

University of Wollongong

Research Online

Faculty of Engineering and Information
Sciences - Papers: Part B

Faculty of Engineering and Information
Sciences

2017

Game-based interventions and their impact on dementia: a narrative review

Jiaying Zheng

Zhejiang Provincial Hospital Of Traditional Chinese Medicine

Xueping Chen

Qianjiang College Of Hangzhou Normal University

Ping Yu

University of Wollongong, ping@uow.edu.au

Follow this and additional works at: <https://ro.uow.edu.au/eispapers1>



Part of the [Engineering Commons](#), and the [Science and Technology Studies Commons](#)

Recommended Citation

Zheng, Jiaying; Chen, Xueping; and Yu, Ping, "Game-based interventions and their impact on dementia: a narrative review" (2017). *Faculty of Engineering and Information Sciences - Papers: Part B*. 712. <https://ro.uow.edu.au/eispapers1/712>

Research Online is the open access institutional repository for the University of Wollongong. For further information contact the UOW Library: research-pubs@uow.edu.au

Game-based interventions and their impact on dementia: a narrative review

Abstract

Objective: The aim of this review was to examine the efficacy of game-based interventions for people with dementia. **Methods:** Seven studies that met the inclusion criteria were found in four databases. Their interventions and key findings were analysed and synthesised. **Results:** Game-based interventions for people with dementia are showing promise for improving cognition, coordination and behavioural and psychological symptoms. The generalisability of the findings is limited by weak methodology and small sample size. **Conclusions:** Game-based interventions can improve cognition, coordination and behavioural and psychological symptoms for people with dementia. Future research should include methodological improvement and practice guideline development.

Keywords

interventions, their, game-based, impact, review, dementia:, narrative

Disciplines

Engineering | Science and Technology Studies

Publication Details

Zheng, J., Chen, X. & Yu, P. (2017). [Game-based interventions and their impact on dementia: a narrative review](#). *Australasian Psychiatry*, 25 (6), 562-565.

Game-based intervention and its impact on dementia: a narrative review

Running title: Game-based intervention for dementia

Abstract

Objective: The aim of this review was to examine the efficacy of game-based intervention for people with dementia.

Methods: Seven studies that met the inclusion criteria were found in four databases. Their interventions and key findings were analyzed and synthesized.

Results: Game-based intervention for people with dementia is showing promise for improving cognition, coordination, behavioural and psychological symptoms of people with dementia. The generalizability of the findings is limited by weak methodology and small sample size.

Conclusions: Game-based intervention can improve cognition, coordination, behavioural and psychological symptoms for people with dementia. Future research includes methodological improvement and practice guideline development.

Key words: dementia, game, game-based intervention, literature review

Introduction

Dementia is a progressive neurodegenerative disorder that leads to cognitive impairment, functional disability, and poor quality of life. It was estimated that approximately 46.8 million people worldwide lived with dementia in 2015, and the number is likely to increase by 2- and 4-folds by 2030 and 2050, respectively [1].

Treatment of dementia includes both pharmacological and non-pharmacological interventions. The available pharmacological treatments are not only expensive but also associated with significant adverse effects [2]. Non-pharmacological interventions that are person centered have been considered the best choice [3]. Game-based intervention is a relatively new non-pharmacological, easily accepted treatment [4, 5]. It requires mental concentration, memory, and quick motor reaction [4, 5], suitable for cognitive training and rehabilitation for people with dementia [6, 7].

Although there are some suggestions that game-based intervention can decrease symptoms of dementia. Sound evidence is needed about how to design and implement a

game-based intervention to bring in benefits in dementia care. Therefore, this study aims to examine the efficacy of game-based interventions for people with dementia in the published, peer-reviewed studies.

Methods

A literature search was conducted in January 2016 on four electronic databases, PubMed, EBSCO, CNKI, and Wanfang - a Chinese database. Keywords used were “game”, “dementia” or “Alzheimer’s”. As the preliminary screening did not return sufficient number of articles, no date limitation was set for the search. A manual search was further conducted on the references of the selected publications (see Figure 1).

The inclusion criteria were English or Chinese language, peer reviewed, full-text articles that focus on the game for improving health conditions of people with dementia. The study participants were aged 60 years and over. The exclusion criteria were papers out of the topic, lack of empirical evidence, did not report the effect of game on dementia, or included multiple interventions in addition to game. Finally seven articles were selected.

Results

The findings are presented according to the study setting, population, type of game-based interventions, delivery and outcomes.

