A Study of Falls Prevention Education design for the Elderly

-Centred on the Development of Teaching tools

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Abstract

With the accelerating global aging population, preventing falls in older adults is becoming a top public health priority. Falls are an important issue affecting the health and quality of life of the elderly. This study investigated the design of effective teaching aids for fall accident prevention education for the elderly, and investigated existing methods and techniques to develop and design a card design for fall accident prevention education for the elderly. First, a literature survey was conducted to understand the definition and classification of disaster prevention design, the importance of fall accidents, and fall accident prevention education for the elderly as the theoretical basis for this study. Second, the current status of disaster prevention education programs for the elderly was analyzed by investigating and analyzing the cases of disaster prevention education for the elderly, which were divided into three types of case studies: education and training, technology application, and public awareness disaster prevention education. However, despite the interest in older adult education in general, there is little information on the design of educational materials specific to older adult disaster preparedness education. This may be because disaster preparedness education is often integrated into a broader older adult education curriculum rather than designed as a stand-alone course with materials. It is also possible that disaster preparedness education is more hands-on and experiential than theoretical, and therefore does not have a specific textbook. This is an area for further research.

In this study, through an innovative teaching method of game-type card teaching aids, the elderly learn and master prevention knowledge in a relaxed atmosphere through interaction and entertainment, and put forward evaluation indicators and principles. It can effectively improve the fall prevention awareness and skills of the elderly and reduce the incidence of fall accidents.

Key words: elderly, falls, prevention education, prevention design, cognitive, cognition

I. Introduction

Falls are one of the leading causes of serious injury and death among older adults. In 2016, 2,746 cases of falls were reported to CISS, accounting for 47.4% of all safety incidents among older adults, with more than 2,500 cases reported each year for the past three years （As shown in Table 1）(Korea Consumer Agency, 2017). According to the National Health Insurance Statistics, the out-of-pocket medical expenses of the elderly aged 65 and over will be 23.5% in 2021, an increase of 0.3% year-on-year (Centers for Disease Control and Prevention, 2021)

Table 1. 2017 Elderly Safety Incident Analysis

Accident types	Number of safety incidents	Percentages
Falls	2,746	47.4%
Food and anomalous object	913	15.8%
Other physical impacts	723	12.5%
Product-related	666	11.5%
Other	535	9.1%
Fire-Burns	212	3.7%

Traditional education methods such as lectures and notebooks, while effective, often lack interactivity and fun and struggle to hold older adults' attention. Game-based card education offers a new approach to preventive education by combining education and entertainment. The purpose of this study was to design a game-based card teaching aid for fall prevention in older adults and evaluate its educational and preventive effectiveness. The development of educational teaching aids for older adults is an important area of research.、

II. Theoretical Discussions

1. Disaster Prevention design

Disaster prevention design is defined as design that prevents various forms of disaster or protects people and property when disaster strikes, minimizing damage and facilitating recovery. According to the response to disasters, it can be divided into ① mitigation and prevention design ② preparedness design ③ response design ④ recovery design (Hwang-Woo Noh,IJoC,2014, pp.54-61). This study belongs to prevention design as it proposes a game design that enhances cognitive training for the elderly to increase their awareness of fall accidents.

2. Elderly and fall definitions

The World Health Organization (2018) defines the elderly as those aged 65 years and older, with adjustments to the age limit based on physiological and psychological characteristics (naver).

A fall is an unintentional and involuntary change of position due to any cause, resulting in a sudden loss of balance and landing on the floor or other lower plane (World Health Organization, 2016).

3. Definition and Meaning of Education and Disaster Prevention

Education (教育, English: Education) or teaching is the activity of teaching and learning knowledge or skills necessary for human life. In a broader sense, education can be seen as "all actions and experiences that influence the formation of an individual's mind, character, and abilities".

Disaster prevention education is a part of safety education to ensure the safety of citizens from various hazards, and it aims to induce them to take actions to ensure their own safety against disasters, so that they can expect to benefit the safety of other people or the community in the event of a disaster (Hyejin Kim, 2013).

The purpose of disaster prevention education is to cultivate basic disaster response capabilities based o

n learning the principles of natural disasters and understanding local disaster characteristics and disaster pre vention systems (National Institute for Disaster Prevention Research, 2006).

III. Case Analysis of Senior Disaster Preparedness Educations

1. The Case for Senior Disaster Preparedness Education

In Korea, various types of disaster prevention education programs for the elderly are being implemente d to help them protect themselves and respond safely in the event of a disaster. This study examines disast er prevention education programs for the elderly in terms of the form of promotion and classifies them int o three main types.

