

HEALTH EDUCATION FOR WOMEN UNDERGOING BREAST CANCER TREATMENT: EDUCATION ON HEALTH RANDOMIZED CONTROLLED CLINICAL TRIAL PROTOCOL

EDUCAÇÃO EM SAÚDE PARA MULHERES EM TRATAMENTO DO CÂNCER DE MAMA: PROTOCOLO DO ENSAIO CLÍNICO RANDOMIZADO EDUCATION ON HEALTH

EDUCACIÓN EN SALUD PARA MUJERES EN TRATAMIENTO DEL CÁNCER DE MAMA: PROTOCOLO DEL ENSAYO CLÍNICO ALEATORIZADO EDUCATION ON HEALTH

Letícia Campos Aguiar¹
Jean Luiz Souza Maciel Gomes²
Lucia Helena Moreira Lima Teixeira³
Isabelle Christine Vieira da Silva Martins⁴
Surama do Carmo Souza da Silva⁵
Ismael Forte Freitas Júnior⁶
Andréa Dias Reis⁷

ABSTRACT: Introduction: Sedentary behavior among women with breast cancer is a public health issue. Information technologies combined with health education may facilitate lifestyle changes, although little is known about programs designed to strengthen self-awareness and self-care in this population. Objective: To evaluate the effect of health education on sedentary behavior, lifestyle, physical activity level, nutrition, self-esteem, anxiety and depression, quality of life, pain, functional capacity, and strength in women undergoing breast cancer treatment. Method: This randomized controlled clinical trial will allocate 28 participants in a 1:1 ratio to the Health Education Group (HEG) or Control Group (CG). During 12 weeks, the HEG will receive health education recommendations through face-to-face meetings, WhatsApp, and Instagram, whereas the CG will remain under usual care and later receive the informational intervention. Assessments will occur at baseline, six weeks, and 12 weeks. Multivariate analysis will compare group, time, and interaction effects using SPSS version 24.0, with $\alpha = 5\%$. Discussion: The protocol proposes an innovative multidimensional strategy addressing physical activity, sedentary behavior, nutrition, mental health, socialization, and physical health. Conclusion: The intervention seeks to promote self-care and autonomy and support the integration of digital technologies into oncology care.

Keywords: Breast Neoplasms. Health Education. Sedentary Behavior.

¹Doutoranda em Ciências do Movimento, Universidade Estadual Paulista "Júlio de Mesquita Filho" — UNESP.

²Mestre em Educação Física pelo Programa de Pós-Graduação em Educação Física — PPGEF. Universidade Federal do Maranhão — UFMA.

³Mestra em Educação Física pelo Programa de Pós-Graduação em Educação Física — PPGEF. Universidade Federal do Maranhão — UFMA.

⁴Doutora pelo Programa de Pós-Graduação em Neurociências e Biologia Celular da Universidade Federal do Pará — UFPA. Docente do curso de Nutrição da Universidade do Estado de Minas Gerais. Universidade do Estado de Minas Gerais — UEMG.

⁵Doutora em Ciências da Saúde. Docente do Instituto de Saúde e Biotecnologia UFAM, Universidade Federal do Amazonas — UFAM.

⁶Doutor em Fisiopatologia em Clínica Médica pela Universidade Estadual Paulista "Júlio de Mesquita Filho". Docente do Programa de Pós-Graduação Interunidades em Ciências do Movimento. Instituição: Universidade Estadual Paulista "Júlio de Mesquita Filho" — UNESP.

⁷Orientadora Docente do Departamento de Educação Física da Universidade Federal do Maranhão, Doutora em Ciências do Movimento pela Universidade Estadual Paulista "Júlio de Mesquita Filho".

