Original Article

The effect of serious games (simulation) on attitude and empathy toward elderly nursing students

Bahare Zanjiriani[1], Fatemeh Keshmiri[2], Samaneh Mirzaei[3], Khadijeh Nasiriani[*4]

[1]Nursing Department, Research Center for Nursing and Midwifery Care, Non-Communicable Diseases Research Institute, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
[2]Medical Education Department, Education Development Center, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
[3]Department of Health in Emergencies and Disasters, School of Public Health, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
[4]Nursing Department, Research Center for Nursing and Midwifery Care, Non-Communicable Diseases Research Institute, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.

Article info

Article history:
Received 12 Apr. 2024
Accepted 1 Aug. 2024
Published 14 Dec. 2024

***Corresponding author:**
Khadijeh Nasiriani, Nursing Department, Research Center for Nursing and Midwifery Care, Non-Communicable Diseases Research Institute, Shahid Sadoughi University of Medical Sciences, Yazd, Iran
Email: nasiriani@gmail.com

How to cite this article:
Zanjiriani B, Keshmiri F, Mirzaei S, Nasiriani K. The effect of serious games (simulation) on attitude and empathy toward elderly nursing students. J Med Edu Dev. 2024; 17(56): 129-137.

Abstract

Background & Objective: Nursing students require a positive attitude and empathy towards the elderly in order to provide high-quality healthcare services. This study aimed to assess the effect of a serious aging game on the attitude and empathy of nursing students toward aging.

Material & Methods: This study utilized a quasi-experimental design involving 72 nursing students who were divided into intervention and control groups. The intervention group engaged in a serious game focused on aging, while the control group received traditional training courses. The students' attitudes toward aging were evaluated using Kogan's attitude towards aging and Jefferson's empathy questionnaires. Data analysis included descriptive statistics (Mean ± SD) and inferential tests (independent and paired t-test).

Results: The students' score of attitude towards aging in the intervention and control groups before intervention was (139.72 ± 6.43) and (139 ± 6.43) respectively. After the intervention, a significant difference was reported between the attitude scores of the students in the intervention (153.42 ± 14) and control (137.18 ± 10.67) groups ($p < 0.0001$). In addition, the mean scores of empathy towards old age in students of the intervention (103.54 ± 16.41) and control groups (99.90 ± 15.11) before the educational intervention. A significant difference between the scores of the intervention (113.42 ± 10.07) and control (94.42 ± 14.24) groups was reported ($p < 0.0001$).

Conclusion: The serious game of the elderly has been associated with the improvement of attitude and empathy in nursing students. The serious game of the elderly was suggested as one of the teaching methods in the nursing curriculum.

Keywords: serious games, elderly, attitude, empathy, nursing, students

Introduction

Aging is a natural, continuous, and irreversible physiological process in the human life cycle (1). With the increase in the elderly population and the vulnerability of this group, the need to train skilled geriatric nurses is significant (2-4). The care and provision of services to elderly people are influenced by different factors, including nurses' attitudes towards elderly patients (5).

Attitudes and beliefs are recognized as the main factors that affect the behavior and performance of healthcare providers (6). The attitude of nurses toward the elderly directs the therapeutic interaction between nurses and the elderly (7). A positive attitude toward the elderly has an effect on their enthusiasm and attention in nursing care for them (8), while a negative attitude leads to non-participation of the elderly in decision-making, disrespecting the elderly, and insulting them (9). Therefore, providing quality geriatric nursing requires a positive attitude towards the elderly, which is influenced by an empathic understanding of the elderly (10). In this regard, nursing education institutions need to develop nursing students as future nurses to improve their perception of aging (11). Nursing schools should train nursing students not only to provide healthcare services

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to the elderly but also to enhance a positive attitude and the ability to understand the feelings and perspectives of patients (12). Jeong and colleagues used an elderly simulation in which students wear specially designed clothes that create a state similar to an 80-year-old person as an educational intervention to improve the perception of nursing students toward the elderly (13).

In addition to attitude, empathy is recognized as the primary source and determinant of behavior (14). Empathy is also considered an important requirement in hospitals to provide quality patient care (15). It is a complex set of psychological processes (16) and an essential competency for helping relationships between patients and providers. Empathy is recognized as a core component in person-centered care that is required to improve among nursing students (7). An empathetic approach to patient care leads to positive results such as increased patient satisfaction, accurate diagnoses, and decreased patient complaints (17).

