patients, where fatigue is often linked to loss of muscle mass.

These findings indicate the importance of considering not only anthropometric characteristics, but also fatigue, when assessing health and well-being, especially in specific populations such as cancer patients. Maintaining a healthier anthropometric profile can contribute to reducing fatigue, offering valuable insights for therapeutic approaches and appropriate care.

Discussion

Interpreting the results of the research conducted to examine the connection between anthropometric measurements and levels of stress and fatigue experienced by individuals who have survived breast cancer, we delve into the main findings of this research effort to uncover the intricate interplay between these factors and its possible implications.

Regarding research exploring the relationship between physical attributes and cognitive/motor development in different contexts, Linhares (2021) analyzed anthropometric differences and the motor and genetic coordination of children with and without learning difficulties. Body mass and height measurements were taken of the children in both groups (with and without learning difficulties). The results of the T-tests for comparing means showed no significant statistical distinctions among the body mass and height of the groups studied The Neurological Developmental Examination (NDE) tests were used to compare motor coordination, dynamic balance and static balance in the children of both groups. The results indicated that there was no notable statistical distinction in the NDE test among the groups. and it can be concluded that the children's body mass and height do not influence the learning and cognitive process, showing that body measurements do not produce direct effects on the variables demonstrated in learning.

This shows that anthropometry linked to cognitive or psychological aspectsshould pay attention to other variables, not just body measurements. As shown in the present research on the fatigue and stress of former cancer patients. Thus, in view of the data presented, there is no direct and expressive causality of physical characteristics that

can act as determinants in this context, even though there is an influence of the associations between fatigue, physical activity and stress.

Cancer patients often face significant stress due to diagnosis even at an early stage, treatment and the uncertainty associated with the disease, which can upset the balance of the stress system and contribute to adverse effects on their health, and alterations in the nervous and hormonal systems, resulting in low therapeutic efficiency and antibody production (Wahyuni, Sitepu, & Daulay, 2020).

According to Simões, Méa y Ferreira (2022), in their quantitative, descriptive, comparative and cross-sectional study, a study carried out with the aim of investigating of stress and anxiety symptoms in individuals undergoing chemotherapy for cancer, 140 subjects participated in the study, made up of 70 cancer patients who were undergoing chemotherapy and 70 adults from a sample of the general population.

Regarding the results, the study revealed that among cancer patients, women and individuals who had undergone surgery exhibited higher scores of stress and anxiety symptoms, who had cancer and the disease returned, with metastasis and those who underwent psychiatric treatment or used psychotropic drugs and suggests in his conclusion that the medical team assess the presence of psychological symptoms in patients undergoing chemotherapy, with psychotherapy being one of the possibilities to help cope with the disease.

This differs from the present study, in which participants had a moderate level of stress, with some variability between individuals, showing that there were no significant correlations between stress and anthropometric measurements and fatigue in breast cancer survivors analyzed.

In addition, fatigue is a significant concern for many cancer patients, and can affect 70 to 100 percent of people undergoing chemotherapy. This fatigue can be multifactorial and result from a combination of treatment side effects, such as anemia, sleep disorders, metabolic and psychological changes. This may involve strategies such as managing the side effects of chemotherapy, adjusting daily activities to avoid burnout and seeking psychological and emotional support to deal with the emotional impact of fatigue. The greatest increase in fatigue in former cancer patients is evident during the chemotherapy phase, which impairs physical exercise and corroborates the emergence of other comorbidities, such as obesity, hypertension and dyslipidemia. (Cruz, 2020).

Cruz (20209, in his thesis "Chemotherapy treatment for breast cancer and metabolic syndrome", states that there are positive correlations between anthropometric

measurements and biochemical parameters, which interfere with oxidative stress, indicating a direct relationship between these variables. In contrast, in the study here, no significant correlations were observed in relation to stress, while fatigue showed an inversely proportional relationship with the secondary anthropometric variables BMI, WHR and %BF.

The link between physical exercise and attenuation of fatigue in cancer patients has been widely discussed in the existing literature, and the findings of the current study seem to be in line with previous investigations. Regular physical exercise is widely recognized as having beneficial effects on the well-being and mental health of people who have previously experienced cancer. These findings could further reinforce this understanding by highlighting how measures such as BMI, WHR and %BF are interlinked with this specific benefit.

Conclusion

In summary, cancer has emerged as one of the most prevalent conditions in the contemporary world, causing millions of deaths every year. Breast cancer, in particular, stands out as one of the most common forms, significantly impacting global health, especially in countries with a high Human Development Index. The heterogeneity of this cancer poses therapeutic challenges, influencing treatment choices and requiring interdisciplinary approaches.

Traditional therapies such as chemotherapy and radiotherapy, although effective against cancer cells, generate side effects that impact on patients' quality of life. Fatigue, common during and after treatment, can persist, affecting physical and psychological well-being. In addition, the diagnosis of breast cancer often triggers emotional conflicts, altering family dynamics and raising stress levels, measured by physical parameters.

In this context, regular exercise emerges as a vital strategy to mitigate these challenges Studies indicate that physical activity contributes not only to reducing fatigue, but also to improving self-esteem and social integration, reducing the stress levels associated with the diagnosis.

This study investigated the link between anthropometric measurements, stress levels and fatigue in breast cancer survivors. The results indicated significant correlations between physical characteristics, stress and fatigue. The inverse association between body mass index (BMI), waist-to-hip ratio (WHR) and percent body fat (%BF) with fatigue

underscores the importance of maintaining a healthy anthropometric profile to reduce fatigue levels in cancer survivors.

These findings highlight the need for integrated approaches in the treatment of breast cancer, considering not only clinical aspects, but also psychological and physical factors. Continued physical exercise, even during treatment, is crucial for promoting well-being and improving quality of life after cancer. Thus, the research reinforces the importance of continuous study in this field, with a view to improving patient support strategies and optimizing the results of breast cancer treatment.

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