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Digital Game Design for Elderly People

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Abstract

Researchers have found that digital gaming is beneficial for the cognitive, psychological, and physical health of the elderly people [1][6]. The percentage of the elderly people playing digital games is growing increasingly (and so do the demographics) and thus the elderly generation form a potential base for a yet inexperienced game market. Nevertheless, the game industry seems to have ignored this important layer of the population as a special category of users [3]. Neither the hardware nor the software are designed with the elderlies’ age-related cognitive and physical impairments.

While there is a lot of research on the positive effects of digital games on the elderlies’ well-being, the characteristics of the elderly gamers have rarely been explored [1]. The purpose of this study is to find out the elderly people’s perceptions and experiences of playing games and map the difficulties they experience. Based on the collected data and facts, a number of important factors to be considered by the designers of games for the elderly people are recommended.

Almost 50 individuals between 65 and 90 years of age, living in their homes and enjoying a for their age normal health, have been interviewed by the author. The results reveal that a considerably high majority of the respondents show interest in playing games. Meanwhile, they complain about the complexity of both hardware and software in relation to their age-related cognitive and physical limitations. Most of the elderly individuals say that they need help with both playing games and using the devices. An important conclusion from the findings of this research is that games targeting the elderly users should be designed beyond the general usability issues, considering the possibility of customizing the technologies to individual needs and requirements, as the health and physical conditions of the elderly people vary greatly. The study concludes that for the elderly population to be motivated and benefit from digital games, developers producing the software and hardware, and designers engaged in the design of user interface, need to consider this population as a separate category of gamers and offer games meeting age-related needs and requirements.

Key words: elderly gamers, seniors, older users, digital games, game design.
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**Definitions:**

The definitions listed below are only for the purpose of this thesis.

**Elderly people:** Ages 65 and over.

**Mobile devices:** Smart phones, tablets.

**Computer games, IT-based games:** games programmed for mobile, tablets, game consoles and computers.

**Digital games:** Alias to IT-based games.

**Video games:** games played on consoles such as X-Box, Nintendo and Play Station.

**UI** User interface

**RQ** Research question

**The Author** To differentiate between the author of this current paper and the author(s) of the articles reviewed or referenced, the term “the Author” (with a capital A) hereafter refers to the writer of this current paper.
1 Introduction

Digital games, i.e. games that are played on electric devices using processors, (computers, consoles, and mobile devices) have been around for many decades (at least since 1970’s [1]), attracting persons of all ages. However, playing IT-based games has been, by large, limited to the younger generations, but the percentage of the elderly population, (age 50 and above) is growing increasingly [1]. Today a remarkable portion of the elderly people play computer games, forming a special category of game users. While there is a lot of research on the positive effects of digital games on the elderlies’ well-being and improved social interactions, the characteristics of the elderly gamers have rarely been explored [1].

As of today, game developers have not taken seriously the age-related cognitive and physical changes of the elderly population in the design of the game software and the hosting hardware. Game developers have neglected the elderly generation as an important group of users, although there is evidence showing that this group forms a considerable, yet inexperienced, market [3]. According to a UN report, the percentage of the population 60 years and above will grow from 22% in 2008 to 34% by the year 2050 [2]. The demographics of 65+ are growing faster in Europe [3]. Studies also reveal that 15 to 25% of the people 60 years and above play digital games on a regular basis [2, 3]. The population of the people aging 75+ will also increase in the world, according to [2].

In view of the above brief discussion, the need to investigate the requirements of the elderly people on the design of digital games in relation to their physical and mental abilities becomes obvious.

The focus of our study is therefore to find out how the older generation experiences the available game software, and the devices they have access to. Furthermore, the thesis aims to map the problems, obstacles, and hardships that challenge the elderlies’ age-related physical and mental changes, which keep them away from playing digital games. The results provide a summary of the perceptions and ideas
given by the elderly people themselves to improve and facilitate the users’ interaction with the game software and hardware. In addition, related results of vital importance from recent research and studies are also utilized and integrated with the results, in order to build a stronger platform with more reliable data, as well as to verify the findings through interviews.

1.1. Background

As mentioned above, the use of digital games for the purposes of well-being and improved social interactions possesses a high potential, according to several studies carried out in this area [1, 6]. However, the effectiveness and efficiency of the results vary depending on the age, health conditions, and even social aspects for every individual. The physical and mental abilities of all humans reduce with age. As we get older, our sensory, hearing, seeing abilities degenerate, our memory and our learning skills are not as good as the youths

1.1.1. Gaming by the elderly people and age-related factors

About 30% of people suffer vision loss problem by the age 65 and most humans experience hearing loss from around the age of 40 [4]. Motor and balance declination and memory loss are a few other factors. Such age-related impairments make it harder for a senior aged 65 and above to play digital games. Despite these facts, the percentage of elderly users is growing, as mentioned earlier, but there is a notable lack of research that provides insight into the gaming experiences of the older population [1]. The best way to study the problem is to have a dialogue with the older ones themselves and learn about their experiences and note their requirements. Therefore, the Author interviewed a large number of older adults between 65 and 90 years of age. The participants of the interviews represent these three different societies. Thus, a broader elderly audience is included in this research, which has made it possible to include the influence of culture, religion and other social factors in playing IT-based games.
1.1.2. The elderlies’ attitude and motivation

According to Wang [4], 20 to 50% of the retired people (65+) in UK and USA play games. Despite the fact that such a large percentage of the seniors are already playing games, and despite the difficulties discussed above, more seniors may get attracted to and benefit from the positive effects of digital gaming on the computers and other digital devices. In this connection, it can be said that there are at least two main factors to consider [5]:

a. Motivation is very important. How to change the attitude of the older generation to want to play games is a substantial issue.

b. The technology and the software have to be customized for them in terms of not only usability and contents, but also have to be designed for the needs and requirements of the users.

The first issue, i.e. changing the attitudes of the older generation to play digital games is, to a great extent, a social factor which is not the main concern of this study. However, the elderlies can be attracted to both technology and gaming if they are provided systemic instructions and stimulations, particularly if the games bring them benefits, for instance, physical and mental improvements [4].

As regards the second issue (b), the challenges are several. Based on the finding of this research, the elderly people are usually not self-going and in most cases need somebody to teach them how to use the technologies. The devices such PCs, tablets and phones are not designed so the users can get going with a few steps. The systems change all the time and as soon as things change, the older people get confused and need to be helped. The elderly individuals may find simple games, such as card games easy to play, but more sophisticated games, e.g. online games require more skills to be learned.

