Review of European Studies; Vol. 10, No. 4; 2018
ISSN 1918-7173 E-ISSN 1918-7181
Published by Canadian Center of Science and Education

# Digital Skills for Elderly People: A Learning Experiment in Four European Countries

Andrej Jerman Blažič[1] & Borka Jerman Blažič[2]

[1] Institut "Jožef Stefan", Jamova 39, Ljubljana, Slovenia

[2] Jožef Stefan International Postgraduate School, Jamova 39, Ljubljana, Slovenia

Correspondence: Borka Jerman Blažič, Jožef Stefan International Postgraduate School, Jamova 39, Ljubljana, Slovenia.

Received: June 12, 2018 Accepted: July 11, 2018 Online Published: September 5, 2018

doi:10.5539/res.v10n4p74 URL: https://doi.org/10.5539/res.v10n4p74

**Abstract**

The problem of learning digital skills among the elderly addressed in this paper is focused on a methodology that tries to overcome the barriers in adoption of touchscreen digital technology faced by older adults, by using a game-based learning approach. The paper provides an overview of some early results and findings from an exploratory study among the elderly from four European countries based on the use of touchscreen tablets for playing games as a pre-course activity for learning how to use a smart phone. The learning was carried out with pre-selected games designed to enhance the motor skills of the players and improve the coordination between cognitive and motor skills capacity. The results presented in the paper were collected within the partners of the project GIRDA – Gameplay foR Inspiring Digital Adoption from the European ERASMUS+ programme. The paper describes the research setting, the experiments and the results accompanied by discussion and the conclusion.

**Keywords:** elderly people, game-based learning, touchscreen, touch-table, case study

## 1. Introduction

### *1.1 Introduction to the Problem and Its Importance*

As nowadays digitalisation is permeating all sectors and everyday life, citizens are required to have more digital skills in order to participate in modern society and to advance their professional careers. However, according to the factsheet of EU-based facts presented at the Digital Summit in 2017, 44% of the European population lacks even basic digital skills, although in the near future 9 out of 10 jobs will require digital competence. It is moreover predicted that in 2020 the Information and Communication Technology sector in Europe will face a lack of 500,000 experts. Despite the improvements in data and the clear commitment on the political side, Europe is still lacking the digitally-skilled workforce needed to fill the gaps.

Many initiatives in learning digital skills include different training opportunities and methods expected to enable European citizens to be fully equipped with the skills required for the era of digitalisation. The Skill Agenda launched recently presents a number of actions and initiatives that seek to improve the digital skills at all levels and among all citizens, but specific attention is given to the elderly. The problem of learning digital skills among the elderly comes from the way they have learned in their youth and from the feeling that they are outsiders to digital culture. Elderly European citizens may either be retired or middle-aged, and they often lack the digital skills required to use the services offered on modern phones or similar devices with touchscreen interfaces. Digital skills are increasingly required for performing instrumental tasks such as searching for contacts, medical help, measuring medical indicators in an e-health service, paying bills, and taking part in democratic processes. To use them, they often visit public day centres where help can be found. Access to cultural resources, social connectedness and emotional well-being are also activities that require the adoption of digital skills among the elderly. The study presented in this paper is focused on experiments with an application method that helps overcome the barriers in the adoption of digital skills by older adults.

Several hindrances for learning digital concepts among older adults were identified relatively early (Tang et al., 2006). These hindrances partly appear because the learning of digital skills is different in its fundamental nature from what these people have previously experienced and learned. It was also found that the acquisition of digital concepts occurs more easily through hands-on trials and with the use of error-based learning principles developed by some researchers (Damodaran and Sandhu, 2016) as compared to the classical class-based learning. The learning method based on the hands-on exploration approach was found to be more effective than using secondary assistance such as manuals or

procedural descriptions of concepts as tools in class teaching. This method becomes the typical approach to learn the use of digital devices in the last ten years (Häkkiö et al., 2007). However, this type of learning appeared not to be familiar to many older citizens because its use involves several problems in approaching them, either cognitive or motoric. One of the barriers is the sense that the learning is a too difficult task and a discomforting or potentially stigmatizing prospect for the elderly due to their lower physical ability and more difficulties in understanding the digital concept. In addition, many older people are also not comfortable to learn something that they perceive to be a 'classroom' setting by trying to pick up concepts and skills through a third party. Also, many of them are not acquainted with digital technologies and for their digital based service needs usually rely on visits to public day centres where they get help. Sometimes, additional concern appears among them when a mentor is present who lacks the specific competence in teaching the elderly.

*1.2 Short Overview of the Past Experience and the Approach Applied in the Paper*

The emerging game-based learning in the educational process was also applied to the elderly. A game concept for the elderly was designed not only for learning digital skills, but also for activating social interaction and physical activity. This was investigated in several case studies (Gerling, Schulte and Masuch, 2011). One of the studies has found that playing brain-training games on a portable game console had a positive correlation with the reported fun and the learning in an older age group. Similar studies have recognized some cognitive challenges that are aimed to provide satisfying gameplay mechanics for the elderly (Al Mahmud et al. (2008)) and consequently better learning. Finally, the Elder Games project by Gamberini et al. (2008) proposed gaming solution specifically designed to test and train cognitive abilities of elderly persons.

Previous research in this area tried to address mainly (Gerling, Schulte and Masuch, 2011) digital game designs for elderly persons from different perspectives, but its main goal was to create an enjoyable gaming experience for seniors, while trying to motivate the elderly to engage in healthy behaviour through the engagement in playing games.

The work presented in this paper is aimed to provide another aspect of education for the elderly by focusing the work with the elderly on developing digital skills by an attempt to enable elderly people to use modern digital devices with touchscreen interfaces. This paper provides an overview of the results and findings from an exploratory study based on the use of an alternative learning approach by playing games on a touch tablet to facilitate acquiring digital literacy and digital skills in the elderly. The learning took place with designed games offered on big tablets with touchscreen technology and a selection of several games with different demanding skills. The study was carried out in four European countries, the UK, Austria, Slovenia and Macedonia, and the results collected from 107 adults aged between 57 and 84 were elaborated, studied and compared. The study results presented in the paper are part of the research work carried out by the Slovenian partner in the context of the project GIRDA – Gameplay foR Inspiring Digital Adoption from the European ERASMUS+ program. This paper introduces the research setting, the experiments and the results accompanied by discussion and conclusion.

