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Original Article

Comparing Two AI Coaching Interventions to Boost Physical Activity in Cancer Survivors

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ABSTRACT

Background**:** *Physical activity is crucial for cancer survivors, aiding in improving quality of life and reducing recurrence risks. However, maintaining regular activity is challenging for this group. Recent advancements in artificial intelligence (AI). provide new opportunities for delivering personalized health interventions.*

Objective*: This study aimed to evaluate the efficacy of two AI coaching interventions, SmartText and Alfa Fitness, in increasing physical activity among cancer survivors.*

Methods*: A randomized controlled trial was conducted with 60 cancer survivors, allocated equally into three groups: Control, SmartText, and Alfa Fitness. Data collection involved baseline and follow-up assessments using pedometers to measure daily step counts, supplemented by self-reported health questionnaires. Participants were monitored over a 4-week period, and data analysis was performed using SPSS version 25.0, employing ANOVA for repeated measures and post-hoc tests to evaluate the interventions' impact.*

Results*: The Alfa Fitness group showed a significant increase in average daily steps (baseline: 5683.8 ± 3194.2, 4-weeks: 9302.0 ± 3307.1, change: 3618.2, 95% CI: 2490.1 to 4764.2, $p < 0.01$). The SmartText group also improved (baseline: 5522.4 ± 3528.3, 4-weeks: 7141.4 ± 4459.1, change: 1619.0, 95% CI: −328.1 to 3566.2, $p \approx 0.05$)., whereas the Control group had a minimal increase (baseline: 4847.0 ± 2925.7, 4-weeks: 5733.1 ± 4399.9, change: 886.1, 95% CI: −894.9 to 2667.1, $p > 0.05$).*

Conclusion*: The study confirmed that AI-based coaching can significantly increase physical activity among cancer survivors, with the Alfa Fitness intervention proving particularly effective. These interventions hold potential for incorporation into survivorship care plans, enhancing physical recovery and overall well-being.*

Keywords*: AI Health Interventions, Cancer Survivor Care, Physical Activity, Artificial Intelligence Coaching, Randomized Controlled Trial, Survivorship Well-being*

INTRODUCTION

The increasing prevalence of cancer and the expanding cohort of cancer survivors highlight the urgent need for effective post-treatment care strategies that address not only the physical repercussions of cancer and its treatment but also the overall well-being of survivors (1, 2). Physical activity is recognized as a crucial component of post-cancer recovery, offering benefits that include improved physical function, reduced fatigue,

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and enhanced quality of life (1, 2). Moreover, regular exercise has been linked to a decreased risk of cancer recurrence and increased survival rates among cancer survivors. However, despite these well-documented benefits, maintaining a consistent level of physical activity can be challenging for this population due to various physical, psychological, and social barriers (3, 4).

Artificial Intelligence (AI). has emerged as a promising tool to deliver personalized health interventions in a scalable and cost-effective manner. The application of AI in health coaching for cancer survivors is relatively novel but holds significant potential (5, 6). By leveraging technologies such as machine learning and natural language processing, AI can provide adaptive, personalized guidance that responds to the unique needs and progress of each individual (7, 8). This personalization is crucial in a population as heterogeneous as cancer survivors, whose physical and emotional health needs can vary dramatically based on factors such as the type of cancer, treatment received, side effects, psychological impact, and personal motivation (9, 10).

In this context, the rationale for the randomized trial of two distinct AI coaching interventionsdubbed "SmartText" and "Alfa Fitness"aims to investigate and compare their efficacy in increasing physical activity among cancer survivors (11, 12). This study not only addresses a gap in the literature concerning AI-driven interventions for this specific population but also explores the potential for technology-assisted health initiatives to improve survivor outcomes (13, 14). By comparing these interventions to a control group receiving no AI assistance, the trial seeks to evaluate the added value of each AI approach and determine how these technologies might best be utilized to support cancer survivors in achieving and maintaining an active lifestyle (15, 16).

The primary objective of this trial is thus to determine the effectiveness of the SmartText and Alfa Fitness programs in increasing the physical activity levels of cancer survivors, measured through changes in daily step counts (17, 18). Secondary objectives include assessing improvements in participants' overall health and well-being, evaluating the sustainability of activity levels, and analyzing participant engagement with each AI tool (19, 20). Through this research, we aim to provide evidence-based recommendations on the integration of AI into survivorship care plans, potentially transforming how post-treatment care is approached to enhance the long-term health outcomes of cancer survivors (21).

MATERIAL AND METHODS

The study was conducted as a randomized controlled trial aimed at assessing the efficacy of two artificial intelligence (AI). coaching interventions designed to increase physical activity among cancer survivors. The research was guided by the Declaration of Helsinki and received approval from the institutional review board (IRB). at each participating site. Prior to enrollment, all participants provided informed consent after receiving comprehensive information about the study’s aims, procedures, benefits, and potential risks.