RESUMO: Introdução: O comportamento sedentário entre mulheres com câncer de mama constitui um problema de saúde pública. Tecnologias da informação combinadas à educação em saúde podem favorecer mudanças no estilo de vida, embora ainda sejam pouco conhecidos os programas destinados a fortalecer a autoconsciência e o autocuidado nessa população. Objetivo: Avaliar o efeito da educação em saúde sobre comportamento sedentário, estilo de vida, nível de atividade física, nutrição, autoestima, ansiedade e depressão, qualidade de vida, dor, capacidade funcional e força em mulheres em tratamento do câncer de mama. Método: Este ensaio clínico controlado randomizado alocará 28 participantes, na proporção 1:1, no Grupo Educação em Saúde (GES) ou no Grupo Controle (GC). Durante 12 semanas, o GES receberá recomendações por encontros presenciais, WhatsApp e Instagram, enquanto o GC permanecerá sob cuidados habituais e posteriormente receberá a intervenção informativa. As avaliações ocorrerão no início, após seis e 12 semanas. A análise multivariada comparará os efeitos de grupo, tempo e interação no SPSS 24.0, com $\alpha = 5\%$. Discussão: O protocolo propõe estratégia multidimensional envolvendo atividade física, comportamento sedentário, nutrição, saúde mental, socialização e saúde física. Conclusão: A intervenção busca promover autocuidado, autonomia e integração de tecnologias digitais à assistência oncológica.

Palavras-chave: Neoplasias da Mama. Educação em Saúde. Comportamento Sedentário.

RESUMEN: Introducción: La conducta sedentaria entre mujeres con cáncer de mama constituye un problema de salud pública. Las tecnologías de la información combinadas con la educación en salud pueden favorecer cambios en el estilo de vida, aunque aún se conocen poco los programas destinados a fortalecer la autoconciencia y el autocuidado en esta población. Objetivo: Evaluar el efecto de la educación en salud sobre conducta sedentaria, estilo de vida, nivel de actividad física, nutrición, autoestima, ansiedad y depresión, calidad de vida, dolor, capacidad funcional y fuerza en mujeres en tratamiento del cáncer de mama. Método: Este ensayo clínico controlado aleatorizado asignará 28 participantes, en proporción 1:1, al Grupo de Educación en Salud (GES) o al Grupo Control (GC). Durante 12 semanas, el GES recibirá recomendaciones mediante encuentros presenciales, WhatsApp e Instagram, mientras que el GC permanecerá bajo atención habitual y posteriormente recibirá la intervención informativa. Las evaluaciones se realizarán al inicio, después de seis y 12 semanas. El análisis multivariado comparará los efectos de grupo, tiempo e interacción en SPSS 24.0, con $\alpha = 5\%$. Discusión: El protocolo propone una estrategia multidimensional que integra actividad física, conducta sedentaria, nutrición, salud mental, socialización y salud física. Conclusión: La intervención busca promover autocuidado, autonomía e integración de tecnologías digitales en la atención oncológica.

Palabras clave: Neoplasias de la Mama. Educación en Salud. Conducta Sedentaria.

INTRODUCTION

The uncontrolled growth of abnormal cells beyond their usual boundaries in any part of the body is generally defined as cancer. When abnormal cells affect adjacent areas, metastasis occurs, and this process is the leading cause of death associated with the disease (WORLD HEALTH ORGANIZATION, 2025).

The global cancer landscape is undergoing a continuous process of change. The total number of people diagnosed with the disease has nearly doubled over the past two decades, from 10 million cases in 2000 to 19.3 million in 2020 (INTERNATIONAL AGENCY FOR RESEARCH ON CANCER, 2020).

Breast cancer has surpassed lung cancer and become the most commonly diagnosed cancer worldwide. In Brazil, estimates for the 2026-2028 triennium indicate approximately 78,610 new cases per year. The South region has the highest estimated incidence, followed by the Southeast, Central-West, Northeast, and North regions, where cervical cancer ranks first (INTERNATIONAL AGENCY FOR RESEARCH ON CANCER, 2020; BRASIL, 2026).

Treatment for breast cancer is based on the clinical stage of the disease and the type of tumor. Surgery and radiation therapy are considered local treatments and are directed at the tumor area, whereas drug treatments are systemic and may be administered orally, intramuscularly, or directly into the bloodstream. These treatments can cause adverse effects such as anxiety, depression, and fatigue (NATIONAL CANCER INSTITUTE, 2024).