## 2. Learning Digital Skills with Touch Screen Tablets

*2.1 General Insight Into the Applied Approach*

Contemporary digital skill training for older citizens usually reflects a 'behaviourist' metaphor of teaching and learning. Typically, learners are tutored and taught basic manipulations for specific key tasks offered by e-services, such as filling claim forms. Frequently reported problems in building these skills with this approach include difficulties in acquiring and retaining the skills, as fear appears among the learners that errors will be made. A general reluctance to explore the technics or the technology is present on the part of many elderly participants. These may include:

- A belief that they lack the ability to master it;
- That they are ‘outsiders’ in the digital culture;
- That the experience will be unpleasant;
- That they are back in school/being judged;
- That the technology is impossibly complex;
- That there is insufficient or inappropriate help provided for learners.

The role of the mentors is not easy either, as they are often not highly skilled or trained teachers, and many of them have themselves acquired digital skills only recently. Therefore, being placed in a 'teacher-like' role for such tasks is something that can be discomforting for the mentors too. The interpretation of the roles of teacher and learner is often problematic for learners too, particularly if they had bad previous experience of formal learning in a classical classroom setting. By contrast, the approach taken in the study presented below reflects the constructivist and socio-cultural methods that encourage learners to develop confidence and skill through hands-on exploration and discovery in a supportive environment that includes mentorship, but always with collaborators from their own environment. In such environment

the mentors are expected to easily interact with learners, to observe them and to demonstrate the tasks through action by providing direct support rather than being put under pressure to 'teach' the class in the traditional sense.

The approach taken in the study explicitly distinguishes learning from any specified instrumental context by using games generally available on large tablets. In doing so, the approach presented below is based on the intention for the learning process "to be hidden" from users. The attractiveness and pressure-free nature of the games selected in the experiment additionally attempt to remove the affective and culturally-situated barriers to learning. Academic studies (Haikio et al., 2007) of novice older users playing touch table games have suggested that older users are capable of rapidly acquiring manipulation skills and that they exhibit a willingness to explore the new tool in a way that naturally develops cognitive and motor skills. This suggests that effectively 'hiding' the learning of digital concepts in games that are also carried out in a socializing environment allows users to acquire the skills and the confidence for progressing towards full digital literacy. The 'reality-based interaction' of touchscreens is also very likely to be capable to transfer the adopted skills in using key modern devices, such as mobile smartphones and their touch-based screen, a non-avoidable tool for many e-health and other e-services.

In setting the research, all interrelated areas for this type of learning were taken into consideration. Serious games have increasingly attracted the attention of professional trainers and educators' due to the empirical evidence, notably from the 2014 PISA project that surveyed the relationship between the ICT technology used and learning outcomes evaluated through scores achieved by the students in 17 European countries. The authors of the PISA report, Biagi and Loi (2013), found that the relationship between the domain-specific PISA test scores and the measure of the intensity of the student's gaming activity (playing any game) is the only information technology indicator that had a clear positive correlation with the achieved subject scores, in mathematics, science and the language of instruction in the majority of the surveyed European countries. All other IT-activities measured in the same study indicated only negative correlations with the scores. The positive association between the intensive use of gaming and the test scores indicates that gaming positively stimulates the development of the necessary skills, competences and abilities, such as problem-solving, strategic thinking, memory, fantasy, interaction and adaptation to the learning subject – all elements well-captured by the standardized tests in particular subjects, such as those used in the PISA survey. Earlier findings by Wilson et al (2008) on 'Relationships between Game Attributes and Learning outcomes contributed to the accepted assessment of the "game-based learning value." This type of learning was supposed also to be re-enforced and easier with the abilities offered by touchscreen tablets (Jerman Blažič and Jerman Blažič, 2016).

### *2.2 The Research Design*

The main objective of the Gameplay for Inspiring Digital Adoption study was to use several games as a learning tool to develop and practice skills critical for using touchscreen technology, for example to tap, drag and rotate objects on the screen. The initial criteria for selection of the games included familiarity from the 'real world', such as card games, crossword puzzles and jigsaw puzzles, chess and backgammon. Regarding the previous knowledge of the participants, the study team decided to select participants without any skills in playing games on touchscreen devices. The selection of games to be used in the study was based on that decision.

The study was designed as two-player gaming on a touch-table device (basically a giant tablet, e.g. the Lenovo table) to introduce older learners to touchscreen functionality, in a low-pressure immersive environment where the fact that participants were learning was 'hidden'. The Lenovo touch table used in the study offers a selection of preinstalled games that can support up from one to four people playing simultaneously. However, we decided the games would be played by pairs of elderly people of the same gender or mixed and, if possible, from same environment. Exploring the diverse range of game categories available on a Windows touchscreen device presented certain challenges - which might be off-putting for new users trying to find their way in using the screen functionality. The main criterion to select a game was that it created a non-stressful, enjoyable path to learning cognitive and acquiring motor skills. This implied games types that do not place a cognitive burden on the learner, as this usually distracts unduly from the skill-learning process. The same applies to games with a complex set of rules that may burden the player's working memory. The featured 'popular' games were generally overly sophisticated; 'educational' games were clearly aimed at pre-school and primary school age children, while 'adult games' were found to be inappropriate. More useful were the genres which included puzzles, board games and casual games. The decision was made that the first game to introduce should use a basic drag action as an introductory lesson for using a touchscreen device. The selection was not very difficult as there are a number of games that introduce dragging in a variety of ways. The drawing game was selected as most appropriate for users who did not use touchscreen technology and computer games before. The simple drawing tool in our repertoire of games was somehow an introductory element so that our participants could have a first experience of just touching the tablet and getting an immediate visual result – be it a fingerprint-sized dot, a line, a house or a ship. The game allows users to change the colour using the tablet keys. The second game introduced the rotate action and the moving of objects on the screen; this was a puzzle that requires completing an image. Puzzles are popular entertaining games and it was supposed that not much

