Sensors and Materials, Vol. 35, No. 5 (2023) 1539–1546
MYU Tokyo

S & M 3267

Development and Evaluation of Diet- and Health-themed Board Game Products for the Elderly

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(Received July 26, 2022; accepted April 13, 2023)

Keywords: seniors, board game, design-based research

In this study, we employed design-based research (DBR) to develop a board game aimed at seniors. The board game, named "Eat for Good Health", offers three game modes, ranging from basic to advanced, to allow players to choose the appropriate mode based on their abilities, time constraints, and activity preferences. Additionally, players can use QR codes in place of event cards and scan them to access more information and videos about healthy eating and disease prevention. To determine players' satisfaction with the board game, 37 graduate students were selected to serve as senior board game instructors and help teach seniors how to play the game. A survey questionnaire was used to collect feedback from players, with a six-point Likert scale used for analysis. The scale consisted of 12 questions and the average score was above 5, indicating that participants had a positive view of the board game product. This study highlights the importance of considering the vision and legibility of elderly individuals in product design. It also suggests that board games can be integrated with lectures on diet and health in future health promotion efforts.

1. Introduction

Population aging is a common global issue. The World Health Organization (WHO) introduced the concept of "active aging" in 2002 and plans to promote the concept of "healthy aging" in the next decade (2021–2030) (https://www.who.int/health-topics/ageing) to promote the welfare policy for elderly populations and to improve the quality of life in old age as an international consensus. Taiwan became an aged society in 2018 and its super-aged population (85+ years old) accounted for 10.5% of the elderly population in 2021. Taiwan is expected to enter a super-aged society by 2025.(1) Therefore, our country advocates for community care and encourages elderly individuals to engage in community activities to enhance their overall health. Research conducted in Taiwan regarding elderly individuals indicates that their mental health tends to improve as they participate in more activities, particularly those related to leisure and entertainment. Furthermore, those who engage in leisure and learning activities tend to have a higher quality of life.(2–4)

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https://doi.org/10.18494/SAM4050

ISSN 0914-4935

A guide for seniors to prevent dementia was developed by Chen *et al*.,[5] who stated that the principle of dementia prevention involves "three activities and two highs". The three activities being referred to are mental activities, leisure activities, and aerobic exercises, while the two highs are high learning and high-antioxidant food.[5] Tabletop games (board games) are leisure games that can strengthen hand-eye concentration and can be played with as few as two or three people. They rely on three core elements by using one's hands, mouth, and brain, which meet the three principles of mental activities, leisure activities, and higher learning. They also meet the need for social interaction among the elderly. Therefore, board games are suitable home leisure activities for elderly populations.

In a large French study, which followed 3675 residents over the age of 65 for 20 years, researchers found that those who participated in board games had a 15% lower risk of dementia than those who did not.[6] Board games improve blood flow to the brain, concentration, and thinking skills, and slow down dementia and/or memory loss.[7,8] The study conducted by Lin also demonstrated that board games can strengthen cognitive skills, such as orientation, attention, memory, and language skills.[9] Activating brain function and preventing dementia are the primary reasons why middle-aged and elderly individuals become interested in playing board games or taking related courses. Participating in board games with friends can also increase the motivation to engage in this activity, as it provides an opportunity to share in the fun together.[10] Therefore, the interventions with elderly board games can help revitalize the brain and promote social participation.[11]

When board game products are designed or when gaming activities are held, consideration should be given to the players' interests, age, characteristics, and individual needs.[12] In their six-week action research on board games for the elderly, Gau and Hsiao found that the process of playing board games can bring satisfaction and concentration for seniors;[13] however, the main difficulties seniors faced were individual differences and physical deterioration. Many elderly people do not have ideal memory and concentration, and their learning speed and effectiveness may differ from those of younger groups when learning to play the same board game. Therefore, appropriate assistance should be available for addressing the obstacles to learning during the teaching process. During the game, it is recommended that simple physical movements be added to relax the muscles and bones, depending on the physical condition of the elderly players, so that the board game can have the leisure effect of both movement and stillness.[13] Therefore, board games suitable for the elderly should consider the factor of physiological aging. Game accessories and card fonts should not be too small to remove or to read or operate. The rules should be simple and easy to learn, and players should be able to select the difficulty level according to their preference. If the game includes interactive, fun, and resonant elements, it can increase the elderly players' interest in participating. Presenting important health information in a manner that is easy to understand makes it more accessible for elderly individuals to participate.[14,15] Technology can also be incorporated into board game products to offer more diverse experiences and information.

There are only a few health-themed board game products in Taiwan designed specifically for the elderly. In light of this, we aimed to develop a healthy diet and disease prevention board game that meets the needs of elderly populations, allowing the elderly to learn health promotion

concepts while playing in a fun and relaxing context. Through testing activities and questionnaires, the players' satisfaction with the product was also determined, which can be used as a reference for the subsequent optimization of the board game and the development of health promotion activities suitable for the elderly.