In women with breast cancer, regular moderate-to-vigorous physical activity is associated with reduced treatment-related adverse effects, prolonged survival, and improved quality of life (JOAQUIM A, et al., 2022). Despite these benefits, a large proportion of women with the disease do not meet the recommended 150 to 300 minutes of moderate-to-vigorous physical activity per week (LYNCH BM, et al., 2019; WORLD HEALTH ORGANIZATION, 2020).

Sedentary behavior is frequent in this population and may lead to health impairments, including worsening cardiac autonomic function. Greater sedentary behavior may also be related to treatment effects such as pain, fatigue, and nausea (MCNEIL J, et al., 2019; PALMA MR, et al., 2022).

There is emerging interest in determining how long a person can remain seated, reclined, or lying down to be classified as engaging in sedentary behavior. The literature presents different cut-off points, including an average of nine hours per day, two hours per day, or prolonged periods of 20 minutes in a seated or reclined position. Other criteria consider fewer than 5,000 steps per day or activities involving less than 1.5 metabolic equivalents (TREMBLAY MS, et al., 2017; LYNCH BM, et al., 2019; PINTO B, et al., 2016; KREIDIEH D, et al., 2020; MENDES GFF, et al., 2018).

Wearable technology has emerged as a promising tool for facilitating changes in physical activity and sedentary behavior. Nevertheless, few studies have tested mobile technologies, social media platforms, and wearable activity trackers in this population (PHILLIPS SM, et al., 2018; MCNEIL J, et al., 2019).

With the continuous advancement of emerging technologies, researchers have used activity trackers, smartwatches, email, telephone calls, and social media. Findings from the ACTIVATE Trial indicate that such technologies are feasible and potentially cost-effective for supporting healthier lifestyles among women with breast cancer (LYNCH BM, et al., 2019).

The ALIVE program considered email a feasible tool for delivering dietary and physical activity interventions to racial and ethnic minorities, with promising results for a larger intervention (PAXTON RJ, et al., 2017). Similarly, an intervention combining social media with smartwatch-based health education suggested that these approaches may increase physical activity among breast cancer survivors (POPE ZC, et al., 2018).

Thus, technology-mediated health education interventions represent an effective alternative. However, little is known about the use of multidimensional health education and its effects on the lifestyles of women with breast cancer. Therefore, this study aims to evaluate the effect of health education on sedentary behavior, lifestyle, physical activity level, nutrition, self-esteem, anxiety and depression, quality of life, and pain in women with breast cancer.

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METHODS

Study design

This is a randomized controlled clinical trial that will be conducted with women diagnosed with breast cancer.

Sample

The study will be carried out in São Luís, Maranhão, Brazil, with women with breast cancer and without prior physical training. Participation will be voluntary, and women will be invited by the research team and oncologists from the participating hospitals: Hospital Aldenora Bello and Hospital Geral Tarquínio Lopes Filho.

The sample size was estimated using the mean and standard deviation of overall health status after eight weeks of a telerehabilitation intervention: 73.50 ± 20.76 in the intervention group and 50.45 ± 20.78 in the control group (GALIANO-CASTILLO N, et al., 2016). The

calculation was performed in Stata 14.0, with 80% power, a two-tailed alpha of 5%, a 1:1 allocation ratio, and independent samples, resulting in 28 participants: 14 in the intervention group and 14 in the control group.

Inclusion, exclusion, and withdrawal criteria

Participation will occur after signing the Informed Consent Form and meeting the eligibility criteria. The inclusion criteria are:

1. Women aged 18 years or older;
2. Diagnosis of breast cancer;
3. Current breast cancer treatment, including chemotherapy, radiotherapy, and/or hormone therapy;
4. Daily access to a smartphone.

The exclusion criteria are:

1. Diagnosis of another type of cancer;
2. Physical training during the three months before the intervention;
3. Medical contraindication to perform any type of physical activity;
4. Answering “yes” on the Physical Activity Readiness Questionnaire (PAR-Q) and having a medical contraindication;
5. Lack of mental capacity to use a smartphone or complete the research questionnaires;
6. Illiteracy.