① Training. It aims to increase the awareness and capabilities of the elderly in disaster prevention thr ough community and governmental activities and education. Methods include regular lectures and mock dril ls. Lectures are regular lectures on disaster prevention held at community centers or government department s, where experts are invited to explain disaster knowledge and response methods. Simulation drills are orga nized so that the elderly can improve their practical skills by directly participating in disaster simulation dri lls such as fire evacuation and earthquake evacuation.

② Technology Application. Utilize high-tech means to enhance the effectiveness and coverage of disas ter prevention education. Virtual reality (VR): Simulate various disaster scenarios through VR technology so that older adults can learn coping skills in a virtual environment. Mobile phone applications (apps): Devel op disaster education apps to provide disaster knowledge, emergency preparedness tips, and interactive learn ing. Online courses: Provide online disaster education courses for older adults.

③ Public awareness. Disseminate disaster prevention knowledge through media and public events to in crease disaster awareness among older adults. Media campaigns include: Utilize platforms such as television, radio, newspapers, and social media to disseminate disaster knowledge and emergency instructions. Inform ation dissemination: Provide disaster information and emergency guidance by putting up disaster prevention posters and distributing pamphlets in public places.

Table 2. Types of Disaster Prevention Education for Elderly in Korea

Form	Type	Case	Educational content	Pictures

Training	Regular Lectures	"Safety in Mind" Safety Class for Senior Citizens (Namdong Fire Department)	- Apartment Fire Evacuation Tips & More - Fire safety training - Digital education, such as how to use cell phones and kiosks - Distribution of safety materials and promotional items with first aid QR codes.	 *https://fpn119.co.kr/213438*
	simulation exercise	“Joint fire drill and fire safety training at the Korea Senior Citizens Center” (Hadong Fire Station)	- Fire safety measures for elderly-related facilities during the winter season when the risk of fire increases - Intensive promotion to prevent damage to human life and property, and fire safety education such as cardiopulmonary resuscitation	 *https://fpn119.co.kr/193180*

Technology Application	VR	“Discover Traffic Safety VR Content (Korea Safety Education Association)	- Pedestrian Safety - Drunk Driving Experience - Major Scooter Safety - Lower School Safety - Bus Safety	 https://blog.naver.com/ksea1004/223083801391
	APP	Elderly and Vulnerable Safety OX Quiz Content (Korea Safety Education Association)	Take this quiz to learn about the causes of safety accidents and how to prevent them, so that you can memorize safety common sense.	 https://post.naver.com/viewer/postView.naver?volumeNo=37261421&memberNo=19462446&vType=VERTICAL
	online education	Traffic Safety Education for the Elderly (Korea Transportation Safety Authority)	1. Never jaywalk!!! 2. Wear light-colored clothes in winter! Please keep the elderly safe!!!	 https://www.youtube.com/watch?v=WgN7FC2JO_k
Public awareness	Television, media	Tips to Prevent Falls in the Winter for Older Adults (Department of Public Safety)	It's important for seniors to develop the habit of recognizing the most common fall situations, and to be prepared to prevent and respond safely to accidents.	 https://www.safetv.go.kr/base/video/view?idx=1805
	Posters, teaching materials	Safe Life for Seniors ((Disaster Safety Research Center)	Pedestrian Safety, Transportation Safety, Automobile Safety, Bicycle Safety Agricultural Machinery Safety, Fall Accident Safety, Fraudulent Crime Safety, Fire Safety, Health Safety, Occupational Health Safety, New Health Safety	

A training approach to disaster prevention education is activity-based disaster response training. It corresponds to community or organization coalition disaster response training. Second, VR disaster prevention education belongs to experiential disaster prevention education, which can guide the elderly to experience various disaster situations, and app disaster prevention education adopts the form of question and answer, which belongs to gamified disaster prevention education [9]. Gamification education has achieved remarkable results in children's education by incorporating learning content into games to make learning more interactive and fun. Recently, gamified education has been gradually applied to adult and elderly education, especially in the field of health and disease prevention, with good results.

Disaster prevention education through publicity materials is an information dissemination type of disast

er prevention education that covers a lot of prevention knowledge, but it has the disadvantage of being ove rwhelming and failing to consider the interests and learning abilities of the elderly.

2. Analyzing the characteristics and needs of the elderly

The case study showed that current disaster prevention education is centered on hands-on and experien tial learning. Therefore, this study analyzed the characteristics of the elderly to complete the design guidelin es. The characteristics of the elderly are mainly divided into two types, physical and cognitive, and are aff ected by various factors (Hawthorn, D, 2000,12: p. 507-528).

Table 3. Characteristics and cognition of elderly

Category	Characteristics	Manifestation
Aging of physiology	-Aging of vision -Aging of auditory -Aging of language -Aging of behavior; etc.	-Physiological changes in vision result in reduced contrast and colour perception. -Reduced visual sensitivity, making it easier to make visual errors
Aging of cognition	-Aging of cognition -Aging of memory aging -Aging of attention -Aging of learning ability -Aging of decision-making ability; etc.	-Poor concentration and easily distracted by other factors in the environment. -The ability to switch attention is inflexible and cannot take in target information simultaneously.