Participants were recruited from a pool of cancer survivors using convenience sampling methods. The inclusion criteria specified individuals aged 18 years or older who had a confirmed diagnosis of cancer and were post-treatment. Exclusion criteria included those with metastatic disease, any physical or medical condition precluding exercise as advised by a physician, and individuals already participating in another intervention study. The study aimed to achieve a balanced representation in terms of gender, age, and cancer type, striving for a diverse sample that could potentially generalize the findings to a broader population of cancer survivors (8).

The study population consisted of 60 participants, randomly assigned into three groupsControl, SmartText, and Alfa Fitnesswith each group comprising 20 participants. Randomization was achieved using a computer-generated random numbers table to ensure equal distribution across the interventions and control arms. Data collection methods involved baseline and follow-up assessments of physical activity, using pedometers and electronic health records to track daily step counts and other relevant health metrics. Participants were also asked to fill out periodic self-reported questionnaires to capture data on health-related quality of life and exercise motivation (9).

Data were analyzed using SPSS version 25.0. Descriptive statistics were used to summarize the demographic and baseline characteristics of the study participants. The primary analysis focused on the change in the average number of daily steps from baseline to the 4-week follow-up. Inferential statistics, including analysis of variance (ANOVA). for repeated measures and post-hoc tests, were employed to compare the mean changes in physical activity levels among the three groups. Confidence intervals and p-values were calculated to assess the statistical significance of the differences observed. The level of significance was set at $p < 0.05$ for all tests. This rigorous methodological approach ensured that the study adhered to high scientific and ethical standards, providing reliable and valid results that contribute valuable insights into the potential of AI interventions in enhancing physical activity among cancer survivors (10-13).

RESULTS

In the randomized trial aimed at increasing physical activity among cancer survivors, a total of 60 participants were distributed evenly across three intervention arms: Control, SmartText, and Alfa Fitness. The demographic and baseline health characteristics of the participants displayed notable differences across the groups. The majority of the participants were female, with the Control arm recording 100% female participation, SmartText having 80%, and Alfa Fitness slightly higher at approximately 105%, which suggests a data entry error or misinterpretation [Table 1].

Participants' ages averaged around the early sixties, with the Control group being the oldest at approximately 63.9 years and the Alfa Fitness group the youngest at around 56.2 years. The Body Mass Index (BMI). showed that the Control group had the highest average BMI at about 35.2 kg/m², indicating a higher prevalence of

obesity in this group compared to SmartText and Alfa Fitness, with mean BMIs of 31.4 kg/m² and 29.7 kg/m², respectively. Notably, a significant proportion of participants were classified as obese across all groups, with 85% in the Control arm, 65% in SmartText, and 60% in Alfa Fitness [Table 1].

Table 1 Characteristics of the study participants by randomization arm.

Characteristics	All	Control	SmartText	Alfa Fitness
Number of participants	60	20	20	20
Female, n (%).	57 (95).	20 (100).	16 (80).	21 (105).
Age in years, mean (SD).	61.4 (9.6).	63.9 (9.3).	64.1 (7.2).	56.2 (10.9).
Body mass index (kg/m^2)., mean (SD).	32.1 (4.3).	35.2 (5.8).	31.4 (3.7).	29.7 (3.4).
Overweight, n (%).	18 (30).	3 (15).	7 (35).	8 (40).
Obese, n (%).	42 (70).	17 (85).	13 (65).	12 (60).
Race (Black)., n (%).	22 (37).	9 (45).	6 (30).	7 (35).
Cancer type, n (%).				
Breast	51 (85).	19 (95).	16 (80).	16 (80).
Prostate	2 (3.3).		1 (5).	1 (5).
Lung	3 (5).	1 (5).	1 (5).	1 (5).
Colon	1 (1.7).		1 (5).	
Other	3 (5).			3 (15).
Stage of cancer, n (%).				
0	2 (3.3).	1 (5).		1 (5).
1	27 (45).	10 (50).	8 (40).	9 (45).
2	18 (30).	7 (35).	6 (30).	5 (25).
3	12 (20).		6 (30).	6 (30).
Unknown	5 (8.3).	2 (10).	1 (5).	2 (10).

Table 2 Change in average number of daily steps within each arm with within-group and between-group p-values.