The following withdrawal criteria will be applied to the Education on Health program:

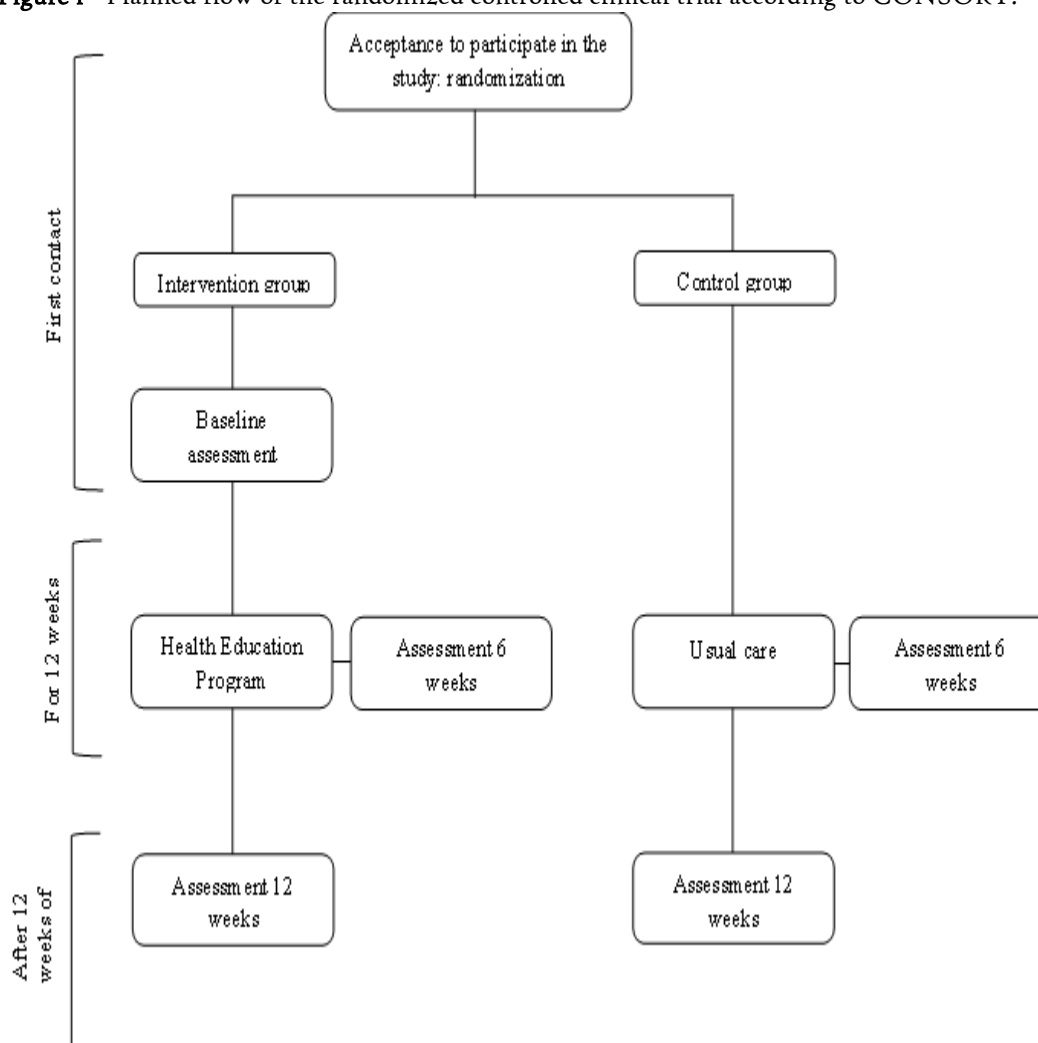
1. Three consecutive absences from face-to-face meetings;
2. Failure to attend scheduled activities without justification.

