

Gamified Text Messaging Contingent on Device-Measured Steps: A Randomized Feasibility Study of a Physical Activity Intervention for Cancer Survivors THE UNIVERSITY OF TEXAS MDAnderson

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Introduction

- Most cancer survivors do not meet the recommended physical activity levels.
- Combining game design elements, wearable technologies, and behavior change theory may be a useful and scalable approach to promoting cancer survivors' physical activity.
- Self-Determination Theory (SDT) provides a framework for understanding how one's motivation affects adherence to health-related lifestyle behaviors.
 - Autonomous regulation, which includes enjoyment, is a strong predictor of physical activity.

Results

•We randomized 78 participants, 3 (4%) were lost to follow-up

The sample was mostly female and relatively well-educated. The mean age was 55.1 years (SD=13.5 years). Most participants were breast cancer survivors (58%) and the overall mean time since cancer diagnosis was 9.4 years (SD=7.3 years). Most participants were either overweight (46%) or obese (24%)

- •The median number of days to complete the journey for experimental group participants was 30 days; this ranged from 15 to 128 days (IQR = 23-51).
- •We identified 3 overarching themes in individual interviews (Figure 2)

Figure 2. Themes and subthemes identified in individual interviews with illustrative quotations

Results (continued)

• There was minimal loss to follow up (4%), the device wear rate was high (83.5% of days), and technical problems were limited.

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- Participants successfully navigated the technological aspects and game design elements of the intervention.
- Participants found messages targeting *autonomous motivation* and *competence/self-efficacy* to be enjoyable and compelling, but one feasibility criterion for participant engagement (response rate to text messages) was not met.

Aim

We created *Steps2Health*, an mHealth intervention that uses game design elements to increase autonomous regulation associated with physical activity in insufficiently active cancer survivors. The aim of this study was to evaluate the feasibility, acceptability and potential efficacy of Steps2Health.

Methods

- We randomized participants to an experimental or comparison group. All participants received a Fitbit Alta.
- Experimental group participants also received MMS messages that were triggered by step counts in real time.
- These messages presented photographs and vivid descriptions of actual, geographically accurate destinations along a tour of Japan's Inland Sea.
- Progress on the 166,000 step (approximately 83 mile) journey was determined by cumulative step count.
- Messages also presented content related to SDT constructs of *autonomy* (providing choice in optional mini-journeys), relatedness (role model narratives), and competence (selfefficacy-enhancing techniques).

 Limited technical difficulties Accessibility Appreciation of intervention's celebratory orientation



Enjoyed messages Increased motivation for physical activity Mixed indicators of engagement Seldom accessed

linked media content

14%

22%

Enable self-tailoring of

actual conversation

Carefully consider use

social modeling

Avoid mimicking

of social media

16%

- "Not a single issue. Worked straight up no problem...it was remarkable to me that there were no issues at all." -[67 year old male CLL survivor]
- "I'm not real big on exercising and it (Steps2Health) definitely was encouraging. One thing (that was encouraging) was hitting your markers when you've made it there, and there was interesting information... Having that didn't overwhelm me and I could make the markers they were setting up for me." -[38 year old female breast cancer survivor]
 - "It's very easy in survivorship to have the world be overwhelming, you fall behind. You move slower than before, and it helped keep it a priority. This was very helpful—some of these messages were

- Messages targeting *relatedness* were less highly rated than the messages targeting *autonomous motivation* and *competence/self-efficacy*.
- Multilevel modeling indicated:
- Both groups tended to increase *autonomous motivation* (B = 0.16; 95% confidence interval [CI] 0.01 to 0.30; P = 0.040; d = 0.49)

Figure 3. Assignment to the experimental group was associated with increased self-reported physical activity pre- to post-intervention (B = 10.78, 95% CI 3.54 to 18.02; P = 0.005; d = 0.64)



 We administered pre- and post-intervention surveys and conducted 15 individual interviews to evaluate the intervention. We performed mixed effects linear modeling and directed content analysis of these data, respectively, to pursue the study research I would recommend this program to a friend or questions

Figure 1. Example Steps2Health messages





The text messages with practical content fo ncreasing physical activity or confidence levels were useful to me

Autonomous

Motivation

really pleasant, and I wanted to see what was going to come next." -[67 year old male CLL survivor]

"I am coming from a year where fitness

wasn't my strong point after treatment but enjoyed the messages and was sad that it ended...I was excited to read the messages, I talked about them with my kids and it was like a family event. I showed them the milestones about the bridges we crossed. It was really neat." -[35 year old female cancer survivor]

"I was waiting for those messages every day... I feel like [Ruby] was my coach." -[45 year old female cancer survivor]

"Ruby, I just didn't do well on that. I am not one of those people who does a lot of texting." -[78 year old male prostate cancer survivor]

"The idea of selecting among two or three (role models) would be awesome, and that constructs. may be all you need. At most four. We aren't going to be chatting, so don't try to Steps2Health intervention, but fostering active ke we are chatting.' participant engagement and targeting relatedness ale CLL survivor] may present additional challenges. lo a group text... that way • Steps2Health may help cancer survivors increase eone was having a hard day their physical activity levels. ourage each other." nale breast cancer survivor] Acknowledgments in terms of responding to · Research supported by the Center for Energy Balance and Survivorship Research, Duncan Family Institute • Michael C. Robertson was supported by the National Cancer Institute of the National Institutes of Health under Award do not know—I just don't do Number F31 CA236433. The content is solely the responsibility of the authors and does not necessarily represent the

Figure 4. Assignment to the experimental group was associated with increased device-measured step count over the course of the intervention (*B* = 322.08; 95% CI 54.01 to 590.15; *P* = 0.019; *d* = 0.28)



Conclusions

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- This study supports the feasibility of using realtime game design elements to target SDT
- Findings generally support the acceptability of the



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The messages about the destinations presented at the journey checkpoints were enjoyable to me	8%	30%			62%	make it feel like we are chatting." -[67 year old male CLL survivor]	
The text messages about the destinations presented at the day trips were enjoyable to me	8%	35%			57%	"If we could do a group text that way	
The text messages from Ruby were enjoyable to me	24%	27%			49%	we could encourage each other."	
		25 F Strongly Disagree Disagr	50 Percentage	75 Agree St	100 rongly Agree	"My trust level in terms of responding to other people I do not know—I just don't d that." -[78 yr old male prostate cancer survivor]	