explanation will be needed for a simple puzzle game. However, this game enabled learning other skills, moving, rotating in dragging objects to come in the right position to assemble the image. The third game was selected from the list of games with in-situ judgment, like the very popular heavy-traffic road crossing game that was selected by the Slovenian and the Macedonian team. Here the player is moving an object over very busy roads, while trying to prevent the object from being crushed under fast-moving vehicles. If the crash happens before the object can reach the other side of the last road, the game closes and starts again. This game is focused on coordination of the vision/recognition and motor activity of the fingers. In Austria and the UK, the third game selected was Candy Crush. This game involves very short distance drag actions similar to the Crossy Road game. The actions often cause rapid system responses that are out of proportion with the input actions. This rapidity undermines the second participant`s ability to observe and take in the active user`s behaviour. The pace of action is similar to the Crossy Road game. These three games proved useful in identifying the key variations and their pros and cons in learning how to act on a tablet's touchscreen. Figures 2-4 (see Appendix C) present the screenshots from the video recording of all three games.

### *2.3 Participant Characteristics*

The age of the participants ranged from 57 to 87. Most of them had no previous experiences with digital technology as novices were requested to form the groups. The level of education ranged from high school up to master's degree. Most of the participants had weaknesses in some of their motor abilities and this governed the way data were collected after each of the completed sessions. The learners played the game in pairs. They were expected to collaborate in helping each other –a socializing effect enriched by the other members of the particular group present during the experiment. The presence of a witness is usually considered as a key dynamic of co-learning. Participants take clues from watching the partner interact with the system and the consequent system response. One of the study tasks was to observe how people interacted with each other as well as with the technology, and how the choice of game or activity influenced the changes in these interactions.

In the UK, the participants were selected with assistance from the GIRDA partner organisation called Good Things Foundation, which is responsible for managing the UK Online Centres Network with over 5000 community centres and a learning platform known under the name My Way, which supports over two million people. The emphasis for the UK team was to involve in the experiment older people close to retirement, or post retirement, from socially deprived areas. Most of the UK participants (40 persons) were from the west of England, Stockport, while the other selected group came from the London area with the help from a group supporting isolated women (20 persons). The participants in the Slovenian part of the study were recruited from three nursing homes in Ljubljana, Slovenia (Bokalce, DEOS Črnuče and Kolezija (30 persons)) and from few other nursing homes in the Velenje region in the north-eastern part of Slovenia, also retired people (30 persons). The home care employee selected the participants that had no experiences in novel technical solutions and had never used a touchscreen device. The Austrian participants were selected with assistance from the Association for Elderly People in Upper Austria (26 persons). The Macedonian team approached nursing homes with retired people too and involved 60 persons in the experiments.

### *2.4 The Study Protocol*

The applied protocol of the experiments included several tasks. However, the approach of using a stiff protocol with strictly controlled variables did not appear a useful approach for the objectives specified. Therefore, we applied some parameters for the study set-up that allowed for local adjustments. The nature of the study was based on the spirit of Grounded Theory (Martin and Turner, 1986), where exploratory studies may resolve questions but equally importantly generate issues and questions for the ongoing investigation. Our guidance for the generation and analysis of data reflects this. As the digital adoption 'landscape' is different in each environment, the selection criteria were affected by the local sensitivities in the participating countries, however they did not differ very much. It was found that among the elderly in the nursing homes, most have had no exposure to digital technology at all, but a more common finding was that among the selected elderly people there were persons with only a low degree of exposure to computers connected to their working environment before they retired. The principle in selecting the participants was that priority was given to elderly people with no prior experience of digital technology at all or a very limited experience. In addition, the gender balance was followed (as far as possible) in the invitations for participation in the experiment. In targeted recruitment, pairs were requested to be formed from both genders as socialising was one of the key elements of the applied learning strategy. Another assumption was that the participants knew each other from before. The staff in the nursing homes or in the partnering organizations was asked to propose pairs by presenting the action as "playing games" as that was the major part of the experiments. The action was additionally illustrated as a 'gift-based' incentive; the gifts were given to the participants at the end of each experiment.

*2.5 Conducting the Session*

The sessions began by welcoming the participants with a brief introduction for the people involved known as study mentors and an explanation of the purpose of the study. Then the participants signed the consent form and agreement to participate and for video recording without disclosure of their identity. The camera was focused only on the tablet screen and on their hands. The mentors were persons paid as tutors or volunteers from the partnering organizations, or simply people with experience in ICT. The mentor was expected to be capable to guide the less experienced players and, in the process, improve their own skills, both as a touchscreen user and as an informal teacher. However, they were not allowed to intervene on the screen during the session, except if the game had to be restarted.

The session started with an introduction of the first activity in the form of a drawing game accompanied with a dragging of objects on the screen. In the introduction, the participants were encouraged to touch the Lenovo table. The mentor was requested to inform the participants that they were not allowed to engage in the game or to work out actions, but it was recommended that they prompt the participants by making suggestions. Some of the mentor's tasks were to ensure that both participants took a turn, to discuss the progress and to express the first impressions. The drawing time for this game was not limited.

The second activity introduced was a game that requires to rotate and move objects on the tablet screen. The participants were encouraged to touch and move pieces to complete the puzzle, but at same time they were allowed to first explore the rotation unprompted, unless stuck. The mentor was supposed to encourage the less active partner to try some of the actions.

The third activity within the third game was more demanding and was introduced with an explanation from the mentor regarding the gestures used and the goals of the game, e.g. successfully crossing several roads with heavy traffic. Again, the time for playing was not strictly limited. Each session lasted from one to two hours and after the gaming ended, open questions were passed to the participants. These open questions were intended to give the participants an opportunity to comment and reflect on their experience. The answers to the post-experiment questionnaires from the elderly groups from the four countries are presented in the Appendix. A sort of scaffolding method was introduced during the game playing. Scaffolding in learning is understood as a support adapted to the needs and learning conditions of each learner. The support provided is decreased over time and with the advancement of the learning. The means used in this learning strategy consist of providing information regarding the learner's performance, giving hints that enable advancements and enabling the learner to go forward, telling them what to do and how the task must be done, explaining the course with detailed information, and finally by demonstrating and later questioning. In our experiments the resolving of learning difficulties and the observed outcomes are summarized and presented in Fig. 1. The different types of mistakes are displayed with reactions and support provided by the mentors.