Randomization, allocation, and blinding

Randomization will be performed using random number generation in Microsoft Excel, version 2021. Participant allocation will be conducted by a research team member with no prior relationship with the participants and no knowledge of their clinical or personal characteristics, ensuring allocation concealment. To support blinding, participants will not have access to the methodological aspects of the intervention, and assessments for each group will be conducted at different times.

Participants will be allocated in a 1:1 ratio to the Health Education Group (HEG) or the Control Group (CG), as shown in Figure 1.

Figure 1 - Planned flow of the randomized controlled clinical trial according to CONSORT.



Source: Prepared by the authors (2026).

Health Education Group (HEG)

At the first meeting, participants will receive a booklet entitled “Health Education - For Women Undergoing Breast Cancer Treatment” as supplementary material. It contains the components of the Education on Health program: physical activity, sedentary behavior, nutrition, mental health (self-esteem, self-care, and body image), socialization, and physical health (disease care, sleep, and hydration). Participants will also receive a diary to record the intervention (Table 1).

Throughout the 12-week study, participants will receive recommendations through WhatsApp according to a schedule defined by the researchers and will be added to a private

Instagram profile for additional content. They will also participate in face-to-face meetings involving discussion circles, activities, and lectures related to the program components (Table 2).

Table 1 - Week-by-week schedule of the 12-week intervention in the Health Education Group.

Week	Communication Method	Physical Activity	Sedentary Behavior	Nutrition	Mental Health (Self-esteem, Self-care, Body Image)	Socialization	Physical Health (Disease care, Sleep, Hydration)
Entry	Educational material (booklet)	X	X	X	X	X	X
	Initial lecture	X	X	X	X	X	X
1	WhatsApp				X		
	Instagram In-person meeting		X			X	X
2	WhatsApp		X				
	Instagram Daily challenge		X	X			X
3	WhatsApp					X	
	Instagram In-person meeting	X		X	X		
4	WhatsApp	X					
	Instagram Daily challenge	X		X			X
5	WhatsApp			X			
	Instagram In-person meeting		X		X	X	
6	WhatsApp						X
	Instagram Daily challenge	X			X	X	
7	WhatsApp				X		
	Instagram In-person meeting		X			X	X
8	WhatsApp		X				
	Instagram Daily challenge		X	X			X
9	WhatsApp					X	
	Instagram In-person meeting	X		X	X		
10	WhatsApp	X					
	Instagram						X

	Daily challenge	X		X				
11	WhatsApp			X				
	Instagram		X					
	In-person meeting				X		X	
12	WhatsApp							X
	Instagram	X						
	Daily challenge				X		X	
Final	Closing lecture	X	X	X	X		X	X

Legend: the initial lecture will provide an overview of all study components and the intervention; the educational material will contain recommendations for all domains; challenges and face-to-face meetings will address two components per session, with each component covered twice during the intervention.

Source: Prepared by the authors (2026).

Content of WhatsApp and Instagram messages

The content delivered through WhatsApp and Instagram will be based on an eBook developed by the lead researchers. The material was reviewed by five experts in the thematic areas and follows the organization of the domains presented in Table 1. WhatsApp was selected because of its widespread use in Brazil and ease of access, whereas Instagram enables interaction with published content and may increase participant engagement. A systematic review of 17 studies considered mobile applications combined with supporting materials a promising approach to improving quality of life (SAEVARSDOTTIR SR e GUDMUNDSDOTTIR SL, 2023).

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Table 2 - Frequency of use of digital technologies and communication media.

Digital technologies and communication media	Period	Total Intervention
Educational material	Beginning of the intervention	1× per component
WhatsApp	Weekly	2× per component
Instagram	Weekly	2× per component
Group meetings (discussion circles, activities, and lectures)	Every 15 days	2× per component
Daily challenge (except the illness component)	Every 15 days	1× per component

Source: Prepared by the authors (2026).

Control Group (CG)

Participants in the CG will remain under usual care and continue their oncology treatment as medically recommended. After 12 weeks, they will receive the informational

intervention through Instagram and WhatsApp because of the ethical considerations of the study.

