Gingerman Challenge: A Persuasive Game for Promoting Adequate Sunlight Exposure for Office Workers

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ABSTRACT
In this paper, we present Gingerman Challenge, which is a persuasive mobile game designed to promote moderate sunlight exposure. The design goals of Gingerman Challenge are to help players to recognize the merits of sunlight exposure and to promote maintenance of healthy vitamin D levels. We aim to accomplish these goals by incorporating both casual gaming features and the design principles drawn from preliminary user interviews.

Author Keywords
Persuasive game; casual game; health game; behavior change; vitamin D; sun exposure; design for moderation

ACM Classification Keywords
H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous.

INTRODUCTION
Vitamin D deficiency has become a worldwide problem. The National Health and Nutrition Examination Survey (NHANES III) revealed that three-quarters of U.S. teens and adults are deficient in vitamin D. The sun's UV-B rays enable skin cells to manufacture vitamin D, which is essential to absorb calcium and phosphorus from diet. A lack of vitamin D can cause bones to become weak, which might lead to bone deformities.

To reach the recommended level of vitamin D, people should expose themselves to a moderate amount of sunlight. However, it is complicated to determine 'How much sunlight is adequate?', because not only environmental factors such as weather and location, but also individual factors such as skin color and sunscreen use can affect the amount of ultraviolet radiation received and vitamin D synthesis. Thus, even though individuals feel the necessity of sun exposure, it is difficult to recognize 'how long they need to be exposed' and 'how to minimize the risk of sun exposure such as skin cancer' at the same time.

To address this challenge, we propose a persuasive game, Gingerman Challenge (GC), which aims to encourage players to get adequate sunlight exposure in more playful and less complicated ways. Previous research and applications, such as Sundroid [1] and SunSmart [2] have mainly focused on protecting users from overexposure to sunlight and on informing the current UV index and its dangers. GC provides personalized recommendation, the adequate time range (e.g. 11AM to 3PM) and duration (e.g. 30mins) for sun exposure, by integrating real-time environmental data (weather, location) and individual characteristics (age, skin color, sunscreen use). We use a 'Baking Oven' metaphor in game design, in which the sunlight exposure is regarded as the heat for baking a gingerman cookie. The mission of this game is to bake a gingerman by getting the adequate amount of sunlight: not to let it burn (overexposure to the sun) nor under baked (insufficient exposure). After comparing the recommended sun exposure time and the actual exposure duration at the end of each day, only a player with the adequate amount of sunlight is awarded for his/her achievement.

DESIGN PRINCIPLE
Four design principles to develop GC were drawn from user interviews. Because there is limited amount of research on managing sun exposure, we think it is essential to obtain opinions of potential users. We recruited five full-time students and five full-time office workers who spent most of their daytime indoors.

1) Provide personalized and practicable information
Most interviewees were fairly aware of the benefit and the necessity of the adequate sun exposure. However, they did not know how exactly they could put this knowledge into practicable action. Thus, GC should provide practicable and personalized information for each player after collecting environmental and personal data in unobtrusive ways.

2) Design for moderation: sun block vs. sun exposure
Because both blocking and catching the sun are equally important, keeping to the middle between them is tricky. The female interviewees were especially afraid of getting freckled or sunburnt by overexposure to the sun. Thus, it should help players to exercise the moderation, which enables them to enjoy the merits of sun exposure as well as stay safe from the harmful effects of the sun.

3) Integrate with daily routines
Some interviewees hinted that it would be hard to make them adopt and engage in new target behavior. Thus, GC should be integrated into the daily routines of players. Therefore, we select one of daily routines of potential users, checking up the daily weather, which should mingle well with our game because daily weather usually determines the optimal daily sun exposure duration.

4) Provide alternative options to supplement vitamin D
Interviewees pointed out several unavoidable situations for playing GC, such as bad weather conditions, business duties and class works. Therefore, when a player inevitably misses a chance to get sunlight, GC should suggest alternatives to supplement insufficient vitamin D, by recommending the food that contains vitamin D, such as fish oils, milk or vitamin D supplements.

**GINGERMAN CHALLENGE**

Gingerman Challenge is a persuasive mobile game aiming to promote players to get moderate amount of sunlight for maintaining healthy vitamin D levels.

**CONCLUSION AND FUTURE WORKS**

Because sun exposure is beneficial and detrimental at the same time, moderating between them can be quite tough. Thus, we propose a persuasive mobile game, Gingerman Challenge, to promote players to expose themselves to the moderate amount of sunlight with practicable and personalized recommendations. The current contribution of this study is the design principles and the game design aiming to encourage players to get adequate sunlight exposure, which could inform the design of various persuasive systems that needs to consider deficiency and overdose. In the future, we plan to complete the whole components of GC and conduct the field evaluation study to test its efficacy and appeal.

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**REFERENCE**