Nursing students may have difficulty understanding because they may not have personally experienced aging challenges (18). Therefore, the use of teaching and learning methods that simulate the state of the elderly to improve nursing students' perception and empathy is vital (7,19,20). Various methods such as simulating old age and visiting old age centers have been used to change attitudes (21). The integration of simulation and games has been used to change attitudes and practices (22). Simulation enables healthcare professionals to simulate aging scenarios using different methods such as mannequins, computer software, and simulated patients. Recently, geriatric suits have been used as a new simulation method for training healthcare providers and students about aging. Elderly clothes allow learners to act as "elderly persons" (23). In simulation training, the interactive educational method provides an opportunity for students to experience the physiological restrictions of the elderly (19).

A serious game or functional game is a type of game designed for an educational purpose other than mere entertainment. The adjective "serious" usually refers to games used in industries such as defense, education, healthcare, urban planning, and politics. The use of games in the education field has expanded since at least the 20th century and shares aspects with simulation (24). Serious games have been used to improve psychomotor and cognitive capabilities and increase motivation (25, 26). Games have been used as a teaching strategy in nursing for the last few decades (27). They provide experiential learning opportunities in which the learner engages in learning activities (28) and improves their learning speed (29). The serious aging game is used to improve students' perceptions and their experiences of the elderly, promote awareness of the aging period, and increase students' positive feelings and attitudes towards aging (2, 4).

Previous studies have demonstrated the effectiveness of simulation-based training in geriatric education among healthcare students (30). However, no specific literature was found on the use of serious game geriatric simulation in nursing education. This study aimed to assess the effect of the serious aging game simulation on the attitude and empathy of nursing students toward aging.

Material & Methods

Design and setting(s)

This was a quasi-experimental study using a before and after design with intervention and control groups. The study took place at the Nursing and Midwifery School of Shahid Sadoughi University of Medical Sciences.

Participants and sampling

The participants were 5th-semester nursing students who were assigned to either the intervention or control group by lottery. Each semester, students were divided into two classes (Class A and Class B) based on a lottery. The inclusion criteria included being in the fifth semester of the nursing bachelor's degree and consenting to participate in the study. Foreign students, students with a diploma in healthcare, and those with a certificate of completion of a course on caring for the elderly were excluded from the study.

The sample size was determined using G*Power software, considering an effect size value of 0.71 for attitude based on the study by Gholamzadeh et al. (7), a 5% probability level of type 1 error, and a 10% probability of type 2 error. The sample size in each group was equal to 31 students. Due to the game design, six students participated in each group, resulting in a total of 72 students in the intervention (n = 36) and control (n = 36) groups (**Figure 1**).

Tools/Instruments

The study utilized the demographic form, the Kogan attitude questionnaire, and the Jefferson empathy questionnaire. The demographic questionnaire included age, sex, GPA, marital status, and experience of living with the elderly in the family. The Kogan Elderly Attitude Questionnaire, first designed by Kogan in 1961, contains 34 items scored on a seven-point scale, with a

maximum score of 238 and a minimum score of 34. A higher score indicates a positive attitude towards the elderly, while a lower score indicates a negative attitude. The Persian version of the Kogan questionnaire was validated (Cronbach's alpha coefficient: 0.83) (32).

The Jefferson empathy questionnaire, designed by Jefferson et al., was confirmed with 20 items and scored on a seven-point Likert scale. The Persian version of the questionnaire was validated (ICC=0.80 and Cronbach's alpha = 0.85) (34). The students in the intervention and control groups completed the questionnaires one week before and one month after the intervention.