The Slovenian team continued with another experiment that was aimed to confirm the usefulness of game playing for the adoption of digital skills. This time, a partnership organization engaged in educating elderly people how to use smart phones with touch screen technology was involved – Simbioza Genesis, which maintains an inter-generation centre in Ljubljana. Over the course of five years they have connected more than 15,000 elderly and 9,000 young people from all over Slovenia in a pan-Slovenian campaign of computer and Internet literacy (Simbioza, 2017). In the last two years Simbioza has developed a model for teaching the elderly how to use a smartphone. Each learning course for digital technology and smartphones lasts one month and is attended by a group of ten elderly people. In the joint experiment, one half of the course participants were offered to play the same games as in the previous experiments for 45 minutes on the Lenovo big tablet each day before they started with lessons in smartphone use. This group of the elderly was somehow younger, as its age varied from 55 to 75 years. At the end of the course each attendee was asked to answer the same questions as presented in the Appendix and to perform five different tasks on the smart phone. The same tasks were given to both types of attendees, to those who played games before the course started and to those who did not. The time for accomplishing each task was measured in minutes for each of the course attendees. The average timing for both groups for each task was calculated and the results compared. They are presented in the next chapter. The tasks were as follows:

1. We would like you to apply for financial social assistance. You do not know how to do it, so you need first to contact the Social Work Centre. Find the appropriate public service to find a contact through the web.

2. The Simbioza team BTC City LAB sent you a reminder to apply for the course. You have found out that you will not be able to come at a specific date, the 18 May 2018. Write an SMS as an apology to the team.

3. You have many interesting pictures in your phone's gallery. Simbioza in BTC City would like you to send them interesting pictures by MMS. Open the gallery or photo app and select the photo you want. Send the photo to the number 040 778 475.

4. You would like to borrow a book from a nearby library. You need to know the address of the library, so that you know

where you are going. Find the address of the closest unit of the library in your area.

5. Today is Wednesday, and on Friday you would like to go on a trip to the hills. It worries you that the weather will be bad. Find a forecast for Friday and the weekend on the web.

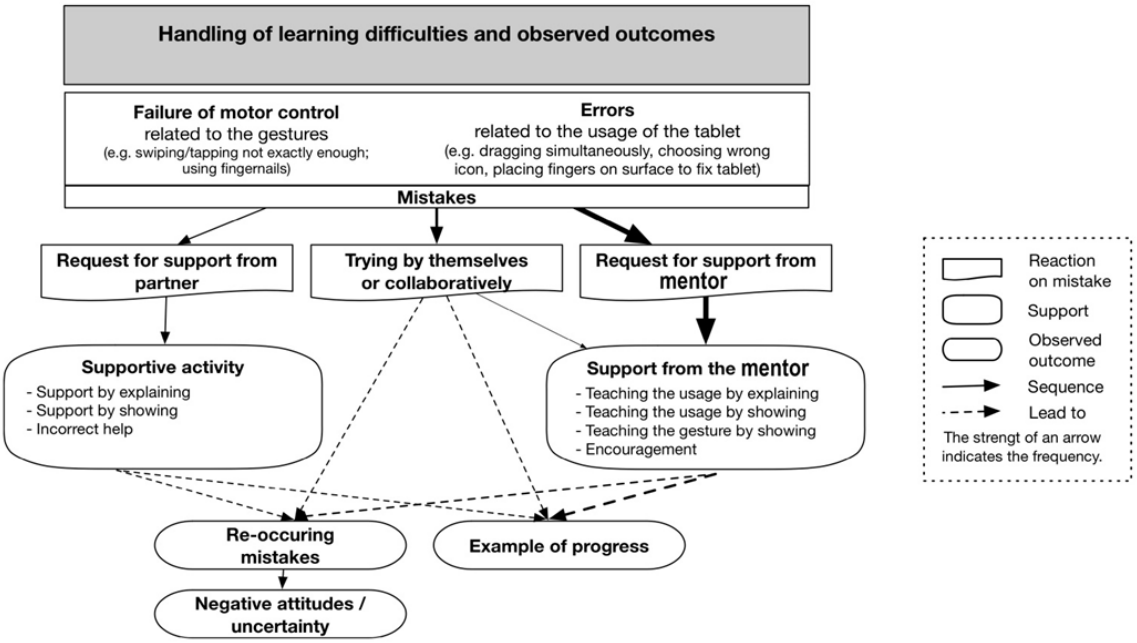



Figure 1. Handling learning difficulties during the learning experiments

## 3. Results

Two different videos were made of each session for each group experiment carried out in the four countries. The first video focused on the tablet (pictures from this video are presented in the Appendix B) and the interaction with fingers; the second showed the whole bodies to analyse the body language. After each session, the participants were asked one by one to take part in an interview with several open questions. They were also asked to complete a template that contained a closed number of questions. (4). The survey was guided by a so-called thematic analysis (Flick et al, 2004) which is an independent approach from the theory of epistemology as it provides a flexible and useful research tool with capability to provide a rich and detailed account of data (Braun and Clarke, 2006, 78). The analysis was focused to find answers and information about the specific needs and most appropriate methods for learning digital skills among the elderly. Examples that illustrate the approach are: do the participants experience any difficulties in the development of the motoric skills necessary to act on the screen, how strong was the players' immersion in the games (obtained from the mentor's observation), was collaboration among the pairs present and was it observed as a support in solving the game, e.g. in the puzzle game, if the participants within the group that accompanied the players provided support with instructions how to play the game or with instruction how to make the move on the tablet. The analysis of the video data showed that the learning hindrances experienced by the participants can be summarized as three types of actions expressed by the participants:

- Request for support from the mentor,
- Support provided by the mentor, and
- A request for support from the partner.