IV. Designing a Trainning aid and Developing Evaluation Criteria for Fall Prevention Education for the elderly

1. Trainning aid guidelines for fall prevention education for the elderly

Based on an analysis of the physical and cognitive characteristics of older adults, this study proposes five design elements for the design of teaching aids. These are usability, safety, aesthetics, interactivity, and education. As people age, their ability to perform complex tasks and make quick decisions decreases. Therefore, design for the elderly should minimize the number and scope of information, avoiding presenting a lot of information.

Table 4. Trainning aid guidelines

Design elements:	Description
Usability	the teaching aids should be designed to be simple and easy for the senior to handle and understand
Safety	the material of the cards should be safe and the game process should avoid any possible risks
Interesting	he material of the cards should be safe andthe game should stimulate the interest of the senior learners through interesting game mechanisms.
Interactivity	the game should promote the interaction and communication among the seniors to enhance the learning effect.
Educational	the content of the cards should cover all aspects of fall prevention, including knowledge, skills and practical applications.

In addition, the educational contents of the diocese are organized according to the four stages of disaster prevention design: prevention design stage, site design stage, response design stage, and recovery design stage. The contents of each stage were organized based on previous research.

Table 5. Educational contents (indoor)

Disaster management steps		Countermeasures	Description
Pre-disaster	Preventive design	Exercise	①Exercises to help improve balance and build muscle strength ②Check your medications to see if any of them cause dizziness ③Regularly check your vision
	Preparedness Design	Disaster-resistant indoor facilities	①Bedroom-Safety handrails and slip-resistant products. Remove thresholds, use non-slip socks. ②Bathroom-safety grab bars, non-slip products, non-slip socks ③Kitchen- slip-resistant products; non-slip socks ④Living room-wires, electrical cords, bundling; non-slip socks
After-disaster	Response Design	When you can get up When You Can't	①If you can get up Stand up slowly to avoid moving the injured area. Turn around and sit down carefully ②If you can't get up Call 911 or ask for help in as painless and comfortable a position as possible.
	Recovery design	Mental Recovery	①Get a good night's sleep ②Exercise regularly ③Talk to people ④Take a walk and enjoy the sun for at least 30 minutes ⑤ Take up a hobby ⑥ Get caffeine

2. Developing a Design for Fall Prevention Education for the Elderly

(1) Composition of the teaching aid:

A game-based card teaching aid consists of the following parts

A set of cards: a series of cards divided into three types: knowledge cards, task cards, and scenario cards.

Additional props: scoreboards, dice, and other props used to add to the fun of the game and competition.

2) Card design:

Knowledge cards: Each card is printed with knowledge points or common sense about fall prevention. For example, how to walk safely, common causes of falls, preventive measures, and detailed explanations and diagrams are printed on the back of the card.

Task cards: Each card contains a prevention task or exercise, such as "Find and remove obstacles in the house that can cause falls" or "Demonstrate the correct way to get up". Points are awarded for completing the task.

Scenario cards: These mimic real-life fall scenarios, such as "walking in a slippery bathroom" or "walking on stairs". Points are awarded for correctly answering how to prevent or deal with these scenarios based on what you've learned.

Table 6. Fall Prevention Education design for the elderly

Card type	Card design	Description
Knowledge cards		This design is a prevention card to prevent an elderly person from falling in the bathroom.
Task cards		It includes tasks such as 'Identify and remove obstacles in the home that could cause a fall', 'Demonstrate the correct way to get up
Scenario cards		What should I do if I fall in my bedroom?

3. Develop teaching aid Effectiveness Metrics for the elderly Fall Prevention Training

1) Action Step:

① Develop and produce teaching aids: Produce cards and additional props according to the design program.

Community outreach: Promote pilot use in community centers and nursing homes.

Training and guidance: Provide training to community workers and volunteers on the use of the teaching materials.

Implement games: Organize games for older adults to learn prevention through games.

2) Evaluate effectiveness

The effectiveness of the tool will be evaluated through the following indicators

V. Conclusions

The main goal of disaster prevention education for falling accidents for the elderly is to help the elderly protect themselves with correct situational judgment in the event of a falling accident and reduce further damage, and to do this, it is important for them to learn disaster prevention behaviors naturally in their daily lives.

Therefore, after analyzing the current status of disaster prevention education for the elderly in Korea, we propose design guidelines and evaluation indicators for the elderly fall accident teaching card because there is little research on the design of the teaching card. As an exploratory stage of elderly fall accident education, there will be some shortcomings in clarifying, exploring, and applying basic issues. Design validation is lacking. Further research is needed in the future.

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