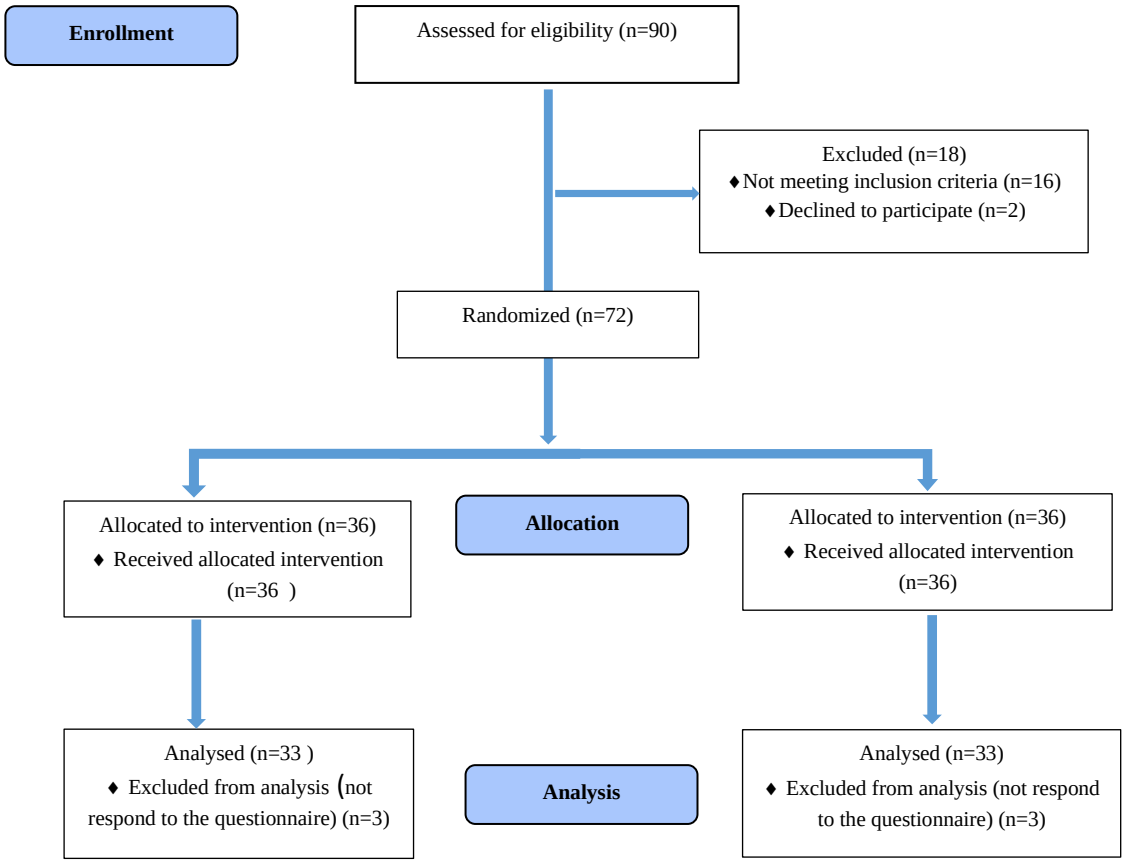

Figure 1. CONSORT flowchart of the study

Procedure

A board game was designed by integrating components of a serious game, a game-based learning strategy (interactive participation in a small group), and simulation (**Figure 2**). The game elements, such as earning points, winning, and receiving a prize to enhance the game's appeal, were incorporated into the present game. Students were asked to wear elderly suits to experience challenges faced by the elderly, such as sensory and psychomotor disorders, during their daily activities.

The game includes an elderly-shaped board with colored structures: blue, yellow, red, and gray; ten sensory activity cards; ten psychomotor activity cards; ten sensory-motor activity cards; a dice; and three markers for moving on the board. Blue cards represent sensorial activities, yellow cards represent psychomotor activities, and red cards represent sensory-psychomotor activities (**Appendix 1**). Additionally, there was an hourglass to measure time, placebo boxes, and limiters. Movement indicators on the board were prepared in three colors: blue, yellow, and red.

Restraints included sensory-motor restraints (two elbow braces, two knee braces) to limit range of motion, vision-limiting glasses, hearing-limiting headphones, and

medical and gardening gloves to reduce sensitivity in the hands, as well as glue for sticking. The finger joints for activities had several humpbacks to create a hump, and a belt to restrict lumbar movements. Two one-kilogram hand and foot weights were used to reduce joint and muscle strength. Additionally, limitations such as wallets, toothbrushes, toothpaste, glasses, water jugs, chocolate pills, medicine boxes, fruits, plates, knives, washing sinks, medicine cans, clothes, pants, educational brochures, books, and mobile phones were used.