Strategies to increase intervention adherence

The intervention will be partially face-to-face and partially online. Participants in the intervention group will be added to a WhatsApp group and should receive the program as proposed. The research team will maintain regular contact with the control and intervention groups through group messages, individual messages, or telephone calls to support adequate adherence to the study.

Study variables

Sample characterization

Social characteristics, including educational level, and clinical characteristics related to cancer, including staging and treatment type, will be assessed to characterize the study population.

Primary outcome: lifestyle

Lifestyle will be assessed using the Individual Lifestyle Profile Questionnaire, which contains 15 items covering nutrition, physical activity, preventive behavior, relationships, and stress control (BOTH J, et al., 2008). Lifestyle will also be evaluated based on changes in two or more study components: physical activity, sedentary behavior, nutrition, socialization, mental health, and physical health (CHAMPION KE, et al., 2019). The assessment of each component is described among the secondary outcomes.

Secondary outcomes

Body composition

Body composition will be assessed using the Sanny Tetrapolar Bioimpedance Analyzer, model 1011. The analysis will provide parameters such as body cell mass, extracellular mass, lean body mass, and body fat (LUKASKI HC, et al., 1985).

Physical activity level and sedentary behavior

Physical activity level and sedentary behavior will be measured using the ActiGraph GT9X triaxial accelerometer (ActiGraph LLC, Pensacola, FL, United States). Participants will wear the device for seven days, including two weekend days, during all waking hours, removing it only for water-based activities and sleep. The device will be positioned on the hip near the umbilical scar (AADLAND E e YLVISÅKER E, 2015).

Nutrition

Food choices will be assessed using the Food Choice Questionnaire, which contains 36 items across nine factors. Participants will respond while considering the statement: “For me, it is important that the food I eat on a daily basis is...” (HEITOR SFD, et al., 2015).

Self-esteem

Self-esteem will be assessed using the validated Rosenberg Self-Esteem Scale, a unidimensional instrument containing ten statements related to self-esteem and self-acceptance. Items are answered on a four-point Likert scale ranging from “strongly agree” to “strongly disagree” (HUTZ CS e ZANON C, 2011).

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Quality of life

Quality of life will be evaluated using the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC QLQ-C30), composed of domains covering global health status and quality of life, functional status, symptoms, and financial difficulties. The breast cancer-specific EORTC QLQ-BR23 module will also be administered. Both questionnaires have been translated and validated for Portuguese (MICHELS FAS, et al., 2012).

Pain

The Brief Pain Inventory will assess pain sites and treatment effectiveness through two dimensions: pain intensity and the interference of pain in participants' lives. Scores will be analyzed independently (FERREIRA KA, et al., 2011).

Statistical analysis

All analyses will be conducted using SPSS version 24.0, with statistical significance set at 5%. Variable normality will be assessed using the Shapiro-Wilk test. Parametric variables will be expressed as mean and standard deviation, and nonparametric variables as median and interquartile range. At each time point, between-group comparisons will be performed using the independent-samples Student's t test. Variables will be compared at baseline, after six weeks, and after 12 weeks using multivariate analysis to examine group, time, and group-by-time interaction effects.

Ethical considerations

The study was approved by the Research Ethics Committee of the Federal University of Maranhão under Certificate of Presentation for Ethical Appreciation (CAAE) 63488322.2.0000.5087 and registered at ClinicalTrials.gov under identifier NCT05873296. The researchers will comply with Resolution No. 466/2012 of the Brazilian National Health Council. All information will remain confidential and will be used solely for research dissemination. Participants will be protected through the signing of the Informed Consent Form. The study was also authorized by Hospital Aldenora Bello and Hospital Geral Tarquínio Lopes Filho.

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DISCUSSION

The prevalence of sedentary behavior among women undergoing breast cancer treatment is a critical public health challenge, particularly because breast cancer is currently the most common neoplasm worldwide (WORLD HEALTH ORGANIZATION, 2025). In Brazil, the high number of expected annual cases reinforces the urgency of strategies to mitigate treatment-related effects, such as fatigue and pain, that may contribute to physical inactivity (BRASIL, 2026; RENTROIA DSJ, et al., 2024).

