Usability Test of a Mobile Physical Activity Program for Breast Cancer Patients During Chemotherapy: A Pilot Study

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1. Introduction

Physical activity (PA), as a representative modified lifestyle intervention allows a possibility for less symptom disturbing and high health-related quality of life (HRQOL) for breast cancer patients. PA is defined as any bodily movement produced by skeletal muscles that requires energy expenditure, which involves in multicomponent, like aerobic exercise, resistance training, flexible or endurance exercise, yoga, stretching activities, dancing programs [1]. The benefits of PA to a range of outcomes for women affected by breast cancer have been well demonstrated. These include survival [2], prevention of recurrence [3], enhancement to HRQOL [4], management of cancer-related fatigue [4], lymphedema and depressive symptoms [5]. Previously, we developed a mobile phone application called “Breast Care” to help promoting PA behavior based on Social Cognitive Theory, Self-Efficacy Theory and the Theory of Planned Behavior [6]. The “Breast Care” we developed included five main pages covering six functions, which containing information delivering, disease tracking, events reminding based on calendar, online interaction, health behavior recording (daily walking steps, sleeping time and body weight) and self-reported assessment. Now we aim to do a pilot intervention to test the usability of this new lifestyle rehabilitation model.

2. Approach

We conducted a pre-post intervention to examine the usability of this Mobile Physical Activity Program (MPAP). Main pathway of the intervention relied on the mobile phone application “Breast Care” and tailored short message sending (SMS).

Concrete PA intervention included two aspects. One is based on “Breast Care” application. The intervention process was as follows: participants signed the consent and downloaded the application from Application Store (App Store for iOS system or

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Yingyongbao for Android system). Then, the researchers delivered the user instruction brochure and helped to type their current chemotherapy stage to realize disease tracking. Afterwards, based on the baseline investigation including international physical activity questionnaire (IPAQ) and self-designed PA assessments, appropriate start aiming daily step (identified through gyroscope function inside smartphone) was set. Start daily stepping rule was set by following their baseline PA level investigated by IPAQ. Participants with PA more than 540 Metabolic Equivalent-min/week (MET-min/week) were assigned to the active group with a recommended 6000 starting daily steps, by contrast, participants with PA less than 540 MET-min/w were assigned to the sedentary group with a recommended 3000 starting daily steps. When the above was ready, documenting the participants’ name and mobile phone number, patients were tracked by the application portal site successfully. At 9 pm of each day, a push notification about individual’s daily total steps and gap with goals would be send to their smartphone to help monitor their PA behavior. For other time, they could browse the relevant content or videos in the app and participate in the online peer interaction. Information in knowledge pool contained principle and recommendation of PA, guidance and supported information related to PA, disease guidance and related information support, nutrition and diet, self-image maintenance and social support.

The other means of intervention was based on SMS. For the first day of each course of chemotherapy: short messages of tailored PA recommendation were sent through the third platform “Jiguang”, consisted of time, intense, frequency of PA intervention. Suggestions were concluded as well to remind participants reading information displayed on app, covering benefits of PA, precautions of diet and rest. For day 2-21, with indication of user behavior analysis on portal site, tailored short messages with content of PA, nutrition, sleeping and mental health support were deliver ed twice weekly. For each week, summary report of PA was texted to participants with encouraging words. When participants completed the aimed steps in the former course of chemotherapy, 1,000 more steps would be added in the following course. Goals of daily steps could proceed increasing until 10,000 steps after 3 months. Consistent with the theoretical framework, various flexible intervention strategies were applied through both app and short message sending, including PA behavior monitoring and feedback, improving self-efficacy, health education, overcoming the PA barriers, providing social support, encouragement and rewarding, and looking back of personal PA experiences.

After a 3-month remote mobile intervention, a mixed method was utilized to evaluate the effectiveness of MPAP. Using behavior of participants was monitored, and main outcome of participants’ PA behavior was collected through IPAQ. Secondary outcomes included PA self-efficacy, cancer-related fatigue, sleeping quality, mood status and HRQOL were assessed by subjective questionnaire. Qualitative interview was conducted by telephone to explore users’ feelings and advice. Quantitative results were analyzed using the paired t-test and Wilcoxon signed rank test by SPSS 16.0. Qualitative data was analyzed through content analysis.

3. Body

Twenty participants were included in this study. The mean age is 44.85±10.05 years. Thirteen of them had a high school or higher education. Mean of BMI was 23.44±3.72. Based on PA baseline evaluation, twelve patients were divided into active group, and eight patients were in sedentary group. The accumulated usage time of application was...
40 minutes, and the average login time was three times a week. Most of the time spent on knowledge browsing, in which headline information were read most. After three-month intervention, the total PA increased 945.70 MET-min/w with a significant improvement \( (P = .04) \). For levels of PA with different intensities aspect, walking displayed a statistically significant improvement after intervention (904.20 MET-min/w) \( (P = .03) \). Percentage of participants with sedentary lifestyle decreased from 40% to 10%, and percentage of participants with moderate PA/active lifestyle increased from 60% to 90%. For secondary outcomes, there was a significant difference in situational factors of exercise self-efficacy \( (P = .02) \) and depression \( (P = .02) \) between baseline and after PA mobile intervention. The qualitative interview from 5 patients indicated that, their cognition of PA improved, and gave positive feedback in terms of application interface, comprehensive education knowledge and intime feedback.

4. Conclusions

This pilot study shows the theory-based MPAP could facilitate PA behavior change, improve exercise self-efficacy, decrease sedentary time of breast cancer patients during chemotherapy. Qualitative results showed benefits of MPAP in enhancing patients’ PA awareness and engagement. Further evaluation of effectiveness of MPAP with a control group and large sample size is needed.

4.1. Acknowledgement

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