The objective of the game is for the player (student) to finish from the starting point by passing through different spaces. Each team has a marker that, after rolling the dice, one must move from the space where the marker stops. Houses with blue, yellow, and red colors are part of the game, and if the piece lands on a gray space, the playing group is out of the game and must start again from the beginning. There are three card colors: blue, yellow, and red, corresponding to the color of the houses. During the game, each group's piece is placed in the house of the card's color; the group must then choose a card of the same color by chance and perform the activity related to that card. Time is measured with an hourglass during the activity. The group members must complete the activity within the time specified on the card, and if they are unsuccessful, they will be banned from the game for one turn. After performing the corresponding activity, the card is discarded, and the next team plays, and so on until the end of the game. The group that reaches the end of the game first is declared the winner and receives a prize (**Figure 1**).

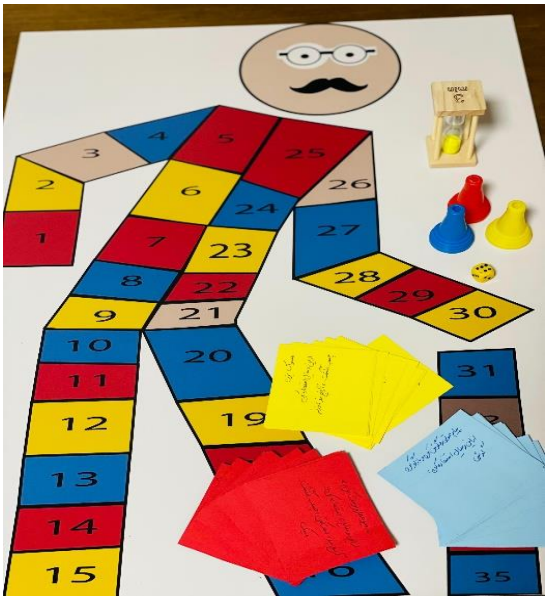

Figure 2. The board game sheet

In this study, the game was played in three groups (n= two students), with six students participating in each round. The game was played in four rounds, and each game session lasted 4 hours. The control group received a conventional training program.

Data analysis

The data were analyzed using the statistical software SPSS version 26. Descriptive (mean, SD, and percentage) and inferential (independent t-tests and paired t-tests) tests were used in data analysis, with a significance level of 0.05.

Results

In this study, 72 students participated. Three students from the intervention group and three from the control group were excluded from the study because they did not respond to the questionnaire after the intervention. Data analysis was performed on 66 students (33 learners in the intervention group and 33 students in the control group). The results showed no significant differences between the demographic characteristics of the two groups using the Chi-square statistical test in terms of gender, marital status, and experience of living with the elderly in the family ($p > 0.05$). The mean age of the students in the intervention group was 21.75 ± 1.16 and in the control group was 22.09 ± 2.18. Additionally, the average scores of academic achievement of the students in the intervention and control groups were 16.64 ± 1.14 and 16.49 ± 1.26, respectively. There was no statistically significant difference in the students' scores in the intervention and control groups ($p > 0.05$).

The nursing students' score of attitude towards old age in the intervention group and the control group was not significantly different ($p > 0.05$). However, a significant difference was reported between the intervention group and the control group in the post-test of students' attitudes towards aging ($p < 0.0001$). Also, findings showed that there was a significant difference in the scores of the attitude towards aging of the students of the intervention group in the pre-test and the post-test ($p < 0.0001$). There was no significant difference between the pre-test and post-test of the students' scores of the attitude towards aging in the control group ($p = 0.298$) (**Table 1**).

The findings showed that there was no significant difference in the scores of empathy towards old age among the students in the pre-test of the intervention group and the control group ($p > 0.05$). However, the scores of empathy towards the old age of the students in

the intervention group and the control group had a significant difference after the intervention ($p < 0.0001$). Additionally, the scores of empathy towards the elderly of the students of the intervention group in the pre-test and post-test using the paired t-test had a significant difference ($p = 0.013$). There was no significant difference between scores of empathy towards the elderly of the students of the control group in the pre-test and post-test ($p = 0.182$) (**Table 2**).