The Education on Health protocol has innovative potential because it adopts a multidimensional approach. Although a recent meta-analysis of 29 clinical trials indicated that digital behavior change interventions improve upper-limb mobility and quality of life, limitations remain regarding their ability to increase whole-body physical activity. This protocol differs by combining specific health education components addressing exercise,

nutrition, sleep, and mental health through WhatsApp and Instagram (ZHANG X, et al., 2025).

Recent evidence supports this strategy. Interventions focused on reducing sedentary time, even without requiring vigorous exercise, may improve physical function and reduce fatigue. Furthermore, attendance at health education sessions has been associated with improvements in metabolic syndrome and quality of life among postmenopausal women undergoing adjuvant breast cancer treatment (ZHANG X, et al., 2025; CESPEDES P, et al., 2024).

CONCLUSION

The Education on Health protocol is presented as a robust and potentially scalable strategy for improving oncology care. By integrating face-to-face meetings with continuous digital support over 12 weeks, the study will evaluate an intervention designed to reduce sedentary behavior and promote autonomy, self-care, and changes across multiple health dimensions.

Personalized digital interventions have shown favorable results in increasing step count and moderate-to-vigorous physical activity. The use of daily challenges, educational materials reviewed by experts, and social media support places this protocol in a strategic position to improve cardiometabolic outcomes and overall well-being. The trial is expected to provide evidence for implementing technology-based health education programs in healthcare services (ZHANG X, et al., 2025; REES-PUNIA E, et al., 2025).

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DATA AVAILABILITY STATEMENT

This study is a clinical trial protocol; therefore, no data are currently available for sharing or public access.

REFERENCES

1. AADLAND E, YLVISÅKER E. Reliability of the Actigraph GT3X+ accelerometer in adults under free-living conditions. *PLoS One*, 2015; 10(8): e0134606.
2. BOTH J, et al. Validação da escala “Perfil do Estilo de Vida Individual”. *Revista Brasileira de Atividade Física & Saúde*, 2008; 13(1).
3. BRASIL. Ministério da Saúde. Instituto Nacional de Câncer José Alencar Gomes da Silva. Estimativa 2026: incidência de câncer no Brasil. Rio de Janeiro: INCA; 2026.

4. CESPEDDES P, et al. Impact of a physical exercise and health education program on metabolic syndrome and quality of life in postmenopausal breast cancer women undergoing adjuvant treatment with aromatase inhibitors. *Medicina*, 2024; 60(11): 1893.
5. CHAMPION KE, et al. Effectiveness of school-based eHealth interventions to prevent multiple lifestyle risk behaviours among adolescents: a systematic review and meta-analysis. *Lancet Digital Health*, 2019; 1(5): e206-e221.
6. FERREIRA KA, et al. Validation of brief pain inventory to Brazilian patients with pain. *Supportive Care in Cancer*, 2011; 19(4): 505-511.
7. GALIANO-CASTILLO N, et al. Telehealth system: a randomized controlled trial evaluating the impact of an internet-based exercise intervention on quality of life, pain, muscle strength, and fatigue in breast cancer survivors. *Cancer*, 2016; 122(20): 3166-3174.
8. HEITOR SFD, et al. Tradução e adaptação cultural do questionário sobre motivo das escolhas alimentares (Food Choice Questionnaire) para a língua portuguesa. *Ciência & Saúde Coletiva*, 2015; 20: 2339-2346.
9. HUTZ CS, ZANON C. Revisão da adaptação, validação e normatização da Escala de Autoestima de Rosenberg. *Avaliação Psicológica*, 2011; 10(1): 41-49.
10. INTERNATIONAL AGENCY FOR RESEARCH ON CANCER. Latest global cancer data: cancer burden rises to 19.3 million new cases and 10.0 million cancer deaths in 2020. Lyon: IARC; 2020.
11. JOAQUIM A, et al. Impact of physical exercise programs in breast cancer survivors on health-related quality of life, physical fitness, and body composition: evidence from systematic reviews and meta-analyses. *Frontiers in Oncology*, 2022; 12: 955505.
12. KREIDIEH D, et al. Association between reduced daily steps and sarcopenic obesity in treatment-seeking adults with obesity. *Frontiers in Endocrinology*, 2020; 11: 22.
13. LUKASKI HC, et al. Assessment of fat-free mass using bioelectrical impedance measurements of the human body. *American Journal of Clinical Nutrition*, 1985; 41(4): 810-817.
14. LYNCH BM, et al. A randomized controlled trial of a wearable technology-based intervention for increasing moderate-to-vigorous physical activity and reducing sedentary behavior in breast cancer survivors: the ACTIVATE Trial. *Cancer*, 2019; 128(18): 2846-2855.
15. MCNEIL J, et al. Activity tracker to prescribe various exercise intensities in breast cancer survivors. *Medicine & Science in Sports & Exercise*, 2019; 51(5): 930-940.
16. MENDES GFF, et al. Comparação das estimativas de atividade física e comportamento sedentário em adultos brasileiros no VIGITEL e PNS, Brasil, 2013. *Revista Brasileira de Atividade Física & Saúde*, 2018; 23: 1-10.
17. MICHELS FAS, et al. Validação e reprodutibilidade do questionário FACT-B+4 de qualidade de vida específico para câncer de mama e comparação dos questionários IBCSG, EORTC-BR23 e FACT-B+4. *Cadernos Saúde Coletiva*, 2012; 20(3): 321-328.

