

The Andragogical Perspectives of Older People's Interaction with Digital Game Technologies: Gameplay on Gesture and Touch-Based Platforms

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Investigating into Older People' Digital Gameplay: Gameful Interaction for Older People

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Abstract: Digital game technology has been adopted by many sectors and in almost every discipline, which includes education, military, business, health care, psychology and computer science. This is due to the engaging factor of gameplay offered by digital games. In recent years, the application of games is becoming a popular medium in promoting healthy lifestyle and improving the quality of life especially for older people; for instance fostering social connectedness motivated and stimulated through social interaction, cognitive exercises and physical activity that can be afforded by digital game technology. It is essential that users or players are captivated and engaged by the game before any serious purposes/activities can be imposed. The design of most games used for both entertainment and serious purposes however focuses on general player population, and mostly the younger population currently engaging with digital gaming. The paper aims to investigate the correlation between the challenges associated with older people, their existing engagement with digital gaming and other interactive technologies, the andragogical perspectives and existing game design attributes. A pilot study was performed with 14 participants aged between 55 and above. Data was collected from their interactions with and experiences of digital gaming. Questionnaires and group discussions were utilised in order to collect their feedback and perspectives on the experience. The results of our study show that there are three key findings which are; 1) the interaction types and the experience provided by the game itself, 2) the game interaction styles which is supported by the platforms and 3) gameplay interaction and challenges associated to age-related changes. These findings should be considered when investigating the interaction and experience of older people with digital games.

Keywords: older people, andragogy, digital game, interaction, experience

1. Introduction

The world population is ageing. In 30 years, one in five people in the world will be over 60 years of age or older (Akitunde, 2012) and is predicted that this population segment will reach two billion by 2050 (Aalbers et al., 2011; WHO, 2002). Declining in physical and cognitive abilities are likely to encounter by the older people at the age of 60 (Kaufman, 2013). Besides that, the age-related changes include decline in visual and auditory capabilities.

Researcher (Sixsmith, 2006), remarks that technologies can offer beneficial and meaningful activities that fun, enjoyable and stimulating. While digital game technology usage and its capabilities have attracted educators and researchers worldwide to address specific interest for certain targeted group of users. Historically, the design of most games used for both entertainment and serious purposes however focuses on general player population, and mostly the younger population currently engaging with digital gaming. In recent years, a game-based approach is being widely used and accepted to cater and address the needs (educational, health, social interaction, etc.) of various target groups, including the older people.

The application of games is becoming a popular medium in promoting healthy lifestyle and improving the quality of life especially for older people; for instance fostering social connectedness through social interaction, physical activity and cognitive exercises that can be afforded by digital game technology. It is essential that users or players are captivated and engaged by the game before any serious purposes/activities can be imposed. Besides that, most models or framework for designing and developing games were particularly developed for general type of games (commercial games) and aiming for younger users in mind. A small number of research proposed game design for older people, however none of them developed specifically for the use of older people that correlates the attributes of game technology and considerations; such as andragogy perspectives and challenges faced by this target groups.

This paper aims to investigate the correlation between the challenges associated with older people, their existing engagement with digital gaming, the andragogical perspectives and existing game design attributes.

2. Related Work

In early 80s, the usages of video games towards older people have been conducted. Among the early study is by Weisman (1983), where the author introduced the video games to institutionalised older people. Based on his studies, Weisman asserts that game should have different levels of difficulties to support individual preferences and sensomotor abilities. In addressing visual and auditory impairment, he suggested the use of large font, well-defined visual symbols and clear auditory feedback.

Similarly, Whitcomb (1990) and Ijsselsteijn et al. (2007) also propose several game designs and recommend appropriate user interface for older people which emphasise on impairments in visual and auditory perception and a loss of sensomotor skill. Extension of above approach has been done by Flores et al (2008) where the author recommends the design of appropriate cognitive challenges, a simple user interface and ability to provide feedback. There are a number of game designs specifically focusing on older people; which mainly focusing on accessibility (Gamberini et al, 2006) and player performance (Gerling and Masuch, 2011). Due to challenges faced and lack of technological experience, usability is a key issue with the older population compared to the younger population.

With respect to game design for older people, studies showed that older people have specific gaming needs and preferences. It is also observed that their abilities differ from younger people (Gerling et al, 2010; ESA, 2011; Pearce, 2008; Nap et al, 2009, Nacke et al, 2009). De Schutter and Abeele (2008) propose that the game design should consider topics that are related to older peoples' real life experiences, foster connectedness and nurture one's self and others. Gerling et al. (2012) echoes De Schutter and Abeele's view by suggesting user experience and sufficient information needs to be examined and provided to capture adequate interaction between players and the games. Studies by Romero et al (2010) however indicates that involvement by older people themselves throughout the design process is important to obtain valuable information in meeting their needs (the transactions of the ageing process that relate to their likes and dislikes). These studies indicate the importance of the andragogical aspects when it comes to designing and developing games, specifically for older people.

Andragogy can be defined as the art and science of 'helping' adults learning. This is based on the assumption of the two different learner groups, adult and children (Knowles, 1984). It shows that the way adults learn or perceive thing is different from children. Therefore, to promote learning for an adult will require a different approach, through adopting the andragogical perspectives.