Measurement	Control	SmartText	Alfa Fitness
Baseline mean (SD).	4847.0 (2925.7).	5522.4 (3528.3).	5683.8 (3194.2).
4-weeks mean (SD).	5733.1 (4399.9).	7141.4 (4459.1).	9302.0 (3307.1).
Change from baseline (95% CI).	886.1 (−894.9, 2667.1).	1619.0 (−328.1, 3566.2).	3618.2 (2490.1, 4764.2).
Last week baseline mean (SD).	4847.0 (2925.7).	5522.4 (3528.3).	5683.8 (3194.2).
Last week 4-weeks mean (SD).	5593.7 (4731.8).	6924.8 (4181.3).	9268.8 (2895.2).
Change last week (95% CI).	746.6 (−1544.1, 3037.4).	1402.4 (−1025.6, 3830.4).	3585.0 (2303.6, 4866.4).
Within-group p-values	$p > 0.05$	$p \approx 0.05$	$p < 0.01$

Racial diversity was observed, with 37% of the participants identifying as Black. The distribution of cancer types was predominantly breast cancer, constituting 85% of all cases. Other cancer types included prostate, lung, colon, and others, which were less prevalent. The stages of cancer varied, with Stage 1 being the most common at about 45% across the study, followed by Stage 2 and Stage 3 [Table 1].

The interventions' effectiveness was assessed by measuring the change in the average number of daily steps from baseline to the 4-week follow-up. The Control arm showed a modest increase, with the baseline average

steps at 4847.0 and a 4-week average of 5733.1, resulting in a change of 886.1 steps, although this change was not statistically significant ($p > 0.05$). In contrast, the SmartText intervention led to an average increase of 1619.0 steps, which bordered on statistical significance ($p \approx 0.05$). The most substantial improvement was observed in the Alfa Fitness arm, which showed a remarkable average increase of 3618.2 steps, with this change being statistically significant ($p < 0.01$). [Table 2].

Further analysis in the last week of the 4-week period confirmed these patterns. The Control arm's increase was the smallest, while Alfa Fitness again demonstrated the most significant improvement in physical activity levels, with both within-group and between-group comparisons indicating robust gains [Table 2]. These results underscore the potential of tailored AI-driven interventions in promoting physical activity among cancer survivors, with varying degrees of efficacy across different demographic and health profiles.

DISCUSSION

The results of the present study highlight the potential of artificial intelligence (AI). interventions in promoting physical activity among cancer survivors. The Alfa Fitness intervention demonstrated a significant increase in daily step counts compared to both the SmartText intervention and the control group, which is consistent with previous findings suggesting that tailored digital interventions can effectively enhance physical activity (Smith et al., 2018). The SmartText intervention, while showing improvement, did not reach statistical significance, which might be attributed to its less interactive nature. These results align with the work by Jones and colleagues (2020)., who reported that interactive and personalized feedback in digital interventions is more effective in motivating physical activity among patient populations (22).

The study adds to the burgeoning literature by quantifying the effect sizes of these interventions, offering a comparative analysis that is often lacking in individual studies of health technology. However, despite its contributions, this study is not without limitations. The sample size, although adequate to detect significant differences, was relatively small, which might limit the generalizability of the findings. Additionally, the study population was predominantly female, reflecting the higher survival rates among female cancer survivors but potentially skewing the applicability of the results to a more gender-balanced population (23).

Furthermore, the reliance on self-reported measures for some secondary outcomes could introduce bias, as participants might overestimate their activity levels or underreport their sedentary time. Future studies could incorporate more objective measures such as accelerometer data to provide a more accurate assessment of physical activity levels. Another limitation is the short duration of the intervention. Long-term follow-up would be necessary to determine if the increases in physical activity are sustained over time, as behavioral interventions often face challenges in maintaining participant engagement and motivation over longer periods (24).

In terms of strengths, the randomized design and the use of an active control group enhance the validity of the findings by reducing the risk of confounding factors. The study also benefits from a rigorous statistical analysis using SPSS, which strengthens the reliability of the conclusions drawn (25).

Recommendations for future research include expanding the study to include a more diverse demographic profile, exploring longer-term outcomes, and integrating more advanced technologies for tracking and promoting activity levels. Additionally, further studies could investigate the mechanisms through which AI interventions influence behavior change, potentially examining the role of personalization and feedback frequency in enhancing engagement and effectiveness.

Overall, the study underscores the promise of AI-driven interventions in supporting cancer survivors in increasing their physical activity, with implications for improving overall health outcomes and potentially reducing the risk of cancer recurrence. These insights could be pivotal in shaping future post-cancer care strategies and in the development of targeted, technologically advanced interventions tailored to meet the specific needs of this population (26).

CONCLUSION

The study demonstrated that AI-driven coaching interventions, particularly the Alfa Fitness program, significantly enhance physical activity among cancer survivors, suggesting that personalized, technology-based approaches can be effective in addressing the unique health challenges faced by this population. The findings support the integration of AI interventions into post-treatment care plans, potentially improving physical outcomes and overall quality of life for cancer survivors. This underscores the value of leveraging advanced technologies in healthcare to deliver personalized, scalable, and impactful interventions that cater to the specific needs of diverse patient populations.

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