18. NATIONAL CANCER INSTITUTE. Surgery to treat cancer. Bethesda: National Cancer Institute; 2024.
19. PALMA MR, et al. Association between cardiac autonomic modulation and sedentary behavior in breast cancer survivors: a 12-month cohort study. *Supportive Care in Cancer*, 2022; 30: 1873-1878.
20. PAXTON RJ, et al. A lifestyle intervention via email in minority breast cancer survivors: randomized parallel-group feasibility study. *JMIR Cancer*, 2017; 3(13): 1-15.
21. PHILLIPS SM, et al. Wearable technology and physical activity in chronic disease: opportunities and challenges. *American Journal of Preventive Medicine*, 2018; 54(1): 144-150.
22. PINTO B, DUNSIGER S, STEIN K. Does a peer-led exercise intervention affect sedentary behavior among breast cancer survivors? *Psycho-Oncology*, 2016; 26(11): 1907-1913.
23. POPE ZC, et al. Effectiveness of combined smartwatch and social media intervention on breast cancer survivor health outcomes: a 10-week pilot randomized trial. *Journal of Clinical Medicine*, 2018; 7(6): 1-17.
24. REES-PUNIA E, et al. Digital intervention for increasing physical activity and reducing sedentary behaviour in cancer survivors: a trial within the Cancer Prevention Study-3 cohort. *British Journal of Sports Medicine*, 2025.
25. RENTROIA DSJ, SOUSA ML, REZENDE LF. Agulhamento a seco no pós-operatório de câncer de mama: influência na dor e na amplitude de movimento do ombro - estudo piloto. *Revista Brasileira de Cancerologia*, 2024; 70(3).
26. SAEVARSDOTTIR SR, GUDMUNDSDOTTIR SL. Mobile apps and quality of life in patients with breast cancer and survivors: systematic literature review. *JMIR Cancer*, 2023; 9: e42852.
27. TREMBLAY MS, et al. Sedentary Behavior Research Network Terminology Consensus Project process and outcome. *International Journal of Behavioral Nutrition and Physical Activity*, 2017; 14(1): 75.
28. WORLD HEALTH ORGANIZATION. WHO launches new guidelines on physical activity and sedentary behavior. Geneva: World Health Organization; 2020.
29. WORLD HEALTH ORGANIZATION. Cancer. Geneva: World Health Organization; 2025.
30. ZHANG X, et al. Digital behavior change interventions to promote physical activity and reduce sedentary behavior among survivors of breast cancer: systematic review and meta-analysis of randomized controlled trials. *Journal of Medical Internet Research*, 2025; 27: e65278.