These actions followed usually after the failure of motor control over the tablet and in cases of errors, such as the change of colour, fixing the tablet in the expected position or re-activating the game in case of failure. In case of Candy Crush and Crossy Road errors, the request for support most frequently happened when the participant misunderstood the rules of the game. However, in playing the whole set of games, supportive activities among the pairs and the witnessing members of the group were noticed as well as several examples of progress acknowledged by the accompanying persons. Both independent and cooperative activities were noticed as well as an enjoyment and engagement in the game playing. The post-test interviews showed that most of the participants (82%) described the action as pleasant and full of fun, however

18% found the action tiresome. The most enjoyed game was the puzzle followed by the drawing game. Crossy Road was somehow tiresome for some of them and maybe demanding due to the required speed of action and coordination of vision and motor skills required for successful playing. Most of them (75%) said that they did not find the use of the touchscreen difficult, the other part (25%) declared that they have encountered some difficulties especially in the Crossy Road and Candy Crush games due to the speed required in moving the object. An important finding was that most of them (95%) did not experience any physical discomfort in using their fingers to play the games. The same results were obtained about the experienced novelty of the technology used and the attraction of playing games on a touchscreen table. Most of the participants did not find that playing games was difficult (80%) and the attractiveness of the approach was also assessed as high (90%). The participants declared that they would describe this experience to others as fun and good entertainment. The collaboration – playing as a pair and with group support was also accepted positively by the majority of the participants.

The collected data from the post-test questionnaire were further analysed with the same intention as in the interviews: to reveal how elderly people react and accept the new digital touchscreen technology, what attitudes towards learning with it they display, do they accept gaming as a way for learning digital skills and is fear still present in using this digital technology. Selections of the processed data from all involved countries are presented in the Appendix C. The answers to the fifth question about feeling fear are not presented as no fear was reported by the participants. In general, the entire experiment was assessed by the participants as very positive experience. Some participants asked will there be a second session with the same technology and the same mentors. The charts in the Appendix C show that the elderly people in the countries studied have very common and similar attitudes towards new challenges and the possibility to learn trough gaming and enjoying. Participants from Austria, the UK and Slovenia distributed their answers about the feeling of enjoyment when playing among two scores „strongly agree“ and „agree“. The Macedonian group responded only with „strongly agree“. The same observation applies to the second claim „I feel I have learned something about using a touchscreen“. The claim „I would be interested in playing more games” got a very positive score in the UK and Macedonia (only strongly agree and agree). The answers from participants in Austria and Slovenia were more distributed though highest scores were given to „strongly agree“ and „agree“. The claim „I now feel more positive about using digital systems after this“ was approved in all four countries with the scores „strongly agree“ and „agree“.

The experiments carried out with Simbioza Genesis confirmed the advantage of learning digital skills through gaming on a touchscreen tablet. From the two groups of the elderly who attended the one-month course in learning how to use a touchscreen smart phone, the group that played games before the lessons displayed much more skill in performing more complex tasks. The first and the fifth tasks were very simple and the differences in the efficiency in performing the task by the learner did not differ very much among the group. The average timing for both groups was close to 1 minute (0.78) for the first task and 0.3 minutes for the fifth. However, the differences among the timings of the more complex tasks 2, 3 and 4 were remarkable. The average timing for task 2 was 1.196 minutes for the gaming group and 3.471 for the other group, task 3 was performed by the gaming group in 1.178 minutes and in the second group in 2.272 minutes, and task 3 required 0.492 minutes for the gaming group and 0.768 for the control group.

## 4. Discussion

In most cases, the foundations of being a good user, meaning to develop trust, self-efficacy and perceived value, is growing slowly and steadily without anyone giving the matter much thought, often well before someone, e.g. a child starts learning in a particular case. By the time the person is seventeen, s/he can easily understand the benefit of learning to drive as this helps the mobility. The person is also well aware of the risks of driving, but also knows how they can be mitigated.

However, these learning foundations are often absent when it comes to non-users of digital technology, as several studies (Damodaran and Sandhu, 2016) proved it is very hard to teach them by means of the general ‘show and tell’ system. The first step – going from being a complete non-user to an engaged newbie – is the steepest process. The challenge for digital inclusion practitioners is to ensure that the training for new users is fun, social and risk-free, while still building vital interface skills and encouraging experimentation and self-guided learning by the learner. Research shows that these factors are especially important for older learners, for whom the opportunity to play with digital technology helps to capture interest and build confidence. These findings were confirmed in the presented study as well. The learning was „hidden” and the adoption of self-learning was present and proven. All points indicating the importance of game-based learning for digital inclusion have shown to be true even in a group of elderly people with some physical or mental weaknesses. It was also shown by the majority of participants that using games to learn is perceived as fun, is a low-risk activity, and the players were able to run through situations again and again e.g. in the drawing game and in the Crossy Road or Candy Crush games. During game playing they explored how the different moves of their fingers have different results by changing the colour in the drawing and by completing the image in a puzzle game. The big difference from classical teaching of digital inclusion skills is that games can be very familiar or incredibly easy to learn and in the case of the elderly they need to answer to their needs. In fact, the easier and more familiar they are, the better for the learner, at

least to begin with. The rules for learning this type of games are not the rules of the game or winning the game, but the rules of how to interact with a digital device. In the studied sessions, almost all participants adopted the touch interaction method easily regardless of their motor skills. Evidence from the experiments presented above suggests that the 'right' game depends on a number of factors, and that perhaps in this type of learning the mentors would benefit from a diagnostic tool to be developed for selecting games based on players' attitudes, skill levels and relationships with their partners. Another observation was that when both people playing the game did not have any experience using the technology, the group they belong to displays a dynamic that becomes especially influential: assertive, dominant personalities in the group tend to take over and sometimes no mentoring is needed. Most of them understood the games easily and some outperformed the others especially in playing the second game – the Koala puzzle. All of them were capable of drawing a figure on the tablet and to change colours; however, several trials were necessary to touch the right place on the screen. The differences in the flow observed among the participants might be attributed to the fact that the players with some motor weaknesses seemed to encounter more problems when interacting with the Crossy Road game, as the game requires fast reactions with the finger. Immersion in the game was present as well. Collaboration among the players, either from the partner in the pair or from the group that gave loud advices how to act on the tablet, was very visible. Some of the participants were first watching, before they actively entered the game. Observations during the sessions suggested that the cognitive load of managing the session sometimes required more than one mentor. Altogether these findings came from the participants' observations, but also from the data collected in the interviews and the closed questionnaire. Despite the age-related cognitive and physical changes, all participants were able to play and to understand the questions in the questionnaire. Yet, further research regarding the test criteria, such as the reliability and internal consistency of such exploratory study, is necessary especially when further learning is in place as was the experiment with courses for smartphone use.

