

AGING CITIZENS' EXPERIENCES OF ELECTRONIC BRAIN GAMES

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INTRODUCTION

In the rapidly aging societies more and more aging citizens are seeking for ways to keep them active and alert. Different magazines, e.g., advice people to take care of their brain with the help of special activities, such as making jigsaw puzzles, playing music, learning foreign languages, juggling, dancing, and playing ping pong. Electronic game producers have now responded to the need of the aging citizens by designing special software and computer and video games to stimulate and train the brain. Although there's no scientific proof yet that using tools like computer games or any other mental training devices could train our brain, these games entertain now a new generation of computer users: aging persons who have not been too interested in computer games before. There is a clear growing market and business opportunity for the computer game industry for the older adults. It is also easy to predict that these kinds of applications and uses of technology will emerge as baby boomers age. This creates a major challenge for the game companies to design attractive and interesting games and applications for the aging adults. Although there is not yet direct evidence that increased mental activity can slow the age related decline in the brain, millions of brain games have been sold so far in Japan, USA and Europe. The debate around brain training is heating and results from academic research are desperately desired.

BRAIN TRAINING TECHNIQUES AND PROGRAMS

A growing number of companies are marketing computer programs and games that they say will help aging people stay mentally sharp and perhaps ward off inevitable decline and possible dementia. The applications are targeted at one of the fastest-growing segments of the game market: people over 40 years old worried about losing their mental edge. These programs include MindFit by the Newton Company, Brain Training by Nintendo, and Brain Fitness by Posit Science. They take varying approaches but generally involve repeated practice with increasing challenge in multiple areas of cognitive skills, and aim at improving the brain's ability to process information. Brain Training and Big Brain Academy [4] are Nintendo's games played on a handheld directional pad control (Nintendo DS Lite), and using stylus or voice for controlling the game. The Brain Training –game consists of ten different exercises, including reading aloud and doing math, whereas the Big Brain Academy –game tests logic and reactivity. Brain Fitness Program [3] is a computer-based memory training program focusing on improving listening ability. MindFit [9] is a computer-based program which trains individuals in 14 skills over nine months.

So far there is little proof that brain exercises can prevent mental decline or definitive evidence that brain training programs help coping in everyday life. In the early 1990s Merzenich et al. [10] discovered that the brain remains plastic throughout life, and claimed that with training, it can be rewired to learn new skills. Mahncke et al. [8] suggested in 2006 that a brain plasticity-based training program can improve cognitive function - and memory in particular - in mature adults with normal age related cognitive decline. Klinberg et al. [7] suggest that short-term memory can be improved by training and that such training helps people with attention deficits and improves reasoning ability overall. Willis et al. [13] suggest that brain training could positively affect daily-life activities and might delay age-related declines in everyday functioning.

Empirical studies of ageing and memory show that elderly people maintain the ability to acquire new information and strategies [6]. Several studies of elderly in community-dwellings [5;12] suggest that cognitive restructuring techniques may help older adults improve their memory functioning, gain control over their beliefs about memory and thereby enhance their memory performance.

However, there is no evidence for the translation of those skills trained with brain training applications to other skills [2]. Most of the research on memory training has focused on skills that can be applied at encoding when the information is first encountered [1]. Storandt [11] argues that attention should also be paid to memory skills that can be applied at retrieval. Recalling e.g., brief prose passages is

important to our everyday life. Because of the importance of this type of memory, a great deal more attention should be paid to uncovering the important components of such memory and to ways it can be enhanced.

CASE STUDY

VTT carried out a study of the acceptance of brain games amongst older adults. The study was twofold: in the first stage user tests with 16 aging participants (Table 1) were carried out concerning user experience and acceptance towards brain games. In the second stage a workshop of five experts in the area of cognitive sciences (3) and interaction technologies (2) was organised, in order to find out the possibilities of the usage of brain games in rehabilitation and assessment of cognitive abilities. The object for the tests was commercial Big Brain Academy (BBA) -game, played with handheld Nintendo DS Lite console. This game was used as an example of brain training games since it is well playable in a group situation and an exercise takes only one minute to complete. The game concept consists of fifteen exercises in five categories: thinking, memorization, computation, analysis, and identification. It also includes a multiplayer possibility which was not tested in the user tests.

Table 1 Gender and age of the aging participants in four evaluation sessions.

Group	Participants			Age (years)
	All	Female	Male	
1	4	3	1	62 - 72
2	5	3	2	49 - 68
3	3	3	0	51 - 56
4	4	0	4	48 - 63
Total	16	9	7	48 - 72



Fig. 1 Participant playing the Big Brain Academy -game with Nintendo DS.