Table 1. Comparison of mean scores of nursing students' attitudes toward aging in the intervention and control groups

Time	Intervention group	Control group	Minimum-maximum score	p-value**
	M (SD)	M (SD)		
Pre-test	139 (6.43)	139.72 (6.43)	34-238	0.940
Post-test	137.18 (10.67)	153.42 (14.1)	34-238	< 0.0001
p.value*	< 0.0001	0.298		

Notes: *t-test, **Independent t-test
Abbreviations: M, mean; SD, standard deviation; p-value, probability value

Table 2: Comparison of scores of empathy toward old age of nursing students in the intervention and control groups

Time	Intervention group	Control group	Minimum-maximum score	p-value **
	M (SD)	M (SD)		
Pre-test	103.54 (16.41)	99.90 (15.11)	20-140	0.353
Post-test	113.42 (10.07)	94.42 (14.24)	20-140	< 0.0001
p.value*	0.013	0.182		

Notes: *t-test, **Independent t-test
Abbreviations: M, mean; SD, standard deviation; p-value, probability value

Discussion

In the current study, a board game was designed to integrate components of a serious game, a game-based learning strategy (interactive participation in a small group), and simulation. The results demonstrated that playing the serious game designed for the elderly significantly improved the attitude and empathy towards aging among students in the intervention group.

The attitude towards old age among students in the intervention group improved significantly after playing the serious game. This finding is consistent with the results of Mandegari et al., who showed that simulating aging improved the attitude of nursing students towards aging (4). Additionally, Jeong's study (13) confirmed the positive long-term effect of attitude and behavior of nursing students towards the elderly after experiencing simulation through a geriatric suite. Gholamzadeh et al. also reported a significant effect of an empathy training program on the attitude scores of nursing students towards the elderly, with a medium effect size (7). Cheng et al. demonstrated that playing the elderly medicine game improved the attitude and understanding of healthcare towards the elderly among nursing students (35).

Consistent with our results, Fernandes et al. showed a significant improvement in attitude towards the elderly after participating in simulation game training (3). In contrast, Chang et al. found no significant differences in the Kogan attitude scores between the elderly simulation clothing program and the "placebo clothing" group in China. However, both groups reported a significant increase in positive attitudes and willingness to serve the elderly (12). Sarı et al. demonstrated that Aged Simulation Suit and role-playing, as well as aged simulation suit alone, were effective in promoting positive attitudes and an empathic approach towards the elderly among nursing and medical students (36).

In line with the findings of this study and others, it is evident that students' empathy towards geriatrics is enhanced through simulation and serious games designed for the elderly.

The findings indicated that the scores of empathy towards old age among nursing students in both groups were initially higher than the median, with no significant difference. These results may be influenced by the cultural context of the investigated population. However, after playing the serious game designed for the elderly, the empathy scores of the intervention group increased significantly, showing a significant difference compared to the control group. The serious aging game significantly enhanced students' empathy towards aging. Consistent with the present study, Martínez-Arnau et al. demonstrated that playing the Geriatric Medication Game for the elderly improved students' empathy towards the elderly in general (37). Bass-Sarminto et al.

also found that simulation training led to significantly higher scores of nursing students' empathy towards old age in the post-test compared to the pre-test (38). Sari et al. reported a statistically significant increase in empathy scores of nursing students after intervention using old-age simulation clothes (19). Furthermore, Fernandez-Gutierrez et al. showed that a multimodal intervention, involving the implementation of an aging simulation dress and the narration of life experiences of an elderly person, improved the attitude and empathy of nursing students (20). Gholamzadeh et al. stated that the empathy training program significantly affected the scores of nursing students' empathy towards the elderly (7). Another study on teaching empathy to nursing students demonstrated that empathy, self-esteem, and skill acquisition improved in experimental groups in different centers after the intervention (38).

Based on the results of this study, it is evident that the serious game of aging and simulation training improved students' attitudes towards aging.

It is important to acknowledge that achieving the best scores of empathy and attitude of nursing students towards the elderly requires continued use of interactive methods, simulation, and game-based learning in the nursing educational program. It is recommended to further investigate the long-term effects of serious games designed for the elderly on the attitude and empathy of nursing students towards old age.

A limitation of this study was the restricted sample size, which limits the generalizability of the results. Additionally, the use of self-report scales for the questionnaire responses in this study may introduce bias associated with self-report data. Furthermore, each participating student played a round of the game, and the duration and number of activities performed in the game varied between the groups, which should be considered in future studies.