However, we can state that the value of the approach in learning digital skills for the elderly was confirmed in the second experiment where gaming was used as a pre-learning activity in the smartphone use course for elderly people. The group that played games before the course has shown a remarkably better efficiency in performing the more complex tasks required to use digital services with a smartphone. This additionally implies that the gaming approach for the elderly by means of touchscreen tablets needs to be further developed with approaches that accommodate the specific needs of the elderly. This applies especially for the process when mentors or other persons involved select the most appropriate game that enables to equally practice both skills: motor and cognitive. Playing and learning as a social activity is another dimension that should be further supported, as the experiments show. A clear notice about the progress in learning appeared to be as well an important property of the strategy applied in enhancing the learning of digital skills for the elderly.

## 5. Concluding Remarks

To become a proficient user of anything, some absolute essentials are needed. Each person needs an easy and regular access to the thing/device to be used, as s/he needs to develop the skills required for the effective use of it. But having that access and learning those skills are not of much use if there is no trust in the items that are used, and if the user does not have faith in his/her abilities to use them, or simply does not see the point. Just like skills, these internal conditions are not innate, and there are many factors that influence the degree to which someone possesses them and likes them, as they can be nurtured and grown with the right kind of support.

The study carried out in the context of the GIRDA (Gameplay for Inspiring Digital Adoption) project has shown that most of these aspects in modern learning were taken into account during the study. Elderly people need to know how to use modern devices such as smartphones, to stay socialized and to receive the advantages of modern technology especially designed to help them when aging or to stay at home as long as possible. Many e-health applications nowadays are developed for the elderly but their use and the benefits they bring depend on the users' digital skills and on the understanding of the service offered. Playing games on a touchscreen table is obviously one of the methods to help them to acquire these skills more easily and in a friendly manner. Learning without knowing that the person learns is simply more acceptable as it is an easy way to adopt what is needed in the present and future digital world. GIRDA will continue with similar experiments and studies in the future within the environments from participating countries, and future reports and findings will be prepared and published. A comparison of the results will be provided as well. The future rounds of data collection and analysis will aim at understanding the optimum setup for this kind of peer-to-peer learning, and what kind of games will yield the best results. We hope that in future there will be opportunities to use this evidence to create tailor-made games that can build the interface skills and help older learners to overcome the lack of confidence and a feeling that using touchscreen computers is risky and impossibly complicated.

**Acknowledgments**

This paper was produced in collaboration of the GIRDA project partners. GIRDA is a project funded by EU Commission within the program Erasmus+. The authors acknowledge the partners' contributions. Part of the funds come from the Research program P2-0037-106 funded by the Slovenian Research Agency.

**References**

Al Mahmud, A., Mubin, O., Shahid, S., & Martens, J. (2008). Designing and evaluating the tabletop game experience for senior citizens. *Proceedings of the 5th Nordic conference on Human-computer interaction building bridges - NordiCHI '08*, 215-222. https://pure.uvt.nl/ws/files/1049756/p403-al_mahmud2.pdf

Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Journal of Qualitative Research in Psychology*, 77-101(2). https://www.researchgate.net/publication/235356393_Using_Thematic_Analysis_in_Psychology

Damodaran, L., & Sandhu, J. (2016). The role of a social context for ICT learning and support in reducing digital inequalities for older ICT users. *International Journal of Learning Technology, [online] 11*(2), 156-75. http://irep.ntu.ac.uk/27281/1/4898_Sandhu.pdf.

Flick, U., von Kardoff, & Steinke, I. (2004). A Companion to Qualitative Research. *SAGE P.C, London*, 146-153.

Gamberini, L., Alcaniz M., Barresi G., Fabregat, M., Prontu, L., & Seraglia, B. (2008). Playing for real bonus: Videogames to empower elderly people, *Journal of Cybertherapy and Rehabilitation*, (1), 37-48. https://www.researchgate.net/.../280580534_Journal_of_CyberTherapy_Rehabilitation

Gerling, K., Schulte, F., & Masuch, M. (2011). Designing and evaluating digital games for frail elderly persons. In: ACM Conference proceeding ACE. *Lisbon: ACM Conference proceeding ACE*, 119-127. http://hci.usask.ca/uploads/235-a62-gerling.pdf

Glaser, B. G., & Strauss, A. L. (1967). *The discovery of grounded theory.* Aldine Publishing, Chicago, USA, 215 pages.

Häkiö, J., Wallin, A., Isomursu, M., Ailisto, H., Matinmikko, T., & Huomo, T. (2007). Touch-based user interface for elderly users. *Proceedings of the 9th international conference on Human computer interaction with mobile devices and services - MobileHCI '07*, 289-296. https://dl.acm.org/citation.cfm?id=1378021

Light, R. (2008). Complex Learning Theory—Its Epistemology and Its Assumptions about Learning: Implications for Physical Education, *in Human Kinetics Journal, 27* (1), 21-37. https://journals.humankinetics.com/doi/abs/10.1123/jtpe.27.1.21

Martin, P., & Turner, B. (1986). Grounded Theory and Organizational Research. *The Journal of Applied Behavioral Science, 22*(2), 141.

Simbioza, G. (2018). http://www.simbioza.eu/sl/2017/predstavitev, accessed May 2018.