Each user test session lasted about 90 minutes and included three parts: (1) the BBA -game testing (Fig. 1), (2) a questionnaire, and (3) a semi-structured interview. The questionnaire included parts relating to the playing frequency, evaluations about the BBA -game, and opinions of brain training equipments and game types in general. In the interview part, participants' opinions of playing computer or console games in order to train the brain were asked.

Three experts in the field of cognitive sciences attended in the evaluation of the BBA and Brain Training games from the point of view of rehabilitation and assessment of cognitive abilities. The BBA game was evaluated in a workshop that followed the same procedure as the user tests. The experts also took a four weeks period to play the BBA and Brain Training games by themselves, and gave their assessment after this time. Additionally, two experts in the field of interaction technologies attended the discussions in the workshop.

RESULTS

The aging persons' opinions about brain games were generally positive and the games were evaluated as suitable for aging persons. When attitudes towards the game were asked with three semantic differences (boring – fun, typical – new, useless – useful) on a five-point scale, the game was evaluated as fun (mean 4.4), novel (4.1) and fairly useful (3.8). Positive aspects named in the discussions were the assessment of one's own skills, the experience of success, and the need of concentration. The short duration (one minute) of each game session was seen as an advantage because it gives an option to immediately repeat the game and enables playing only short sessions at a

time. All except one of the participants were willing to play the game again, five of them even every day.

Participants were interested in following their success results in the game and comparing the results with others. The possibility to get follow-up information of the success in the game was considered to be interesting. During the game play, some of the participants spontaneously reported their own playing results and were interested in hearing the results from others. Almost all participants (88%) were interested in following the improvement of their playing results. The majority also wanted to make comparisons of their results to the results of others. Family members (63%) were the most desired comparison group but also friends (44%) and representatives of one's own age group (38%) were preferred for comparison. In the discussions many participants stated that they would like to play the games together with a spouse and some commented that it would be nice to play with grandchildren.

The size of the game console was considered as proper (63%) or too small (38%). The need for a larger game console was related to the age of the participants; most of over 60 years old (71%) considered the console to be too small. In many groups having the possibility to easily carry the console with when travelling was considered as a positive aspect of the small size. The size of the screen was assessed as proper (50%) or too small (50%). Using the stylus pen for controlling the game was considered to be easy (mean 1.6 on a 5-point scale where 1 = easy and 5 = hard).

The threshold to try game-like ICT solutions seems to be high for many aging people. However, in our case study it was clearly seen that when this threshold was crossed the playing was truly enjoyed as commented by one participant: "It was fun. One prejudice was crashed." [Woman 68 years, group 2] In our collaborative game sessions learning was highly informal and social, and playing provided a challenging and enjoyable experience. After-play, sharing experiences with others, was also an important social part of the game play. With enjoyable and challenging brain training applications and easy-to-use user interfaces it could be possible to get involved also those people who have no former experiences on computer playing. In order to succeed in this, problems in learning to use the applications should be minimized by adapting the systems to existing knowledge and skills of the aging users, and taking into account the age-related decline in physical abilities, such as vision and visual motor coordination.

The experts found the BBA a versatile game, which, in addition to traditional visual motor rapidity, claims for other cognitive functions as well, and activates diverse brain functions. Although the visualisation was found slightly naïve the game was considered quite stimulating. The game was found suitable especially for youngsters and young adults who are interested in playing games and might also be interested in taking care of their brain. For these user groups, the game should have a strong entertaining aspect. Aging persons, however, are expected to seek for meaningful activities. For them, the game format should be somewhat different offering more informative data on the condition of the person's cognitive functions. The instructions should be clear and understandable. Also the game device should have a large display and an easy-to-use user interface. The stylus pen used for controlling games was considered pleasant, although it requires quite accurate visual motor coordination. The experts considered brain games as promising solutions for activating aging people, but developing these games for professional purposes, e.g., in the area of assessment and rehabilitation, claims for empirical validated studies and cooperation between experts of human sciences and interaction technologies.

DISCUSSION

The most remarkable aspect when assessing brain games' possibilities for brain training is the fact, that we do not know about the transfer influence of the games into everyday life activities. If we train one skill in a game, such as reasoning, it is difficult to say if it carries over to another, such as memory. Accordingly, training short-term memory in a game does not necessarily have any influence on the prospective memory in our daily activities. However, even though we do not know the transfer influence of the games, there are several elements in brain training games that make them worth playing.

It would be worthwhile to study the possibility to develop such applications as brain games for rehabilitation purposes for e.g., people with dyslexia, memory disorders or difficulties in perceptive skills. An interesting thought would also be the usage of a brain game as an assessment tool for e.g. memory tests. Developing these kinds of rehabilitation and assessment tools demands close cooperation between researchers in the area of human and cognitive sciences and interaction technologies, as well as validated empirical studies and user tests.

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