1.1.3. Gaming from a social interaction perspective

In our modern society, the elderly people do not get much interaction and close contacts with their children, grandchildren, friends, and other elder ones, as the
responsibility of providing care has overtaken from the relatives and friends by the social services. A study conducted by the Journal of the American Medical Association shows that the lack of an interactive life plays a negative role in a senior’s well-being [14]. According to the same source, elderly people with more interaction live longer. IT-based gaming can play an essential role in maintaining the bonds between the elderly people and their relatives. Online games do not require players to have a physical attendance at the same location and thus, families and friends can easily connect with their old parents, grandparents and close relatives or friends who may be away from them.

The role of the software and hardware technologies is essential in providing this facility to the elderly people based in their needs and requirements. There are studies that show that multiplayer online games play an important role in building communities, but the key issue is that members in such circles usually share a common interest [4]. Building communities is not an issue for the younger generation as they are capable of handling and utilizing the modern technology but it is not a common place for the older ones.

There are many articles that discuss and show results of research made in the area of games for elderly people. The results in most cases indicate that games play a substantial role in improving cognitive, physical and psychological health of the elderly people, aging 50 and over [1, 6, 7]. In a study of eleven older patients suffering from depression, researchers found that playing certain computer games was more effective than medication [7]. The elderly people have also been engaged in pilot studies of physically-based interactive games (like Nintendo Wii) and results have shown positive cognitive and physical effects [5, 7].

However, not much in-depth studies which address the age-related design aspects beyond the general usability and interaction considerations. A review of the available studies that are related to the focus of this study is presented in Chapter 3.
1.2. Objectives

The key concern of this research is to study whether the games and the underlying hardware and software technologies are adapted to elderly people’s needs. The main purpose of the study is that from the users’ perceptions, experiences, comments, and ideas, compile useful information for the game designers and developers to make games that are particularly designed for the elderly users. Access to the necessary hardware, PC, tablet or smart-phones, and software, i.e. the operating system and Internet, is a pre-requisite to playing games. This study also presents data on the elderly people’s access to these resources as well as their motivation and acceptance of the gaming technologies. Based on these objectives, the following research questions are formulated.

1.3. Research Questions

RQ 1: How active are the elderly population in playing digital games?

RQ 2: How do the elderly people experience and perceive playing digital games, and what are the main challenges?

RQ 3: How should the software and hardware be designed to consider the seniors’ age-related physical and cognitive changes to stimulate elderly individuals to play games?

The first question sheds light into the elderly people attitude in accepting digital games, and this in turn helps finding answers to RQ2, the challenges. It should be pointed out that the main emphasis of this research is on RQ2 as this part has not been examined earlier, as mentioned before. The last questions aims to mark the major issues for the creators of games to consider.

1.4. The old age criterion

There is no standard criterion for defining a certain age to adopt as the minimum for entering the “elderly population” group. The term “old” in terms of age is defined
differently in different sources. The World Health Organization (WHO) uses the retirement age as a basis for defining at which a person is considered as old [8]. This limit varies of course among the countries of the world. According to WHO, the age 60+, more precisely, 65 years in developed countries and 60 in the underdeveloped countries can be used to refer to as the older population.

For the purpose of this study, the elderly people are considered from age 65 years and beyond. These in turn are categorized in sub-groups with a 5-year interval, to get a more deepened view and provide more detailed results, as the skill levels of the old individuals may vary widely with age.

1.5. Limitations

The studies include individuals having a normal health condition for their age and without disabilities. In addition, only private persons living at their homes (and not in care/nursery centers) are included in this research.
2 Methods

Research question one (RQ 1) is about mapping the relationship between the elderly people and gaming, i.e. to map the frequency of playing digital games by elderly people. In addition, it is also necessary to know what portion of the senior population has access to a computer or other playing devices to play games. These two types of data together will be sufficient to answer RQ1. To find answers to such questions, a quantitative approach is implemented as recommended by Ben-Eliyahu [10]. To collect data for this part of the study, a structured questionnaire is prepared and used (Appendix 2).

A first requirement for an individual to be able to play games is to have the pre-requisites, i.e. access to required software and hardware. This is a precondition to going for finding the answer to research question two (RQ 2). Then, the attitude of the elderly people towards digital games, i.e. their playing habits, and acceptance of the modern and new technologies becomes an essential question. To collect data for studying RQ 2, the older adults are questioned about their experiences of playing digital games and using the needed software and hardware technologies, such as a PC, tablet and smart-phone device, and the Internet. Data of this nature is for the most part the participants’ words and sentences that are noted in text form. Building an empirical basis for analysis, which is often based on data that is in text form calls for a qualitative approach [10, 11]. Research question three (RQ 3) also requires qualitative data.

As can be seen a combined quantitative and qualitative method is implemented in this study, although the major part (RQ 2 and RQ 3) will be carried out based on a qualitative approach. A combined approach can be applied in some scientific investigations to gain the most complete understanding of the topics of the research [9, 12].

For gathering quantifiable data for RQ 1, different methods including interviews can be used, but for the qualitative data, a face-to-face interview method is often an appropriate method [12]. The data in this study is obtained almost entirely by face-
to-face interviews and this method is even used for the quantitative data for two reasons:

a. The research includes respondents aged between 65 and 90 years. The best way to reach them and make them talk is through personal conversations.

b. In a face-to-face interview, more information can be noted during the conversations.

The quantitative data was collected by simply asking the participants questions that required a number as an answer, e.g. the frequency of playing games, etc.

Applying other patterns such Design and Creation seemed to be ineffective of the reason that the participants are difficult to reach in a more organized manner and engagement them in the process. The fact that they mostly like to avoid being surveyed was noticeable during this study.

In addition to interviews and face-to-face conversations, a literature review is performed to enrich the results and strengthen the validation analysis of the research. The outcome of the literature review is mainly used in answering RQ 3. The literature review is done on scientific articles that are directly related to the research questions, and presented in the next chapter.

2.1 Interviews

In carrying out the interviews, the guidelines recommended in Chapter 4 of the book written by King and Horrocks [11] have been used. The guidelines recommend ways to prepare and carry out a qualitative interview. It emphasized the importance of issues like location of interviews, presentation of the project as well as how to report the results.

The main part of the interviews in this research is conducted face-to-face at the places where the respondents live, but a few have taken place by phone. Blackstone [9] emphasizes the importance of the interview location and recommends that
interviews should take place in the location of the interview-participant’s choice, so that the participant feels herself/himself comfortable. Blackstone also recommends some best practices, common to both quantitative and qualitative interviews.

