A PILOT TRIAL OF AN ESCAPE ROOM GAME TO COMBAT CANCER NUTRITION MISINFORMATION

Maya Pande, BS; Rachel Moran, PhD; Jin Ha Lee, PhD; Julie Kientz, PhD; Sarah Yarborough, MPH; Nisha Devasia, MS; Lynn Symonds, MD; Chris Coward, MPA; Megan Shen PhD

Fred Hutch Cancer Center

W UNIVERSITY of WASHINGTON

NIH NATIONAL CANCER INSTITUTE

INTRODUCTION

- Cancer nutrition misinformation – inaccurate or misleading information about nutrition related to cancer and/or cancer treatment - has become increasingly prevalent and poses a public health threat to many cancer patients.[1,2]
- Nutrition misinformation is widespread, with one study finding that health claims such as prevent (41.8%), treat (27.2%), and cure (10.7%) cancer and phrases such as "anti-cancer" or "cancer-fighting" were common among recipes posted to the website Pinterest.[3]
- Education alone is rarely effective for combating misinformation. Gamification as an alternative to education is a promising target in this field. It allows patients to learn new skills in a psychologically non-threatening way.[4]

The overarching goal of the present study was to pilot test an escape room intervention designed to reduce breast cancer patient vulnerability to believing cancer nutrition misinformation.

SPECIFIC AIMS

Aim 1: To evaluate the feasibility (1a), acceptability (1b), and usability (1c) of the escape room game intervention among breast cancer patients in active treatment.

Hypothesis 1a: For feasibility, ≥50% of screened eligible patients will enroll in the study.
Hypothesis 1b: For acceptability, ≥70% of patients will rate the intervention as satisfactory (e.g., a "7" or higher on a 10-point Likert scale) on a 10-point Likert-scale item assessing how satisfied they are with the intervention and will recommend this game to others.
Hypothesis 1c: For usability, ≥70% of patients will have a System Usability Score (SUS) of ≥68.

Exploratory Aim 2: To test preliminary efficacy of the escape room game intervention for increasing awareness about types of online misinformation, concern about misinformation, and confidence in the ability to identify misinformation as well as decreasing cancer nutrition misinformation beliefs.

Hypothesis 2: Cancer patients will report increases in awareness about types of online misinformation, concern about misinformation, and confidence in the ability to identify misinformation and reductions in believing cancer nutrition misinformation from pre- to post-intervention.

METHODS

- This study includes n=43 patients with a current diagnosis of stage I to III breast cancer in active treatment.

- The Escape Room Game Intervention
  - Virtual escape room game designed to teach participants how to discern whether cancer nutrition information is accurate or may potentially be misinformation.
  - Follows a fictional company ("ZenFusion Wellness") that is trying to sell its nutritional product (The "Evergreen Diet").
  - Groups of 3-5 participants work together to solve puzzles that teach them common tactics used to spread information.
  - Teams "decode" sensationalist ad headlines to find a password that leads them to the next puzzle.
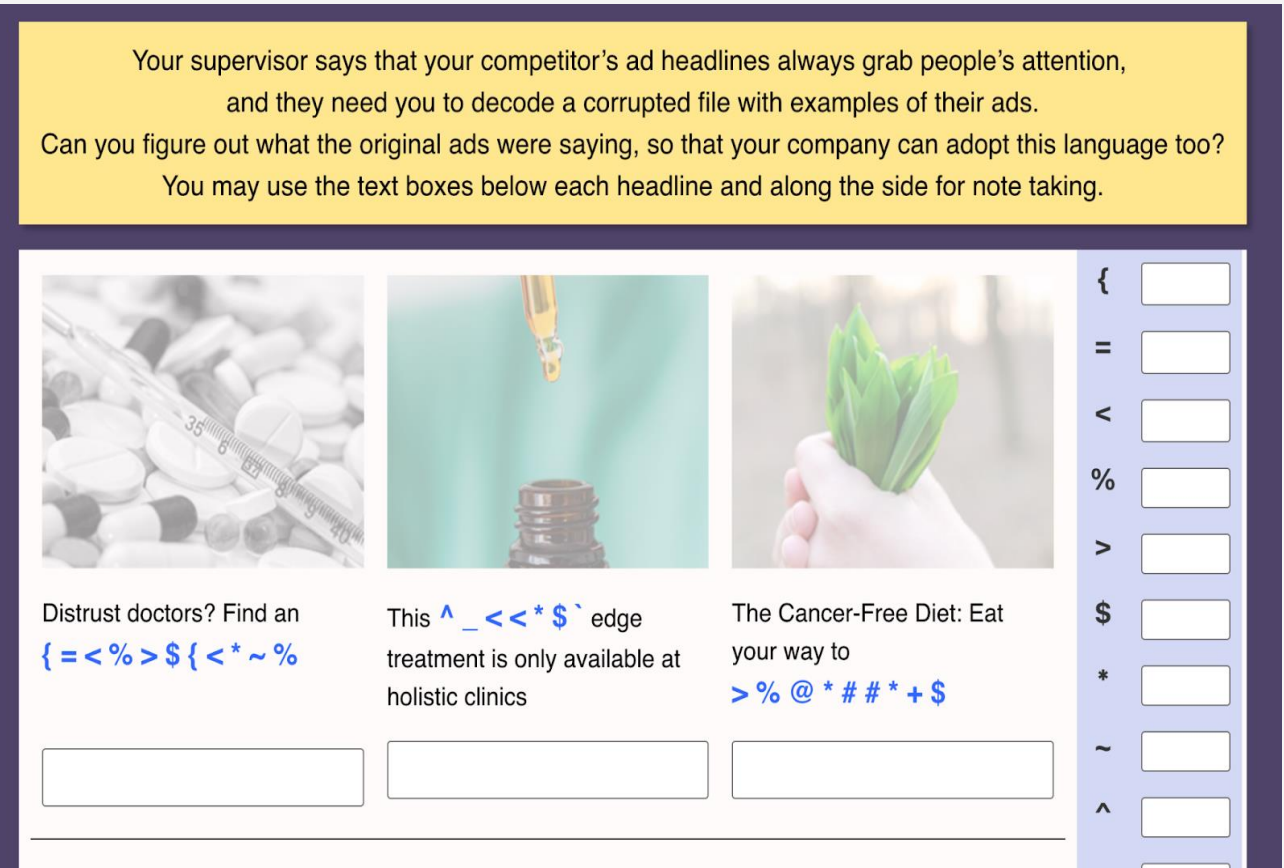

