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Digital Health Innovations to Promote Physical Activities in Patients with Cancer

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Abstract. This study evaluates the Exercise Planning and Tracking (EPT) tool, a digital health solution, designed to enhance physical activity (PA) in patients with cancer. Utilizing a tailored PA database, the tool aids in tracking and planning exercises and monitoring symptoms. A pre-post study shows the tool improves patients' anxiety, depression, and walking distances, especially in high-exertion individuals, highlighting its potential to boost quality of life and physical health for patients with cancer.

Keywords. physical activity; cancer; digital health.

1. Introduction

Research in exercise oncology overwhelmingly reports positive effects of physical activity (PA) on various aspects of cancer, including therapeutic response [1], adverse effects, common symptoms [2], and overall quality of life (QoL) [3]. Despite the substantial evidence supporting the benefits of PA for patients with cancer, adherence to exercise recommendations remains low, with only 10% of patients undergoing treatment and less than 30% of patients post-treatment following these guidelines [4]. To promote PA among patients with cancer, we developed a web application (app) named the Exercise Planning and Tracking (EPT) tool. This tool aims to enhance autonomous self-regulation and intrinsic motivation by enabling patients to actively participate in creating a PA plan tailored to their current physical function abilities, and their personal preferences and to bolster extrinsic regulation by providing intuitive summaries of daily PA progress and symptom logging.

2. Methods

The core features of the EPT tool include: (1) a tailored physical activity (PA) database for oncology, based on the Compendium of Physical Activity Ontology [5]. This database encompasses comprehensive PA concepts and properties, such as activity types, exercise effects, Metabolic Equivalent of Task (MET) values, and the required settings for each activity; (2) the capability to track, summarize, and visualize the progress of planned activities and cancer-related symptoms.

To evaluate the app's efficacy, a single-arm pre-post interventional study was conducted at the Duke Cancer Center Raleigh (DCCR). This study aimed to compare the changes in participant-reported symptoms and physical function before and after the intervention. We recruited 18 patients with cancer, 15 with breast cancer, and 3 with prostate cancer. Of these participants, 4 did not participate in the post-study surveys and

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2 incorrectly used the app, resulting in 12 valid samples for data analysis. These 12 samples were divided into two subgroups (8 in high-exertion and 4 in low-exertion groups) based on the mean of their daily completed MET values, reflecting their patterns of app usage and activity completion. We then compared the patient-reported outcomes (PROMIS measures) and results of the physical function assessment (6-minute walk test) before and after the study.

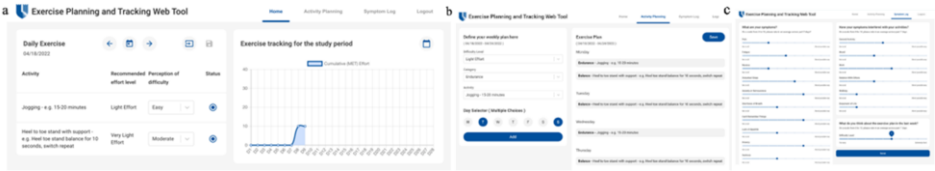

Figure 1. Screenshot of the EPT tool. (a) PA logger and tracker; (b) PA planner; (c) Symptom logger.

3. Results

Patients in both exertion groups exhibited reduced anxiety and depression, as well as increased walking distances, after the intervention compared to before. Those in the high exertion group showed greater improvements in fatigue, sleep disturbance, and overall global health, along with more significant changes in walking distance (22.72m vs. 9.74m) than those in the low exertion group.

4. Conclusions

The preliminary results highlight the significant potential of this digital health solution in promoting physical activity among patients with cancer while reducing symptoms and enhancing physical function. Future efforts will concentrate on gathering a larger sample size to enhance the statistical robustness of our findings through a randomized controlled trial, refining the features of the EPT tool, and rigorously controlling for confounding factors during the evaluation.

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