During the span of this research, it could easily be seen that a portion of the senior adults (mostly those over 75 years) get embarrassed as soon as the words “computers”, “surveys” and “technology” are used. Even if the elderly individuals are interested in learning to use and play games, they are not willingly prepared to participate in surveys and investigations. Therefore, the respondents were found mainly through contacts, acquaintanceships and meeting them at public places like public parks.

To attain a reasonable amount of data so a reliable analysis could be performed, a total of 49 persons between 65 and 90 years old have been interviewed. The participants interviewed are located in different regions, in an attempt to reach individuals living under different technical and social circumstances, and in order to obtain a global view of the problem. The interviews have been mostly carried out by the Author through face-to-face meetings and personal conversations, while a few are done using the phone.

Based on the nature of the research questions, two types of surveys have been carried out, one to obtain quantifiable data for RQ1 (see Chapter 1), and another for gathering qualitative data (RQ 2 and RQ 3). Two separate questionnaire-templates have also been prepared for the interviews. The first one, hereafter referred to as Q1, is presented in Appendix 2 and the second one is presented in Appendix 3 and hereafter referred to as Q2.

### 2.1.1 The quantitative method

The questionnaire for the quantitative part, Q1, is used to record information about the users, their age, educational background, and the devices they own and utilize. These results provide the answer to RQ 1 that is about access to necessary software and hardware, the habits and attitudes of the elders towards digital games. It should
be obvious that for an elderly user to play games, at least the following two initial conditions must exist (or be created):

1. The willingness and motivation to accept modern technology and use computing devices.
2. Availability of the required IT, access to the required hardware (devices meeting the game requirements) software (operating system, games) and Internet.

The questionnaire (Q1) primarily includes semi-structured survey questions but it also contains some open-ended questions to make notes of the extra information during the conversations.

2.1.2 The qualitative method

In finding answers to the rest of the research questions that address the design of the software and the hosting hardware, a separate interview form (Q2) has been used. The principal objectives of this survey is to acquire data that is useful in mapping the elderly peoples’ requirements regarding the design of games and ease of using the devices. The collected data has been studied, analyzed, and compiled using the Coding method [9], as discussed later in this chapter.

The interviewed persons are private individuals living at home and having a for their age normal health. The interviews have taken place in different regions, namely San Diego, Ca USA (where the Author lived) during 2014 and 2015, Tehran Iran (personal visit, autumn 2015) and Malmö/Lund (2016).

2.2 Online Survey – an attempt

In order to approach a wider number of adults in Sweden, an online questionnaire was prepared\(^1\). Several Swedish senior organizations, such as Pensioners National

\(^1\) https://goo.gl/f859UW
Organization (PRO), were contacted by mail and phone. Unfortunately, no success was achieved in this effort. In addition, they are not willingly prepared to participate in surveys that have to do with use of computers and digital devices. Survey participants have been selected through personal contacts. A number of the respondents were found and interviewed in public areas.

2.3 Preparation of the interview results

The quantitative data is organized in tables and sorted according to the age groups defined earlier in this study. As far as the qualitative results are concerned, the collected data is to be organized and analyzed. A common method is “Coding” [9]

Coding can be done very structured and in different phases. However, for data of the size of this research, coding simply consists of the steps: identifying, categorizing and compiling useful and relevant data from the interview notes.

2.4 Test group and observation

A number of the participants were asked to play some popular but simple games in order to observe their attitude. The testers’ desire to play, experience in terms of hardness, user interface, and joy were discussed with the participants. The results are presented in Chapter 4: Results.

The author observed an 86-year old woman’s usage of gaming during the first half of 2015. Her experience, problems, and interaction with the hardware and software, and how her capabilities and skills improved during the period are also summarized in Chapter 4.

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2 [www.pro.se]
2.5 Literature Review

In an attempt to find articles that can be useful in answering the research question 2 and 3, a literature review is performed using the following well-known databases and Internet search engines:

- IEEE XPlore,
- ACM Digital Library
- Google Scholar search services

The searching is done with the following filters and criteria:

- Articles and conference papers, published 2010 or later,

The keywords used are different combinations of the following:

- elderly people, seniors, cognitive, physical
- digital games, online games, design

A review and analysis of some related articles is presented in the next chapter.
3 Literature Review

The main objective of this literature review is to obtain useful data for use as a complementary to the findings through individual interviews. Although this study is based on a somewhat high number of interviews, the outcomes of the current research is strengthened by analyzing data and gathering information from other studies. The data collected will be used in forming empirical hypotheses.

Using the criteria and keywords stated in the previous chapter, over 20 papers that were related to this study were found among the many search results. Of this number, six references [3, 4, 16, 17, 18, 19] were chosen for a closer study and analysis as they deemed to be most useful in answering the research questions. The articles that were discarded did not contain much about the characteristics of the elderly gamers or design issues, seen from the elderly people’s point of view, which the purpose of the study is.

3.1 Characteristics of elderly people playing games

Wang [4] quotes from other researches that in a study of elderly people in UK, 52% of pensioners aged 65+ are playing digital games, and 22% of retirees are playing games on a daily basis. In USA, the percentage of Americans aged 50+ increased from 19% in 2004 to 25% by 2005.

According to Gajadhar et al.[16], studies conducted in Europe and North America have shown that 20-35% of people aged between 65 and 79 years and 40-50% of those aged 80 and over report moderate to serious loneliness. Online games play an essential role in providing the opportunities for the older people to socialize with others.

This article by Karimi, et al. [19] discusses the question of how older adults cope with communication using new technology and acceptance of modern social media. The researchers have, through in-depth interviews and home tours, studied the degree of 12 older adults’ communication and their preference to stay away from new technologies. The persons are individuals between 55 and 83 years of age living
in Canada. The researchers build their study on the fact that the majority of older adults do want to contact their grandchildren and children, and these in return want to know about their old parents. Their findings show that a part of the older people would like to use the technology if they get to learn how to use it. They use computers and smartphones, connect to Facebook and are well aware of that by staying away from the social media, they will be isolated. Nevertheless, another part does not exceed the border of using phones just to make calls.

The results of this study is important as it strengthens the hypothesis about the role of digital technology in creating connectivity between the older ones and the society to build social links to not only families and friend but also to get updated on what is going on in the society. This is very relevant to the research questions of our study.