2. Materials and Methods

In this study, we used design-based research (DBR) to develop a board game for seniors. The "Eat for Good Health" board game was tested, and players' opinions were collected using a survey questionnaire as a reference for subsequent promotion.

2.1 DBR

Working with seniors over 65, who can use smartphones, as the research subjects, we used DBR to develop board games for seniors to create and promote a suitable product through analysis, design, test, evaluation, and repeated modification (Fig. 1). Considering the characteristics and needs of the elderly in Taiwan, a diet- and health-themed board game, "Eat for Good Health," was developed, in which the elderly can familiarize themselves with daily dietary requirements while playing and training their memory and reaction ability.

2.2 "Eat for Good Health" board game

The board game "Eat for Good Health" includes six categories of nutrient cards and puzzles, five health plates, event cards with three themes, a game map, QR code cards, tokens, and dice. QR code technology is integrated into the board game to enhance the health concept for elderly individuals.

2.2.1 QR code technology

Owing to the limited amount of information that can be placed on board game cards, web pages related to health and elderly topics were provided instead. With the widespread use of QR code applications in daily life, numerous easy-to-use QR code generator resources are available online. For this study, a free online QR code generator was utilized to link the supplemental health information webpages, and the generated QR codes were printed on the board game cards. Players can scan the QR codes using their mobile phone cameras or QR code scanner apps to access additional details.

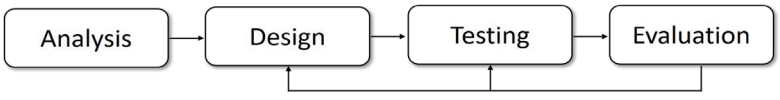

Fig. 1. Process of product development.

2.2.2 Game rules

The board game provides three game modes, from basic to advanced. Players can choose a suitable mode according to their abilities, time duration, and activity needs. In this study, advanced modes were used for board game tests. This board game combines card flipping and pairing, a game map, and event cards to win the corresponding nutrients for an individual's health plate. The event cards are divided into three themes to reflect the characteristics and needs of the elderly: balanced eating, prevention and treatment of sarcopenia, and chewing and swallowing. Players can choose themed event cards according to their interests and needs, and then incorporate them into the game (Fig. 2). Furthermore, players can apply QR codes instead of event cards. One of the events is automatically displayed after the mobile phone scans a QR code (Fig. 3). Also, players can scan the QR code on the cards for more information and videos about healthy diet and disease prevention (Fig. 4).

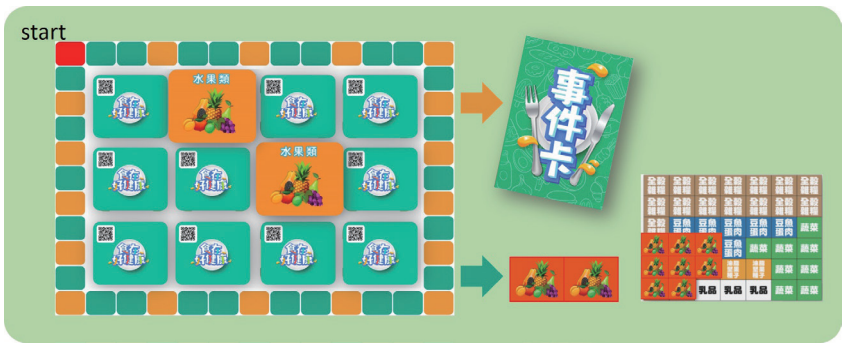

Fig. 2. (Color online) "Eat for Good Health" board game.

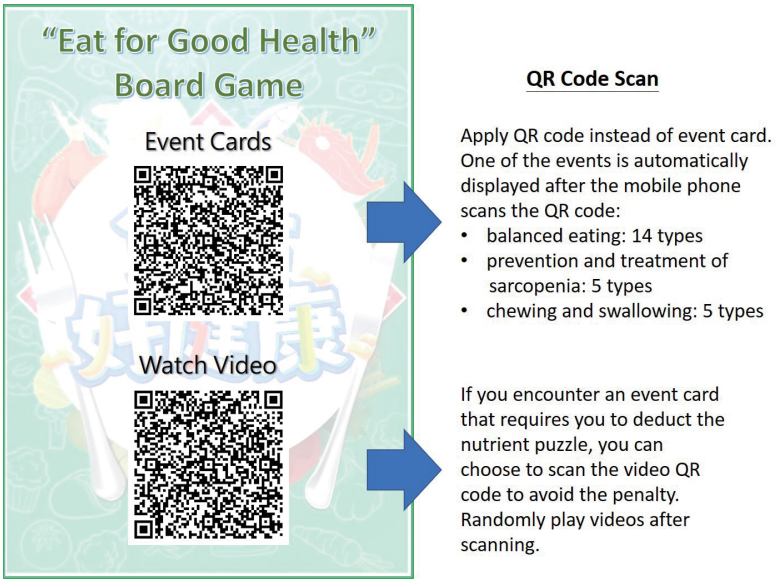

Fig. 3. (Color online) QR code instead of event cards.