Table 1. An overview of the selected studies

| Author, country | Study Setting | Study Length | Mean Age | Gender | N | Game Title and Type (Physical or cognitive) | Outcome |
|--------------------------------|---------------|--|-----------------|----------------|----|---|---|
| <i>Cuifang Chen [8], China</i> | Nursing home | 2–3 sessions per week for 8 weeks, 20-35 minutes per session | 76.4 | 18 F; 42 M | 60 | Both physical games and cognitive games | Improving cognition and subjective well-being of the people with dementia |
| <i>Panpan Chen [9],</i> | Nursing home | 5 sessions per week for 4 | 80.4 in control | 2 M and 6 F in | 16 | Board game Both | Improving cognition |

| | | | | | | |
|---------------------------------------|--------------------------|---|--|----------------------------|--|---|
| China | | weeks, 1 hour per session | group, 79.9 in experimental group | CG, 3 M and 6 F in EG | physical games and cognitive games | and behavioural and psychological symptoms of dementia (BPSD) |
| <i>Sobel [7]</i> , USA | Day care center | 45 minutes each day for two days | 82 | 22 M, 28 F | 50 Bingo Cognitive game | Improving cognition |
| <i>Venturelli et al. [10]</i> , Italy | Nursing home | 30 minutes per session. twice per day for one day | 83 | 2 M, 18 F | 20 Ball games Physical game | Improving cognition and BPSD |
| <i>Yamaguchi [6]</i> , Japan | Nursing home | Once a week for ten weeks | 88.9 | 3 M and 6 F | 9 Video-sports games Physical game | Improving cognition and BPSD |
| <i>Gene et al. [5]</i> , USA | Nursing home | 5 minutes per session for one session | Not clear | 1/4 M; 3/4 F | 33 Making Memories Together Cognitive game | Improving BPSD |
| <i>Padala et al. [11]</i> , USA | Assisted living facility | 30 minutes per session, 5 sessions per week for 8 weeks | 79.3 in Wii-Fit intervention group and 81.6 in the walking group | 3 M and 8 F for each group | 22 Wii-Fit Physical game | Improving cognition, gait and balance |

Study setting

Five studies were conducted in nursing homes [5, 6, 8-10], one in a day care center [7] and one in an assisted living facility [11].

The study population

Three studies did not specify the type of dementia suffered by the participants [6, 8, 9]. Four studies only included people with Alzheimer's disease (AD) [5, 7, 10, 11]. The mean age of the participants ranged from 76.4 to 88.9 years. One study did not specify the age of the participants [5].

Type of game-based interventions

One study was focused on cognitive game [5, 7], three studies investigated physical games [6, 10, 11], and two studies were on cognitive and physical games combined [8, 9].

Delivery and outcomes

The length of study period ranges from one day to ten weeks. One study did not give this information [6]. The duration of a game session ranged from five minutes to one hour.

Cognitive game

“Making memories together” was the first therapeutic game specifically developed for people with AD. It was designed to facilitate interaction among people with dementia and their families. *Gene et al.* [5] investigated the effect of this game on depression/sadness in a three-group comparative experimental study. One group received “Making memories together”. One group was involved in a discussion of a picture-oriented medium with family member or significant other. The third group did not receive any intervention. Each session of intervention ran for five minutes. The game-based intervention group experienced a statistically significant effect in reducing depression/sadness when compared to the other two groups. The design issues include lack of information about whether the participants were randomized or received pharmacological treatment during the experimental period.

Sobel [7] compared the effect of using Bingo as a cognitive stimulation and walking as a physical stimulation on short-term memory, concentration, word retrieval, and word recognition in people with AD. The duration of intervention for both groups was 20 minutes. The cognitive function of the game-based intervention group was improved, but there was no change in the physical intervention group. A limitation of this study was a lack of information about the content of the Bingo game.

Physical games

Three studies examined the effect of physical games, targeted cognition [6, 10], BPSD [10], gait and balance [11].

Yamaguchi [6] examined the influence of video sports-games on cognitive function in people with mild to moderate dementia. There were two types of games: those working on the upper limbs, and those working on the lower limbs. A game for the upper limbs required the player to grab coins which appeared to be coming out of the TV screen. A

game for the lower limbs required the players to move their legs to the music rhyme. During the game, participants were equipped with sensors on the hands. The game was run once a week for ten weeks. The results showed that the player's cognition, visuospatial and constructive function were improved. Nonetheless, the study was limited by the small sample size ($n = 9$), nor reported the duration of a game session, and a lack of description of the baseline characteristics.

Padala et al. [11] measured the effect of a Wii-Fit program in comparison with a walking program on balance and gait in people with mild AD living in an assisted living facility. The participants in the Wii-Fit game group spent ten minutes on a session for three sessions, yoga, strength training, and balance games. The participants in the walking group walked at their own pace. Both group participated in the activity for 30 minutes per day, five days a week for eight weeks. The result suggested that both groups showed improvement in balance and gait; however, there was no significant change in cognition after the game. The limitation of the study was not reporting the intensity of activities.