While the study is interesting and useful, it contains its short-comings too. One of its major aspects, which is the difference in age of the persons in the study, is not very related to the results. The paper does not take into consideration how the test persons’ attitudes differ from an age perspective. Another factor that should be pointed out is that the study states that elderly people have a range of needs to enable them use technology to connect to their family and friends but it does not describe the needs. It would have been useful in answering the question of how the elderly people could be convinced and attracted to use of technologies in connecting with social life.

3.2 Elderly game players’ perceptions

Marston [18] uses qualitative methods to study user experience to find out how the older gamers experiences the flow, interaction, and contents of the digital games. The study was carried out on Nintendo Wii and Sony Play Station 2 (PS2). Sixty-eight persons including males and females participated in this study. Besides recording the participants’ activities while during the play sessions, the participants answered a number of questions. The results showed that the users enjoyed Nintendo Wii much more than PS2 as they found Nintendo Wii to be more interactional. This
article underlines that the older adults’ motivation, purpose, and enjoyment differ from those of the younger users.

The article by Foukarakis M. et al. [17] is specially selected as the authors of this article claim that the availability of games targeted to the older generation is limited. Meanwhile, they emphasize that games for entertainment and recreation keep the brains and minds of the users active, which is important for their health. In addition, games provide opportunities for the older ones to socialize, which is of course another important issue.

3.3 Design of games for the elderly people

Games for the elderly population should be designed with their physical and mental limitations in mind. The characteristics of elderly users differ from other age groups in view of the physical and mental impairments of the individuals, such as reduction in hearing, vision, motor and cognitive abilities (working memory declinations) with age. Elderly users show slower response time and if games require steadily using of the mouse, it can be very challenging for the users. Seniors suffer also from psychological deficiencies, anxieties, stress, etc. The articles by Ijsselsteijn et al. [3] and Wang [4] discuss design of digital games from different disciplines including health, and psychology. The impairment varies for every individual from mild to severe. The researchers recommend design factors that are based on such impairments.

Ijsselsteijn et al. [3] discuss design of games for elderly people beyond the traditional usability requirements, and look at the design of games taking into consideration the physical limitations and other age-related factors.

The article is interesting in the sense that it studies the requirements of the elderlies for the purpose of creating games that are more attractive and enjoyable to these people. The requirements are studied due to a variety of impaired physical abilities such reduced visual, audial and other sensitivity problems.
The researchers claim that the willingness of a considerable part of the elderly people in playing games is affected if the games yield social and educational benefits.

One of the important issues that this article discusses is the design opportunities. It recommends four major areas for the game developers to consider in designing game technologies for the elderly users:

a. *Use of digital games for relaxation and entertainment* – the most basic area: The article states that study has shown that gamers give up with the games, although games may be problem-focused (for example personal care), if the games do not offer entertainment and a sense of pleasure.

b. *Games as a means of social activity*: Games provide enjoyable topics for the elderly people to get socialized with others. The social interaction side of games, according the authors of the article, plays a crucial role in motivating the older people to use digital games.

c. *Games as a motivation to sharpening one’s mind*: The article presents evidence showing that games (such as puzzles and quizzes) can, indeed, have beneficial effects to improve mental activities by challenging the mind.

d. *Games creating physical activities*. The new interaction technologies that allow the whole body (for instance Nintendo Wii games) to interact with games is a valuable feature. Such games can be adopted to an individual’s biometric data (such heart rate) and health conditions.

The researchers in [3] recommend that if the audio and video content of the game is essential for the user experience, subtitles should be provided.

The article indicates that the majority of the seniors are attracted to playing digital games if they are provided systemic instructions or stimulations, and if the games brings them various benefits like motor skills, and cognitive improvements.

In the article by Wang [4], the researcher has analyzed a number of existing games, and then recommends the following four design opportunities:

- Entertainment and relaxation
- Socialization with others inside or outside network
- Cognitive abilities (quizzes, puzzles, etc.)
- Physical and psychological benefits (Microsoft Kinect, Nintendo Wii)

The findings of the researchers in [16] are useful in answering the research questions of our study from the elderlies’ game experience and design perspectives. The authors of the article study the seniors’ attitude towards using online games with other people. The findings show that, in contrast to young adults, the older people do not feel themselves comfortable to play with other online players. This has a negative effect on their socialization and tend to isolate those who are less mobile from the social activities.

The authors studied the player experience of a number of seniors, aged between 61 and 78 years, including both female and male participants. The participants played games in different configurations. They studied gamers playing online in the same room as well located away from each other. The results revealed that presence of co-players in the games had a negative effect, as the games were less fun and less enjoyable for the older players. The difference between placing the players in the same-room or at different locations were not very significant. An important outcome of this research is that it reveals a significant difference in attitude of younger and older adults. While younger adults focus more on competition in the game, the older adults are helping each other.

The researcher in the paper by Foukarakis et al [17] study a multi-player card game designed for the older users. The UI can be adapted to every individual’s requirements. Both the experienced and inexperienced users benefit from the self-adapting UI feature of the game. The game was developed using an iterative process with mock-ups, expert evaluation and prototyping. An important aspect of the game was the inclusion of social features using the social communication platforms. The users could exchange words using this system and that way get in touch with each other.
3.4 Summary

The elderly people’s attitude and requirements are mapped in the articles. Studies show that senior gamers make a certain group of users with needs beyond the traditional usability requirements. They have age related characteristics and suffer psychological deficiencies, anxieties, stress, etc. These factors need to be considered when designing digital games targeting the older adults. The elderly users’ needs can vary widely. Games can be designed to adapt to every individual’s requirements.

Games for senior adults should give the users values, serve as a means of social activity, a way of sharpening their minds, and give them health benefits. Social competition should be avoided and social interaction should be enabled.

The articles contain useful qualitative facts on the attitude of the older gamers, and provide guidelines to consider in designing games for this group of gamers. The results are presented in more details at the end of the next chapter, Chapter 4: Results.
4 Results

The results of this research consist of data collected through face-to-face interviews with the older people. A summary of the collected data from all the individual interviews containing quantifiable data (Q1) is tabulated in Appendix 1. Textural notes and answers to open-ended questions are excluded, but the results are reflected in this chapter together with the results of the qualitative research (Q2).

4.1 Interviews and the respondents

The interviews have been performed during different periods of time. The first rounds were done in 2014 and 2015 aimed mainly to find the answer to RQ 1. During spring and summer 2016, the emphasis was placed on collecting data to understand the users’ experiences as regards the usability, ease, and joy of playing games as well as the underlying software and hardware technologies. The results from these findings help to find answers to RQ 2 and RQ 3.