Fig. 4. (Color online) Video watching QR code on cards.

2.3 Research tools

A six-point Likert scale was used in the survey questionnaire to collect players' opinions, with "1" to "6" indicating "strongly disagree" to "strongly agree", respectively. A higher score indicated a higher degree of agreement with the given statement. The scale consisted of 12 items and had been reviewed by experts to ensure content validity. The preliminary reliability analysis of the questionnaire showed a Cronbach's alpha value of 0.863, indicating the high reliability of the scale.

3. Participants

In this study, 37 graduate students were chosen as test participants, all of whom were qualified to act as senior board game instructors to teach elderly individuals how to play the game. The gender ratio of the participants was approximately 1:3 (male to female), as shown in Table 1. The ages of the participants ranged from 22 to 48 years old, with an average age of 32.35. Out of the participants, 10 were over 40 years old, 10 were between 30 and 39 years old, and 17 were under 30 years old (Table 2).

4. Results

The scale, which contains 12 items, had an average score higher than 5 and 3 of its items were higher than 5.5 on average, indicating that players agreed that "This board game is not difficult

Table 1
Gender distribution of research subjects.

	N	%
Male	9	24.3
Female	28	75.7
Total	37	100.0

Table 2
Age distribution of research subjects.

	N	%
20–29	17	45.9
30–39	10	27.0
40–49	10	27.0
Total	37	100.0

Table 3
Descriptive statistics of board game satisfaction.

	N	Min	Max	Mean	SD
1. I think board games related to health/nutrition are meaningful.	37	4	6	5.49	0.607
2. This board game makes me want to learn more about health/ nutrition knowledge.	37	4	6	5.14	0.631
This board game makes it easier for me to understand the relationship between health and nutrition.	37	4	6	5.30	0.618
4. This board game is helpful for my health/nutrition study.	37	3	6	5.08	0.759
5. This board game makes me want to learn more about health/ nutrition.	37	3	6	5.08	0.829
6. The rules of the board game are clear and easy to understand.	37	4	6	5.49	0.607
7. This board game is not difficult for me to operate, and it does not take much time and energy.	37	4	6	5.51	0.651
8. The contents of this board game are generally readable in terms of font and pattern design.	37	3	6	5.57	0.689
9. This board game is fun for me and I would like to play it again.	37	4	6	5.30	0.661
10. I will recommend this board game to others or play it with others.	37	4	6	5.46	0.650
11. I would suggest relevant institutions to purchase this board game for health/nutrition courses or activities.	37	4	6	5.65	0.538
12. I would like to participate in similar health/nutrition learning activities in the future.	37	3	6	5.11	0.737
Valid N (listwise)	37			5.35	0.665

for me to operate, and it does not take much time and energy (5.51)", "The contents of this board game are generally readable in terms of font and pattern design (5.57)", and "I would suggest relevant institutions to purchase this board game for health/nutrition courses or activities (5.65)". There were two low scores that also met the agreed criteria, namely, "This board game is helpful for my health/nutrition study (5.08)" and "This board game makes me want to learn more about health/nutrition (5.08)". The Cronbach's alpha value of this preliminary reliability analysis was 0.879, indicating that the scale had high reliability (Table 3).

5. Discussion and Conclusions

This study aligns with previous literature in its approach of conveying health information to the elderly in an interactive and engaging manner, which makes it easier for them to accept the concept of healthy eating in a relaxed setting. When designing board games for the elderly, it is important to consider their specific needs and provide gameplay with varying levels of difficulty. Additionally, it is important to take into account the eyesight and hand flexibility of the elderly by enlarging card size and font and focusing on images, with text as an aid, to facilitate their access and readability of the game components. Regarding the above findings, the participants felt positive about this board game product. Players agreed that this diet- and health-themed board game is meaningful, the rules of the board game are clear and easy to understand, and the difficulty of operation is appropriate. Board game activities have been found to be beneficial for the elderly in terms of training hand-eye coordination, alleviating dementia, and fulfilling their social interaction needs. Therefore, board games are suitable as a daily leisure activity for the elderly. The results of this study indicated that the participants were not only willing to recommend the game to others, but also suggested that institutions should purchase the board game to conduct related course activities.

This research suggests that when developing board games for the elderly, it is important to consider their visual needs and legibility, as well as the amount of information that can be included on game cards. The integration of QR codes into the game can expand the knowledge content of the game and make learning about nutrition and health care more enjoyable. Combining relevant lectures on diet and health with the board game can also enhance the activity. However, the limitation of this research is that only players' satisfaction surveys and self-assessment were conducted, so it is not possible to directly infer the effectiveness of the board game in improving the health concept of the elderly. A single-group pre- and post-test design could be conducted in the future to better understand the effect of the board game on players' health concept.

Acknowledgments

This research was part of the project of "Research on Design, Development, and Application of Board Games for the Elderly: Taking Diet and Health as an Example" of the National Science and Technology Council, R.O.C.

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