Venturelli et al. [10] examined the acute effects of adapted ball games on the agitated behavior and cognition in people with advanced dementia. 24 participants were randomly assigned to the intervention group and a placebo group that received foot baths and foot massages. A kinesiologist led the participants to play the game : toss and catch a boll with both hands, kick and stop the ball with one foot. After one-hour intervention, there was a significant reduction in agitated behavior and improved cognition in the intervention group; placebo group, however, did not have significant change. There was also no report about the detailed process of intervention.

Physical and cognitive games combined

Two studies employed both physical and cognitive games [8, 9].

Cuifang Chen [8] tested the effects of game-based intervention on cognition and subjective well-being in people with dementia. The participants were led by a nurse to play jigsaw, origami, chess and so on. The duration of each game session was 20-35 minutes. The game was run two to three times a week. The results showed that the cognition and subjective well-being of the people with dementia were improved. The limitation of the study was no control group, nor information about the duration of the intervention. *Chen* [9]

examined the influence of board games on cognition and BPSD in 16 people with AD. The selected games included various activities, such as “counting numbers”, “distinguishing colors” and “tossing ball”. The game intervention was provided five times a week for four weeks, the duration of each session was one hour. The results suggested that cognition and BPSD were improved. The limitation of the study was not reporting the level of severity of dementia for the study population.

Discussion

This paper reviewed seven studies on game-based intervention for dementia. The findings suggest that game-based intervention tended to bring in benefits in cognition, gait and balance, and positive impact on BPSD for older people with dementia. However, research in this field is still in the infancy stage. The seven reviewed studies was preliminary, lacking rigorous design and quantitative measurement; causing the findings not rigorous.

Implication for future research and practice

The flexibility of individualized deployment, the broad range of effects, and the entertainment value suggest that game-based intervention is among the best choices for delivering non-pharmacological interventions to people with dementia. To ensure this form of intervention really services its purpose, more robust evidence, preferably gathered through randomized controlled trials, is needed to accurately and completely ascertain the effect of game-based intervention for older people with dementia. Participant’s demographics should be fully assessed and documented, including age, usage of pharmacological treatment and severity of dementia. Future research in this area would benefit from larger sample size, more diverse participants, and detailed description of the design of the game-based intervention.

The effect of different duration and intensity of the game-based intervention, or their frequency need to be measured so as to decide the optimal frequency and duration of a game-based intervention.

Although there are various games, the game programs specifically developed for older people with dementia is rare. This calls for the multidisciplinary collaboration between healthcare professionals, researchers, engineers, caregivers and care recipients to develop

suitable game programs for people with dementia.

Acknowledgment: This work was supported by the China Population Welfare Foundation (No. 2014 HSS078).

References

1. Prince M, Wimo A. Word Alzheimer Report 2015, In: Guerchet M, Ali G-C, Prince M, and Wu Y-T, eds. The incidence of dementia. London: Alzheimer's Disease International, 2015:33.
2. Kavirajan H, Schneider LS, Efficacy and adverse effects of cholinesterase inhibitors and memantine in vascular dementia: a meta-analysis of randomised controlled trials. *The Lancet Neurology* 2007; 6:782-792.
3. Douglas S, James I, Ballard C, Non-pharmacological interventions in dementia. *Advances in psychiatric treatment* 2004; 10:171-177.
4. Fenney A, Lee TD, Exploring spared capacity in persons with dementia: What WiiTM can learn. *Activities, Adaptation & Aging* 2010; 34:303-313.
5. Cohen GD, Firth KM, Biddle S, Lewis MJL, Simmens S, The first therapeutic game specifically designed and evaluated for Alzheimer's disease. *Am J Alzheimers Dis Other Demen* 2009; 23:540-551.
6. Yamaguchi H, Maki Y, Takahashi K, Rehabilitation for dementia using enjoyable video-sports games. *Int Psychogeriatr* 2011; 23:674-6.
7. Sobel BP, Bingo vs. physical intervention in stimulating short-term cognition in Alzheimer's disease patients. *Am J Alzheimers Dis Other Demen* 2001; 16:115-120.
8. Chen C, Effect of game intervention on cognitive function and subjective well-being in elderly patients with mild dementia. *Modern Journal of Integrated Traditional Chinese and Western Medicine* 2012; 21:260-261.
9. Chen P. A study about the role of board game group work in the treatment of alzheimer's disease: Huazhong University of Science & Technology, 2013.
10. Venturelli M, Magalini A, Scarsini R, Schena F, From Alzheimer's Disease Retrogenesis A New Care Strategy for Patients With Advanced Dementia. *Am J Alzheimers Dis Other Demen* 2012; 27:483-489.
11. Padala KP, Padala PR, Malloy TR, Wii-fit for improving gait and balance in an assisted living facility: a pilot study. *J Aging Res* 2012; 2012:1-6.

Figure legends

Fig.1 Flow diagram showing the screening and quality evaluation process