Tang, A., Tory, M., Po, B., Neumann, P., & Carpendale, S. (2006). Collaborative coupling over tabletop displays. *Proceedings of the SIGCHI conference on Human Factors in computing systems - CHI '06*, 1181-1190. citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.67.8438&rep=rep1...pdf

Wilson, K., Bedwell, W., Lazzara, E., Salas, E., Burke, C., Estock, J., Orvis, K., & Conkey, C. (2008). Relationships Between Game Attributes and Learning Outcomes. *Simulation & Gaming, 40*(2), 229-243. https://dl.acm.org/citation.cfm?id=1517828

**Appendix A**

**The interview and post-test questions**

The post-session open questions were carried out as an interview. These open questions were intended to give participants an opportunity to comment and reflect on their experience and to discuss the experiment with the mentors and with the nursing team.

a. Which game did you enjoy the most (and why)?

b. Was there anything that struck you as novel or surprising?

c. How would you describe these actions to someone else?

d. Was there anything you found particularly difficult about using a touchscreen?

e. Did you experience any physical discomfort?

**Closed elicitation in the post-test questionnaire using the Likert scale included the following statements.**

a. I enjoyed playing the games.

b. I would be interested in playing more games.

c. I feel I have learned something new about using a touchscreen.

d. I now feel more positive about using digital systems (e.g. touch-tables, tablets, iPads etc).

**Appendix B**

**Shots from video tape**

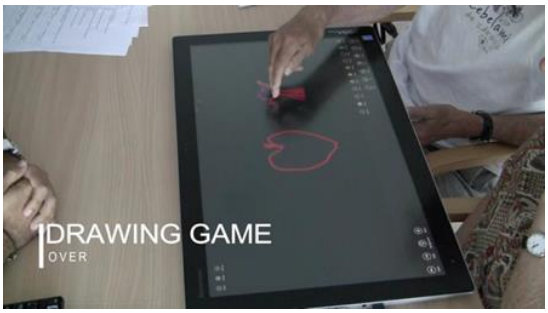



Figure 2. Screenshot from the video – drawing game

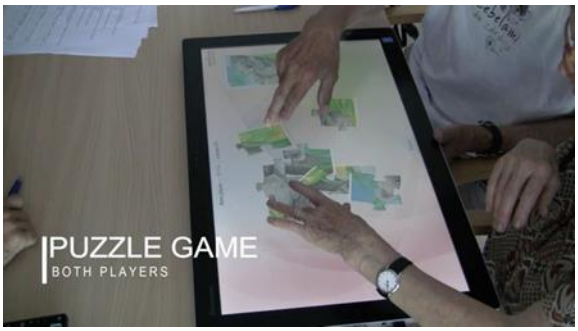



Figure 3. Screenshot from the video – puzzle game

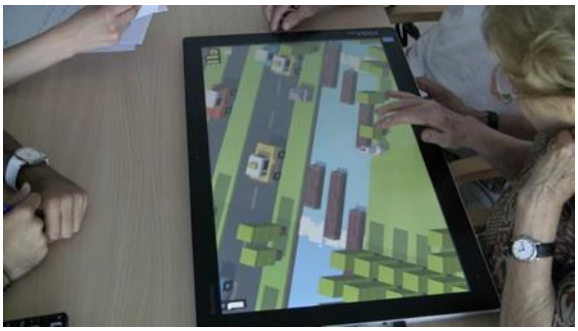
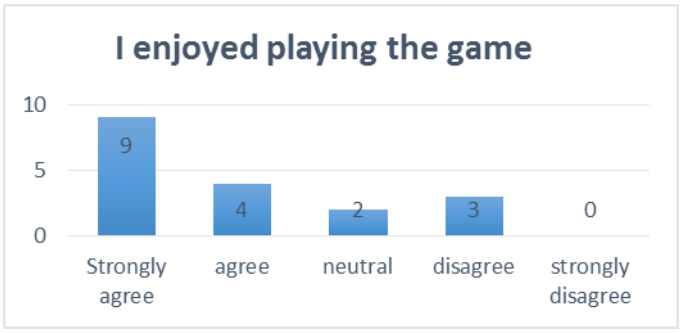