Figure 1. Escape Room Puzzle

- Participants completed an initial baseline survey, and a post-game debrief interview and survey after participating (~ 1 week post-intervention).
- Intervention feasibility was examined by conducting frequency and percentage of enrollment.
- Acceptability and usability means were calculated from multiple Likert-scale items in the post-intervention assessment.
- Potential efficacy was assessed through multiple outcomes mean scores and through mean score differences from pre- and post- intervention assessments. Mean score differences were analyzed using one-tailed paired samples t-tests, with an alpha level=0.05.
- Two trained coders within the research team conducted a grounded thematic analysis of transcripts taken from the debrief. Researchers open coded the full set of transcripts to identify initial themes and points of interest using Braun and Clarke's[5] thematic analysis. Researchers used collaboration software Miro to cluster data and identify themes and connections to form the basis of a thematic codebook (Table 6).

RESULTS

Feasibility

Percentage of screened eligible participants that enrolled in the study	97.9% (45 out of 46)
Percentage of screened eligible participants that completed all game assessment	95.6% (43 out of 45)

Acceptability

How satisfied were you with the Escape Room game? Not at all satisfied (1) – Very satisfied (10)	Mean = 6.8 (SD = 2.34)
How likely are you to recommend the game to someone else (friend, family member, other cancer patient)? Not at all likely (1) – Very likely (5)	Mean = 3.1 (SD 1.31)

Usability

SUS Scale Total possible score range: 0-100 (A score ≥68 is considered above average usability and is used as the cutoff in this study)	Mean = 59 (SD = 19.7)

Table 1: Feasibility, Acceptability, and Usability Ratings from patients enrolled in Escape Room Phase 1. Data is from all patients (N=43) who completed their post-game interview.

Please indicate how you felt while playing the game for each of the items on the following scale:
Not at all (0) – Extremely (4)

Competence	Mean = 2.3 (SD = 1.15)
Sensory and Imaginative Immersion	Mean = 2.3 (SD = 1.09)
Flow	Mean = 2.0 (SD = 1.07)
Challenge	Mean = 1.9 (SD = 0.91)
Positive Affect	Mean = 2.6 (SD = 1.05)

Table 2: Game Enjoyment ratings from patients enrolled in Escape Room Phase 1, grouped by measured component type. Data is from all patients (N=43) who completed their post-game interview.

After playing the escape room game and participating in the debrief...
Strongly disagree (1) – Strongly agree (5)

I am more worried about accidentally believing misinformation	Mean = 2.1 (SD = 1.13)
I am more worried about accidentally sharing misinformation online	Mean = 2.0 (SD = 1.18)
I am more concerned about misinformation in society	Mean = 3.7 (SD = 1.24)
I feel more confident in my ability to identify misinformation	Mean = 3.6 (SD = 0.98)

Table 3: Concern about Misinformation and Confidence in Identifying Misinformation, assessed post-game. Data is from all patients (N=43) who completed their baseline and post-game interview.