The interview participants represent different regions. Table 1, presents a summary of the number of interviews carried out, categorized by the city of residence as well as the participants’ gender.

<table>
<thead>
<tr>
<th>Location</th>
<th>Total number of respondents</th>
<th>Females</th>
<th>Males</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Diego, CA, USA</td>
<td>18</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>Tehran, Iran</td>
<td>12</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Skåne, Sweden</td>
<td>19</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>49</strong></td>
<td><strong>24</strong></td>
<td><strong>25</strong></td>
</tr>
</tbody>
</table>

The individuals represented by the above table all have normal health condition for their age and all live at home. Some the participants were visited and interviewed as a group. A number of the respondents were interviewed on different occasion using both of the survey questionnaires. The majority of the respondents were citizens not
holding any high position before they retired. The majority had occupations as administrator, technician, construction worker, etc. before they retired.

4.2 Access to digital devices according to age group

Having access to modern devices and the will to use the devices together with the modern technologies, are pre-conditions to gaming. Not all older people have access to such devices and technologies and there is a big difference between the developed countries, e.g. USA and Sweden, and developing countries, such as Iran.

Table 2 summarizes the ownership of devices by the elderly people per age category.

<table>
<thead>
<tr>
<th>Age</th>
<th>No. of respondents</th>
<th>Computer (Laptop or desktop)</th>
<th>Smart phone</th>
<th>IPad, tablet</th>
<th>Average hours of usage/pers/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>65 to 69</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>2</td>
<td>3.7</td>
</tr>
<tr>
<td>70 to 74</td>
<td>5</td>
<td>4</td>
<td>4</td>
<td>1</td>
<td>1.9</td>
</tr>
<tr>
<td>75 to 79</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>2.3</td>
</tr>
<tr>
<td>80 to 84</td>
<td>14</td>
<td>5</td>
<td>3</td>
<td>4</td>
<td>2.3</td>
</tr>
<tr>
<td>85 to 89</td>
<td>15</td>
<td>10</td>
<td>8</td>
<td>4</td>
<td>2.7</td>
</tr>
<tr>
<td>90+</td>
<td>3</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>29</td>
<td>22</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

Most of the seniors aged 65 to 89 possess a phone and use them daily. A majority of them also possess a laptop while some stated that they still have their old desktop computers. The usage of computers by seniors is variable depending mainly on their age. The younger adults have other leisure occupations while the older ones do not bother to use computers.
4.3 The elderlies and playing IT-based games (RQ 1)

4.3.1 Acceptance of digital technology and play games

The questionnaire’s initial questions are about the interviewee’s age and educational background. The educational background gives a clue as to whether the acceptance of technology can be related to the level of education. The fact is that it really does play a role as those with a technical background and higher education use more of the computers and need less help (Appendix 1). The results of the interviews show that most of those who stayed away from computers are those without higher education.

The questionnaire includes a question about whether the interviewees have other game devices and consoles such X-Box and PlayStation. No one of the interviewees seemed to have any such devices.

As the people get older, their interest and ability in using computer devices deteriorate, and varies very individually [3]. An important fact that should be pointed out here is that the participants represented in this study all enjoy good health or at least have a normal health for their age. It has been noticed throughout the interviews that the “younger” participants (65 to 75 years old) are active in other social areas such as travelling, sport, or other social activities. This keeps them busy and away from the computer devices. “We play once a while but we don’t have the time to use the computer and play games…”, said a 71 year old couple living with his wife in Lund, Sweden. Another lady, 86 years old said “I had a large number of games in my old computer, but I need someone to help me copy them to my laptop.”

A high portion of the senior adults have mentioned that they need help with such tasks.

Meanwhile, there is a group of older adults who are not very active in using computer devices. Some seniors (typically 75+) get nervous and frightened as soon as computers are mentioned. They reply directly that they do not know anything about computers and cannot use them. This fact is understandable in the sense that
computers and the modern digital technology evolved when this generation was already old.

The participants’ ownership of digital devices based on the survey can be visualized by the diagram below. The percentage is proportional to the total number of survey participants in the corresponding region.

The diagram shows that the percentage of computers owned by the participants in USA and Iran is almost the same. It should however be pointed out that, among the Iranian respondents, only 2 of the interviewees had modern laptops, 3 had older types of laptops, while the rest of the respondents owned old desktop computers, that could not meet the requirements of most modern games. Several of the respondents did not have access to a regular Internet service.

### 4.3.2 Gaming frequency

The questionnaire contains questions about the seniors’ gaming habits. How often they played games is noted as daily, weekly (one or more times), monthly (one or
more times) or more seldom. The following table presents the results estimated in terms of hours per day. As the number of hours per day for those who said they played games one or a few times a year are negligible, these are not included in the results. Furthermore, the results are not categorized per location (USA, Iran, and Sweden) because it will not give any interesting data as every age group includes only one or a few number of participant in each region.

Table 3: Game playing and playing frequency

<table>
<thead>
<tr>
<th>Age</th>
<th>No. of respondents</th>
<th>Playing</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>No</td>
<td>Daily</td>
<td>Weekly</td>
<td>Monthly</td>
</tr>
<tr>
<td>65 to 69</td>
<td>9</td>
<td>3</td>
<td>6</td>
<td>0</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>70 to 74</td>
<td>5</td>
<td>4</td>
<td>1</td>
<td>1</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>75 to 79</td>
<td>3</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>80 to 84</td>
<td>14</td>
<td>6</td>
<td>8</td>
<td>1</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>85 to 89</td>
<td>15</td>
<td>6</td>
<td>9</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>90+</td>
<td>3</td>
<td>0</td>
<td>3</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Total</td>
<td>49</td>
<td>20</td>
<td>29</td>
<td>5</td>
<td>13</td>
<td>2</td>
</tr>
</tbody>
</table>

The above table shows that approximately 20 of the 49 (41%) of the seniors play games, at least some hours per week. This is comparable to the results of earlier studies in different countries. In Norway, Sweden and Denmark 15-20% of the population above 60 years of age now play digital games on a regular basis [21]. In USA and UK studies the percentage differs between 25% and 52%, respectively.
Using the above data, the percentage of the participants playing (and not playing) games, can be demonstrated as in the diagram below.

![Game playing frequency per age group](image)

### 4.4 The elderly’s experience, challenges and design requirements (RQ 2 and 3)

The goal of the qualitative research carried out in this study is to concentrate on the design of games from the elderly people’s own perspective. The objectives are to find out which problems they face, why they stay away from playing digital games and how they would like to have the games for the elderly users. To succeed in this mission, several of the participants of Survey 1 were re-interviewed using the questionnaire Q2 (Appendix 3). The questions are open-ended and all the interviews have been done by making conversations with the participants.