Conclusion

During the intervention, students participated in the serious old age game training program, which allowed them to experience the challenges faced by the elderly. The findings indicate that the serious aging game improved the attitude and empathy of nursing students towards aging. This suggests that serious games designed for aging could be incorporated into healthcare sciences that focus on elderly care.

Ethical considerations

This study was approved by the Ethics Committee of Shahid Sadoughi University of Medical Sciences (IR.SSU.REC.1400.257). Consent was obtained from the participants, and the anonymity of the questionnaires and the confidentiality of information were ensured.

Artificial intelligence utilization for article writing

The authors confirm that generative Artificial Intelligence (AI) and AI-assisted technologies were not used in the writing process of this paper.

Acknowledgments

The authors express their gratitude to Shahid Sadoughi University of Medical Sciences and the nursing students for their participation in the study.

Conflict of interest statement

The authors declare that they have no competing interests.

Author contributions

BZ, FK, SM, and KHN conceptualized and designed the study. BZ and KHN collected the data, while BZ, FK, and SM analyzed the data. All authors met the criteria for authorship and contributed to preparing the manuscript. All authors approved the final manuscript

Supporting resources

This study was excerpted from a master's thesis in nursing with the code (18554) and was supported by a grant from Shahid Sadoughi University of Medical Sciences and Health Services in Yazd, Iran.

Data availability statement

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

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Appendix 1. Game activities designed to understand sensory and motor disorders in the elderly

Game cards	Game activities	Equipment
Sensory cards (Blue)	Listen and repeat the message.	Smartphone
	Write the following message on your phone: "Hello, how are you? Where are you now? I am waiting for you for lunch. Please be home before 2 o'clock. Grab some yogurt on the way, and thank you."	Glasses
	Listen to the nurse's instructions and repeat.	Phone, Glasses
	Complete the profile form.	Glasses, Gloves
	Count the money.	Glasses, Gloves
	Read the brochure and say what it is.	Glasses
	Read the newspaper.	Glasses
	Listen to this music and repeat.	Smartphone
	Separate the pills by color.	Glasses
	Read the book and repeat.	Glasses
Psychomotor cards (Yellow)	Take out the clothes from your tent.	Elbow brace, Knee brace, Hump, Weight, Belt
	Put on your shoes and tie your shoelaces.	Elbow brace, Hump, Knee brace, Weight, Belt, Finger Glue
	Pour water from the pitcher into the glass.	Elbow braces, Knee braces, Weights, Belts
	Sit on a chair and stand up.	Elbow brace, Hump, Knee brace, Weight, Belt
	Pray while seated.	Elbow brace, Hump, Knee brace, Weight, Belt
	Eat food.	Elbow brace, Finger Glue, Weight
	Enjoy a glass of ice cream.	Elbow brace, Finger Glue, Weight
	Brush your teeth.	Elbow brace, Finger Glue, Weight
	Open the lid of the pillbox.	Elbow brace, Finger Glue, Weight
	Fasten the buttons of your clothing.	Elbow brace, Finger Glue, Weight
Sensory cards (red)	Go to the end of the corridor.	Glasses, Elbow braces, Knee braces, Leg weights
	Put on the dress.	Glasses, Elbow pads, Knee pads, Hand weights, Gloves
	Wash the dishes.	Elbow braces, Glasses, Weights, Gloves, Finger Glue, Hand weights
	Unlock the door and then lock it again.	Elbow braces, Glasses, Weights, Gloves, Finger Glue, Hand weights
	Go up the stairs and come down.	Elbow braces, Foot weights, Glasses, Knee braces, Belts
	Take the pill with a glass of water.	Elbow brace, Hump, Glasses, Gloves, Finger Glue, Hand weights
	Get out of bed, lie down, and get up.	Elbow brace, Hump, Foot weights, Glasses, Knee brace, Belt
	Read a newspaper and drink tea with it.	Elbow braces, Glasses, Weights, Gloves, Finger Glue, Hand weights
	Peel the fruits.	Elbow straps, Glasses, Weights, Gloves, Finger Glue, Hand weights
	Separate the pills by color.	Elbow braces, Glasses, Weights, Gloves, Finger Glue, Hand weights