Please read the statements below and indicate the degree to which you disagree or agree using the following scale: Strongly disagree (1) – Strongly agree (7)	Pre-Game Mean Score (SD)	Post-Game Mean Score (SD)	P-value
I trust the health information I get from my doctor	6.0 (1.12)	6.3 (0.93)	**0.007**
I trust the health information I read on the Internet	3.7 (1.06)	2.7 (1.11)	**<0.001**
I trust the health information I read about in the newspaper	3.9 (1.19)	3.3 (1.14)	**0.003**
I am more likely to trust information I get from the Internet than I am the information I get from my friends	4.0 (1.62)	2.9 (1.35)	**<0.001**
I am more likely to trust information I get from the Internet than I am the information I get from my doctor	1.8 (0.83)	1.3 (0.69)	**0.002**

Table 4: Trust and Information Seeking, assessed pre- and post-game. Mean score differences pre- and post- game are assessed for statistical significance, using one-tailed paired samples t-tests with an alpha level of 0.05. Significant mean differences are presented in bold.

RESULTS

	Pre-Game Mean Score (SD)	Post-Game Mean Score (SD)	P-value
Cancer Nutrition Information Beliefs	3.6 (0.68)	3.8 (0.73)	**<0.001**
Confidence/Comfort Sharing Information with a Medical Professional	5.7 (1.20)	5.9 (0.94)	**0.023**
Awareness of Misinformation	5.8 (0.81)	6.2 (0.85)	**0.003**

Table 5 Additional individual outcome measures assessed pre- and post-game. Mean score differences pre- and post- game are assessed for statistical significance, using one-tailed paired samples t-tests with an alpha level of 0.05. Significant mean differences are presented in bold.

Thematic Code	Example Quotation
Sources of trusted information	"I feel like I've got a little bit of wisdom behind me and I don't trust until I... run it by my doctor and see what the doctor has to say about it."
Sources of misinformation	"And they're [social media influencers] really good. Like they're spokespeople, right? That's what they are. But they do it in a way that feels more intimate than like a commercial on a TV."
Factors driving misinformation belief	"The misinformation offers a lot of certainty, you know, like here's a cure, like, do this one easy thing and you're done."
Affective experience of cancer + information seeking	"It definitely is overwhelming and there's so much information out there and I have a really hard time trusting the things that I read. But at the same point you know it's 'How do I stay healthy through this whole process and do the right things?'"
Game feedback - user experience	"I think that the games were really fun. I think it's a great way to learn."
Game feedback - takeaways from playing the game	"And I think that's where too, like that going back to the headlines [puzzle]. That's where the emotional like, where it really gets you is when they feel powerless and you know when it's like—I'm reaching for something , 'And I just thought I'd get you 70 boxes of tea because I hear it's full of antioxidants and that's great, thanks.'"
Game feedback - narrative	"I think that those [storylines] do ring a bell. I mean, you see that all the time, bad marketing, things on the Internet that are supposed to cure cancer and things like that for me."
Game feedback - individual differences in experience	"You're much younger than I. And so I think that people who are brought up on these games and know how to play these games are going to be much more adept."

Table 6 Qualitative themes identified through open coding that were used to create a codebook applied to the qualitative transcripts from post-game debrief sessions.

CONCLUSIONS

- High feasibility scores (95.6% to 97.9%) suggest game-based interventions are attractive to cancer patients, though acceptability (mean = 6.8) was found to be slightly lower than the cutoff (7 or higher on a 10-point Likert scale), and only 34.9% of participants had an SUS score of 68 or more (cutoff for acceptable usability).

- Positive movement on misinformation-related measures including awareness of misinformation and confidence in spotting misleading nutrition information indicates the approach of the game—collaborative, awareness based, tactics focused—holds potential for navigating the fine line between increasing healthy skepticism towards (particularly online) sources without leading to overall distrust and a lack of discernment between sources of information. This is reinforced by the higher reported levels of trust in authoritative sources like a patient's medical team and increased skepticism of (often unverified) online sources of information.

- Study limitations included players' awareness that their participation was part of efforts to improve on the game, which may have contributed to lower acceptability and usability scores. Population also consisted of highly educated individuals (88.3% were college graduates and 51.1% had completed a post-graduate/professional degree) with access to healthcare assistance (including nutrition information) during their cancer journey, who may not have benefitted as greatly from the intervention.

- Future iterations could test the intervention with a more diverse population, particularly looking to test it with patients who have lower levels of access to healthcare and lower digital and medial literacy.

References
1. Swire-Thompson B, Lazer D. Public Health and Online Misinformation: Challenges and Recommendations. Annu Rev Public Health. 2020;41:433-451.
2. Grimes DR. The Struggle against Cancer Misinformation. Cancer Discov. 2022;12(1):26-30.
3. Warner EL, Basen-Engquist KM, Badger TA, Crane TE, Raber-Ramsey M. The Online Cancer Nutrition Misinformation: A framework of behavior change based on exposure to cancer nutrition misinformation. Cancer. 2022;128(13):2540-2548.
4. Yang S, Lee JW, Kim HJ, Kang M, Chong E, Kim EM. Can an online educational game contribute to developing information literate citizens? Comput Educ. 2021;161.
5. Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. Qualitative research in psychology, 3(2), 77-101.