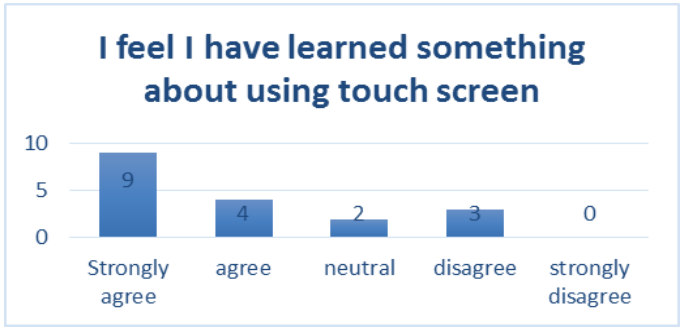
Figure 4. The Crossy Road game

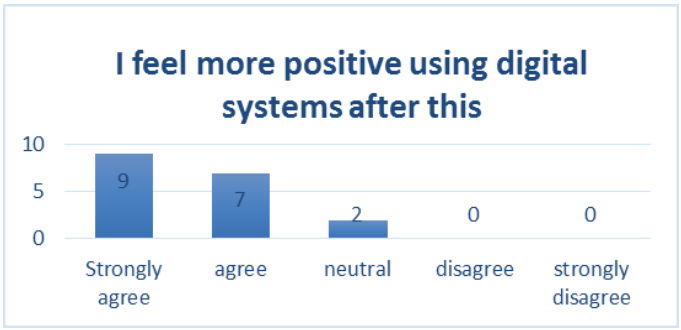
**Appendix C**

**AUSTRIA data**

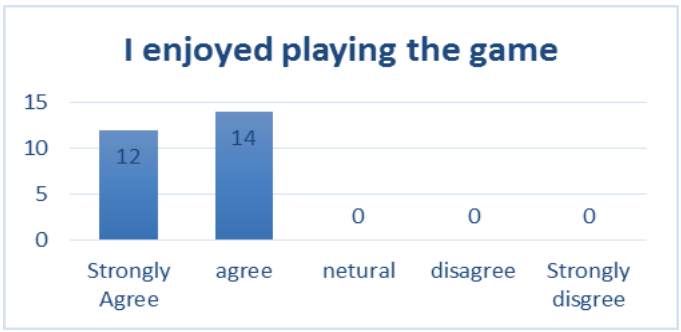


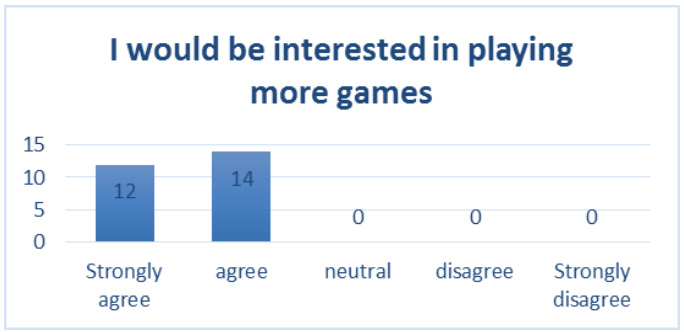


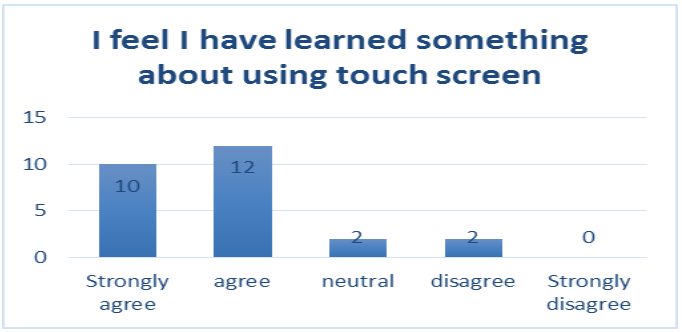


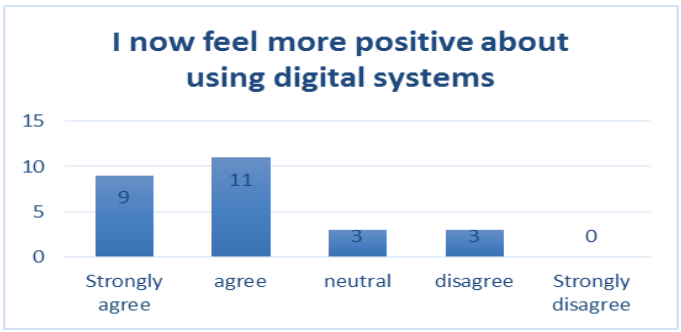




**UNITED KINGDOM data**

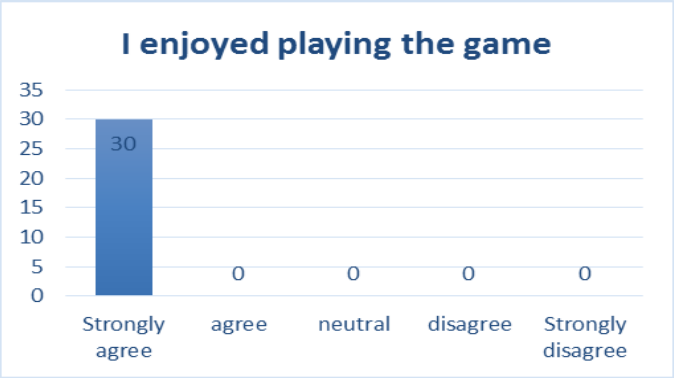


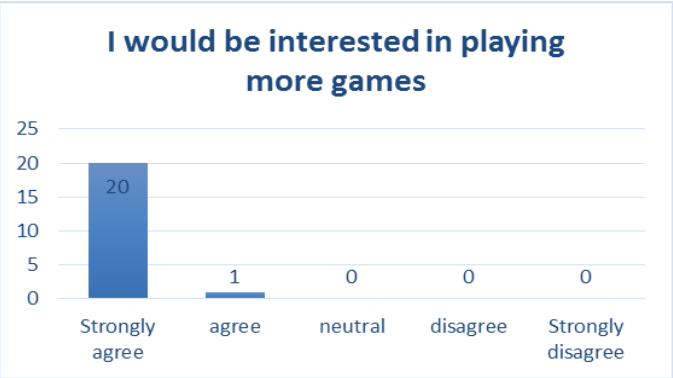



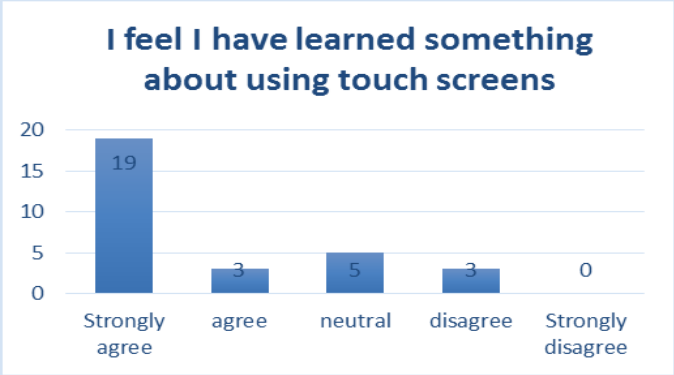



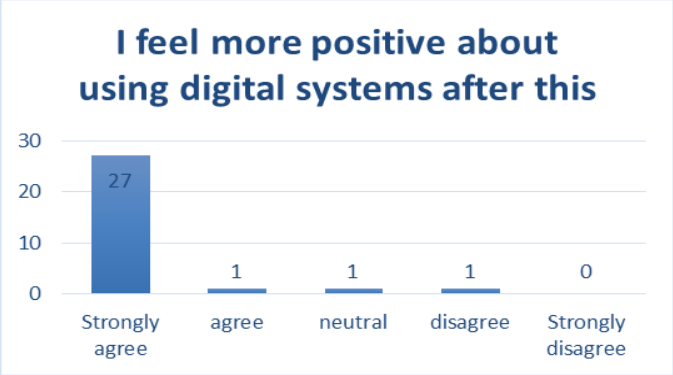



**FYR MACEDONIA data**




**SLOVENIA data**