As mentioned earlier, approximately 40% of the interviewed individuals between 70 and 75 years of age played games at least one or more hours per week. This is in spite of the fact that games they play are not designed specifically for them. Those seniors who play games are mostly interested in simple games specially those they are reminded of the non-digital times, e.g. card games. However, “simple games”
does not necessarily imply easy games, rather games that are not too complicated to play.

A recent study [22] shows that seniors are happy about playing games with good contents and games which challenge the brain and the body. However, the elderlies have clearly stated during the interviews that game designers must think of the reaction time of a senior’s mind and body activities. It takes much a longer time for an older person to react to an event in the game compared to a young person.

Of the 49 interviewed, many of them liked to play card games. Others played games with words puzzles. Some had vision or other such problems that kept them away from gaming.

Most of the participants showed a great interest in playing games provided they could manage the game. Some liked to play games with their grandchildren. Playing online to interact with their family and friends was attractive to some but not all. The common comment was that they needed help with getting online and playing.

On the question of playing games with family members and friends, the responses were only a few mentioned that they did, although most of them were positive about the idea. The major reason for not being able to play with family members was that everybody was busy with different activities and interests of their own. A couple of the respondents pointed out that they knew other elderly adults who played games with their grandchildren.

It was also interesting to find out that most of the interviewed seniors were not active in any IT-based club or circle arrangements. Only one person, a 73-year-old man with a background in the academia said that he was playing chess on the computer almost on a daily basis. He belonged to a chess club made up of friends and they have been playing chess (meeting physically) for many years. He mentioned that the members of the club also played online using free versions available on the Internet.
A majority of the respondents mentioned that they need help and they may not be able to play games on a computer, unless somebody could help them all the time.

4.4.1 Test Group

Among the total number of the 49 participants, a group of 10 retired individuals who used to gather regularly in the neighborhood to enjoy each other’s company, was selected for testing a few popular but simple games. The group, 3 ladies and 7 men, was interviewed once at the beginning of this study on their digital games activities. The group members were then revisited for the purpose of testing and noting their reactions and experiences in testing the games.

To get a better idea of the group’s user experience, a few simple games, Tetris, Solitaire and Chess (Figures 4.1, 4.2 and 4.3) were presented to the group and they were given a chance to try them. Most of the group participants recognized the card game while only a few remembered Tetris. The Chess game (Figure 4.3) did seem to be popular for them. One lady, 81 years old who had played Tetris before tried this browser-based version (Figure 4.2), but she quickly gave up, as her fingers got tired. An 86-year old man became somewhat interested but he could not play the game more than a couple of minutes. He experienced the speed as too fast and had difficulty turning the figures. He liked the chess game but played it only a little. No one wanted to play the card-game, Solitaire (Figure 4.1), but they were amazed when the game was demonstrated. It could be noticed that they were too relaxed and did not bother to play a computer game while enjoying the company. Their opinion on the user-interface of the games were diverse. Some of them wanted bigger images.

![Figure 4.1 Solitaire](solitr.com)
Most of the group members expressed interest in gaming, but they also mentioned that games must be adjusted to their abilities. The indicated that elderly people could not think as quickly as the youth users. One of the members said that games should not be harder than a caliber of 5 on a 1 to 10 scale, where 10 is very hard. He mentioned that their hands do not react quickly with the brain.

On the question of which services they needed and what could make them motivated to start playing games, they all mentioned that they needed help with both the devices and the games. They needed someone to assist them when the computer does
not work or they cannot go online. One of them even asked if there already were any courses for the seniors to learn to use the computers and programs.

To play games, they said they should have somebody who could teach them how to play. This is in fact true for most seniors. They get along well with computers as long as things work the way they have learnt and the way they are used to. As soon as something is modified, new updates or new interfaces, for instance, then they get confused and cannot go further.

To the question of how they experienced the devices they had access to, several of them mentioned they had problems with the updates and upgrading of for example to Windows 10. No one had any tablet but several of them had smartphones which they used most for calling. No one seemed to have tried any games on the smart-phone. On the participants mentioned that he could not use the keyboard on his phone because when he tried to type one letter, two keys were hit or the wrong key was chosen. Writing text with phones were not easy, they meant.

Finally, someone in the group suggested that simple devices for gaming for the old adult should be designed, such that one could start a game and play with any complication.

4.5 A round-up of the qualitative survey

The questionnaire Q2, contains questions that allow the respondents the opportunity to give their responses openly.

The answers revealed some of the common problems, such the design of the interface, the accessibility, and most importantly their need for personal assistance. Many of the people in the age group of 65 to 75 could work on their own and even play online games without much help. They used their mobiles to connect to other people via mail and social media such Facebook and Viber (calls and multimedia communication). Older adults often mentioned that they needed someone who could help them whenever they faced problems. They said that they did not know how to
fix Internet problems if it did not work. The most popular usage of the computer devices by the respondents is for the purpose of watching movies and TV series and last but not least paying bills. Some of the respondents stated that they spent many hours watching movies and series every day.

4.6 Cultural influences

When it comes to different cultures, the habits and attitude of the older people differ a lot. Of the respondents in USA and Sweden, the Swedish participants showed more skills than those in USA. However, no hypothesis can be built based on this study, as in order to come to such a hypothesis, a much wider range of participants need to be interviewed and the study must be conducted in different areas of the countries in question.

In Iran, there are technical, economic, political, cultural and religious issues that affect playing games. The technical problem arises from that not many people have access to Internet and even the Internet is available, it is not quick enough to play online games. Most people do not have access to computers that can play modern games. The interviewed participants indicated that cost of technology was also an important issue, which makes it difficult for most adults to afford to own a computer or other digital devices. These are very expensive compared to their income, as they explained.

The participants in Iran also mentioned that the official instances apply different filters on social media. This limits online gaming. Some respondents mentioned that in Iran, the older people are not very used to playing games or being active online. There are many aspects that affect this phenomenon. Some participants pointed out that playing games were against their religion. Although this is not really true from a religious point of view, it may not be easy to convince them. As the Author is born and has grown up in Iran, this interpretation is not correct. The older adults in Iran have by tradition other responsibilities and they usually stay away from gaming which they consider as being “youth-activities”.

29
4.7 Observation of an elderly gamer

The Author, while in USA, shares an apartment in San Diego, California, with an old lady, whom we can refer to by the fake name “Shirley”, is 86 years old at the time of writing. Her health and physical condition are normal for her age.

Shirley has both a laptop computer and an IPad. Her educational background does not go beyond the primary school; yet her skills in using the computer and Internet are amazingly good. She spends many hours using her computer and tablet every day, mostly watching TV-series, but also sometimes playing games. It is mostly card games, e.g. Solitaire, which interest her the most.

During the first half of 2015, the Author studied her capability to learn new games and watched her growing interest. The games she tested were chess, memory games, some other card games (FreeCell, etc.) Candy Crush, online free casino games, and Online Tetris. The observations showed that she enjoyed playing whenever she could understand what was going on, but as soon as the games challenged her memory more than a few seconds, she gave up. It was quite apparent that Shirley did not like games with complicated interfaces. She liked simple games and those that did not play with limited time or high speed. That is why Tetris did not interest her much as it got speedier with each new level. She usually wrote down the steps to remember the next time, but she called for help as soon as things did not work the way she expected or as she was used to. However, with some minor help she could go on and manage her way through the games. She felt herself quite secure knowing that somebody was at her disposal to help her with the computer and the programs she was using.

As far as online games with other players were concerned, she did not feel comfortable playing with others. Shirley communicated with her children by phone and physical meetings. However, she used Skype to see her grandchildren and talk to them. Her husband died in 2013 and her children, all adults, living in Los Angeles. They came to visit her often and she visited them a number of occasions per year.
Shirley represents an old individual using modern technologies in her old days. The digital devices as a medium of communication and entertainment keep her undoubtedly more active in life and make her daily life more pleasant. However, although she is a somewhat more skilled than most of the other participants of this study, she experiences similar difficulties related to the design of the games, the complexities of the hardware and her aged-related factors. The first possible aid in this situation is that the societies make available technical support their senior citizens and the game makers should consider this sector of the population separately when designing the software and the hardware.

4.8 Results of the literature review

From the literature review done in the previous chapter, it has become evident that older users have age-related decreased functional and accessibility abilities which are not considered by game designers. The industry mainly invests on the younger gamers but rarely on the older people. The older individuals do not look at the games from the same point of view as the younger gamers. Elderly users for example are attracted by the perceived benefits instead of the costs [3]. For a young gamer, winning a fight game, for example, is important while the same criterion is not considered as a positive activity by the elderly gamers [18]. For an older adult, the purpose of the game and its outcome is more interesting.

As far as the use of technology is concerned, for most of older adults, it is a smart phone is what they own [18]. However, Marston, et al. in another article [13] have gathered very interesting statistics about the use of technology by various groups of older population. Use of technology is of course, a fundamental assumption on which the studies of gaming for elderly people are based. It is a precondition. The main question is whether the older generation of today is willing to accept and utilize the growing new technologies. According to the mentioned study, there is a positive trend towards usage of technology by adults aged 65 years or older.

The researchers, however, state that the older adults experience a “digital divide”, describing the inequality between individuals, businesses and households. The
authors of the above-mentioned article state: “...The digital divide is associated with two key aspects: (a) ownership or access to technology; (b) having the skills and experience to use it. Although there could be a wealth of knowledge enabling people to access the technology hardware and software, for some, not knowing how to execute a process, access is blocked...”. From a global perspective, the digital divide is also observed between the developing and developed countries based on the prevailing social systems.

The literature review presented in this paper strengthens the findings in this study in many ways, particularly, in identifying the challenges facing both the elderly individuals as users of the digital games, and the software developers making games for this group of population. Despite the fact that there is a set of the publications related to the older generation’s habits and attitudes of playing games, the grounds and the underlying assumptions vary with time. Those who today are in their 70+ (or especially 80+) years of life are less technology aware than the future corresponding age-group. Those who are today 70+ or 80+ years old have not grown up with the technologies available today. Therefore, the outcome of this current study provides a more recent update of the subject. On the other hand, the literature search done by the Author has resulted in articles that may give output useful for answering the specific research questions presented in this study.
5 Discussion

The research questions in this study include an investigation of the habits and interest of adults aged 65 years or older. A mixture of the quantitative and qualitative method which is used in collecting data through interviews and meeting with the elderly people served the purpose of the research well. The quantitative data provides the answer to the question of whether the participants meet the pre-conditions to be active in playing games, i.e. access to required hardware and software. The qualitative data gave many important facts, data and design options for consideration of the game developers. It is evident from this study that the elderly games are different from other users and in addition heterogeneous group with diverse characteristics.

5.1 Having the necessary prerequisites and the attitude of the older seniors towards gaming (RQ 1)

The results reveal that the older generation is a part of our digital society to a relatively high degree. A considerable portion of elderly population have access to some type of modern computing devices. Almost all of the interviewed individuals own a mobile phone and most of them do have even smart phones.

The results are comparable with the theories given in the literature reviews presented earlier in this paper, particularly when the behavior of the elderly towards using technology as well as the challenges they face which make it hard for them to adopt new technology in their daily life. As stated by Wang [4] and by Karimi, et.al.[19], elderly people require assistance in handling the hardware and clear instructions in the gameplay.

The requirement of special considerations in the design of the gaming software due to age-related impairments has been notices clearly in this study, which is also reflected in many articles [24]. In addition, games need to provide values in form of learning, physical and mental activities.
The results of this study indicate that about 40% of the interview participants played some type of a game once or more times a week while a greater amount did not. This data is quite understandable as we get older, one’s interest areas also change. Yet, 40% is considerably high-enough for the game developers to take this group of users seriously.

The attitude of the elderly people towards gaming can be mapped to fall into these categories:

- a. Seniors who are interested in playing digital games, and who are also playing games daily or weekly. These usually have a better understanding and usually manage the computer and the programs.

- b. Seniors who are interested in playing digital games but they need help with hardware and software.

- c. Seniors who showed no interest in playing digital games.

Considering the different regions included in this study, as mobile cell phones, tablets and even computers are expensive in Iran (and other developing countries), not all elderly people have access to such devices. Technology costs are high in the developing countries and not many families and individuals can afford it. In addition, in Iran, as an example of many other developing countries, there are other factors of social, political, and traditional character (beside the economic issue of affording such services) that affect ownership and usage of smart devices as well as digital game playing.

5.2 Game design issues and user experience (RQ 2)

The results once again confirm the outcome of the literature review that games need to be designed for the elderly people based on their physical and mental limitations [3, 25, 13]. The game industry needs to differentiate between the younger and the older generations. The older generation have lower cognitive and motor functions and worse memory than the younger generation. To the open-ended questions about how they would want the games, most of them mentioned better user interface and simplicity in the games. Many participants indicated that speed, complicated rules
and other such aspects hinder them from playing and enjoying games. There are a limited number of games designed the older people\(^3\), but the game industry should invest more on this group of users.

Finally, the need for support and technical assistance has become obvious from the talks with the participants. This is an issue for the society, family member and friends should play a humanitarian role and assist their older ones. Not many of the older people can afford a costly service and support.

5.3 Designing games based on the seniors’ age-related physical and cognitive changes (RQ 3)

This question of how to simulate the elderly individuals to play games has been discussed through the whole study. The results verify that a majority of the elderly people are interested in gaming. Game designers and developers need to produce games that consider issues beyond the traditional usability requirements.

The physical, psychological, and cognitive impairments that are due to aging should make the basis for producing games for the elderly people. This fact is also reflected in the various researches [24, 24, 13]. Furthermore, games should bring the older adult users benefits in form of joy, cognitive learning and should have a content that has a purpose. The useful and pragmatic qualities of games for older adults are to weigh more than the fun aspects [24].

The findings of this paper together with recommendations found in other research articles such as in [1, 2, 3, 24, 25, 13], suggest some major requirements as outlined below:

5.3.1 The devices: Ease of use

- Computers, tablets, smart-phones need to be designed for the older people. Each individual should be able to restart the devices, reset the devices and start the games without technical help.

- A device with a “push-button” that can reset itself was a suggested solution by an elderly who participated in this study.

- Touch features, buttons, mouse and other input devices are to be designed so that even old users with slow arm and finger movement abilities can use them.

- Small screen sizes, especially in smartphones are tedious for an aged person. Playing games on smartphones with a small display is not practical and may not be an element to invest on. Most elderly people use phones (even smart phones) only for making phone calls.

5.3.2 Design of the game software:

- The GUI should be seeable for the older people with vision loss. The texts should be readable for them. The icons are to be large enough so they are distinguishable. Other interface elements must also be distanced from each other.

- Let the users adjust text sizes, foreground, and background colors. Some colors may be annoying for them.

- Sounds are to be hearable by the users with age-related hearing loss. The older user should be able to distinguish words and understand the audio.

- Our motor control declines with age. Using a mouse for hitting a target or moving an object on the screen can be a big problem for many senior adults. Furthermore, movements in a gameplay need to be adjusted to the reactional abilities of the older users. Neither the mind nor the hands of the older users can react in the same way as the younger generation.
- **Value and purpose of the games:** The older users enjoy games when they understand the purpose of the game and get some values. The values can be things they learn, get physical exercises, or keep them occupied.

Sayago and Rosales et.al. [13] state two important aspects that are usually neglected and should be brought to the attention of the game designers:

a. Insufficient involvement of older people in the design of games.

b. Insufficient understanding of their everyday digital gameplay.

To meet the requirements of the elderly game users, it is important that the users are engaged in the design process.

### 5.4 Validation and vulnerability of the results

Interviews of both quantitative and qualitative are based on the information the respondent makes available. Whether the information is reliable or not depends on the sensitivity of the subject, and on how openly and honestly, the respondents answer the questions and provide information.

Some of the interview participants in this study answered the questions without thinking or stressing themselves. When for instance they were asked about the number of hours they used their computer daily, some individuals directly came with the answer 6 hours. The author tried to convince or make sure he/she meant that and soon they changed her/his mind.

In order to carry out some type of validation, the answers and the notes taken were revealed, recited, and confirmed with the participant at the end of the interview.

From the above discussion, it can be concluded that the quantitative interview data may not be reliable but it still provides an approximate image of the situation.
6 Conclusion

As discussed in the Introduction chapter, a great number of researchers have verified the positive side of gaming for elderly people. The researchers have showed evidence that gaming is good for the cognitive, physical, and psychological health of the elderly people [1, 3, 24]. Furthermore, games bring better life quality for the older ones that are suffering from loneliness and social isolation. With these facts as the main standpoint, this paper shows that even seniors would like to play digital games and they form an important yet different user base. A considerable portion of the elderly sector have access to computers and the will to play digital games.

Playing games in general is dependent on hardware and software technology. As new technologies come out, games may also get more complicated (or modified) which may be challengeable for the older adults. In addition to interviews, recent available studies are searched to extract data that can be used in the analysis and verification of the results. Reviewing such data is useful in laying grounds for finding answers to the research questions. The results of a literature review of articles are presented in the next chapter. As will be seen in the next chapter, a number of researchers have studied the design of games for elderly people from different perspectives.

Managing the hardware when a problem arises is hard for a senior adult and requires support by technicians. To minimize the need for this type of problem, the hardware should be designed with an interface for resetting the software. For instance, by a button press on the keyboard, the computer should go back the last good version. Another alternative as proposed solution can be to have a type of a hardware designed solely for playing games, just as kindles for reading books.

A common factor to notice is that the elderly people are not comfortable with games that are complicated, and challenge their hearing and visual abilities, for instances games with small icons and small fonts. As soon as a game gets harder, challenging their age-related constraints, they give up playing. On the contrary, they like challenges in the games if they can learn things and they understand the purpose of the game [24].
For the elderly population to be motivated and benefit from digital games, developers and designers need to consider this population as a separate category of gamers and offer games based on the cognitive and physical limitations of the old adults. The game designers should design the hardware with the minimum of complexities with the possibilities of restoring the device without the help of a technician (push a button)! The software designs should adapt the user-interface, the video, the sound and the movements based on the elderly people’s physical declinations – large icons, slower actions, clear sounds and video features. Features allowing each individual customizing and personalizing the settings.

6.1 Future work

Game researchers and game industry should put more efforts in understanding what differentiates elderly players [24]. The people included in this study all enjoy relatively good health normal for their age, and live at their own homes. Conditions may be quite different in the nursery homes. The physical and cognitive abilities may differ heavily among the elderly people.

As a next step, the use of IT-based games as a medium of entertainment, health improvement, and social interaction is to be studied in elderly homes and care centers for older people. Games may need to be designed purpose-oriented. Memory games for example can be developed for elderly people suffering from dementia. The old people living in such homes may also be imposed to social exclusion if their families are distant, but the environment may be sounder for establishing a network of gamers within as well as outside the institution so the older people can get closer to each other their families and friends. However, the elderly users are not comfortable with online games [16]. Game developers should take a step in providing specially designed online games for the elderly people.
References


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