The current paper extends from our work (Jali and Arnab, 2016). The current paper reported that based on feedbacks from the participants, challenges associated to ageing should be taken into account when investigating the interaction and experience of older people with digital games. This is in conjunction with three other components from the previous work; the perspectives of engaging with different platforms, views on digital games and the factors that could change their perspectives

3. Methodology

Focus groups were conducted which comprised of three main parts; 1) the use of questionnaires, 2) gameplay session for hands-on activities; and 3) group discussion for collecting feedback from the hands-on session. For this study, we focused on platforms that offer natural user interfaces and intuitive that can ease the interaction between the participant and technologies in a natural way (Tanaka et al, 2012). The platforms that were selected were 1) Xbox 360 which allows physical movement that not required holding a controller, and 2) Android tablet that offer touch-based display. The selected games were games on Xbox 360 console (*Kinect Sport: Bowling*, *Kinect Sport-Season Two: Skiing*) and games on Android tablet (*Bowling*, *Car Racing*). Each game was selected with regards to various skill and ability offered; and to trigger different reactions from the participants.

3.1 Participants and Recruitment

The participants for this study consisted of 14 older people within the aged of 55 and above (5 males, 9 females). The average age of participants was 65.04 (MEDIAN: 61-65). Participants were recruited from various organisations, groups and forums in Coventry. In total, 6 different organisations and groups were participated in the study.

The intended participants consist of independently living older people, who were physically and mentally healthy. The recruitment of participants was formed by approaching pre-existing (convenience sampling) groups, forums and organisations located in Coventry. Several other participants were referral (snowball sampling) from their friends. Institutional ethics approval was obtained for this study and participation was on voluntary basis confirmed by a signed consent.

3.2 Measures

A mixed approach is used for this study. The following quantitative and qualitative measures were used in this study: 1) a questionnaire regarding participant's demographic background, user's acceptance towards technology and game experiences; and 2) the informal observations of participants during gameplay and 3) group discussion. Results from the findings will help to inform user's interaction and experience in playing digital game.

3.3 Procedure and Data Analysis

Four focus groups were carried out with a total of 14 participants (n=14) with each group consists of 2 to 4 people. The focus group sessions took about 90 mins each and conducted at the location that was familiar to the participants. Fig. 1 shows the structure of focus group used in this study. The focus group structure explained in the next paragraph.

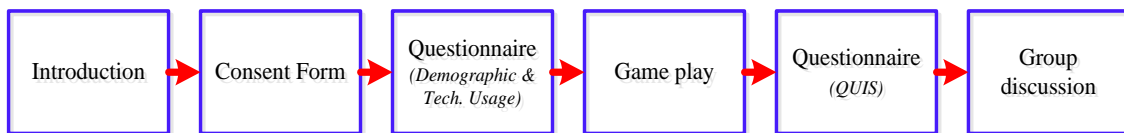


Fig. 1. Focus group flow chart

In *Introductory Session*, all participants were given a brief description of the main purpose of the study. Followed by administered a *Questionnaire* to gather participants' information, technology usage, game experiences and game interfaces. The questionnaire was a modified version of QUIS (Questionnaire for User Interaction Satisfaction) developed by The University of Maryland Human-Computer Interaction Lab (n.d.). Later, participants were introduced and asked to take part in *Gameplay* session to play 3 games (i.e. *Bowling*, *Skiing*, *Car Racing*) on different platforms. This gameplay was conducted to gather participants' feedback. Lastly, a semi-structured interview was conducted in a *Group discussion* setting. The open-ended questions were asked aim to obtain participants' opinions about their game interactions and experiences, and this offered in-depths understanding to researcher on participant's experiences.

All sessions were recorded and transcribed, and feedbacks were analysed quantitatively and qualitatively. The quantitative data analysis was performed using IBM SPSS 22.0. The qualitative data was analysed mainly using Content Analysis to identify common codes and categorised them into themes.

4. Results and Discussion

4.1 Participants' Background

It was reported that all participants owned a personal computer and were familiar with using smartphones or tablets. They have used these technologies for various purposes such as email, e-banking, news, social media and gaming. 9 out of fourteen participants reported previous experiences of playing digital games. In general, 64% of participants classified as non-gamer, who played games occasionally or not at all; and only 36% were considered gamer, who played games every day (61-65 (40%), 66-70 (60%)). Participants generally played digital games on their personal computer, laptop, tablet or smartphones. They asserted traditional games such as Monopoly, Solitaire, Sudoku and Scrabble are some of the games that they are familiar with and they continue to play it on digital game platforms.

4.2 Participants Perspectives on Different Platforms

Fig. 2 illustrates the views from the participants after interacting with both platforms, which address 6 criteria evaluated through gameplay on both platforms. *Mann-Whitney U* test was conducted and showed a

significant difference between console and tablet for two items; *Player Enjoy Playing the Game* ($U(25) = 35.5$, $Z = -2.671$, $p = 0.008$), *Player in Total Control* ($U(25) = 44.5$, $Z = -2.130$, $p = 0.033$). The result reveals that when the older people were in a total control of utilising the platform, they found enjoyment and engagement in playing the game. This is tally to our finding in Section 4.3.1, when the older people found it was easy to operate console and indirectly it brought fun (i.e. social aspect) and enjoyment to them. This result is directly associated to the andragogical perspective in terms of the older people’s need to take control over their learning (i.e. utilising the platform) and enthusiasm towards learning activities they are participating in (i.e. playing games) (Knowles, 1984). Meanwhile, no significant difference is found for the rest of the criteria.

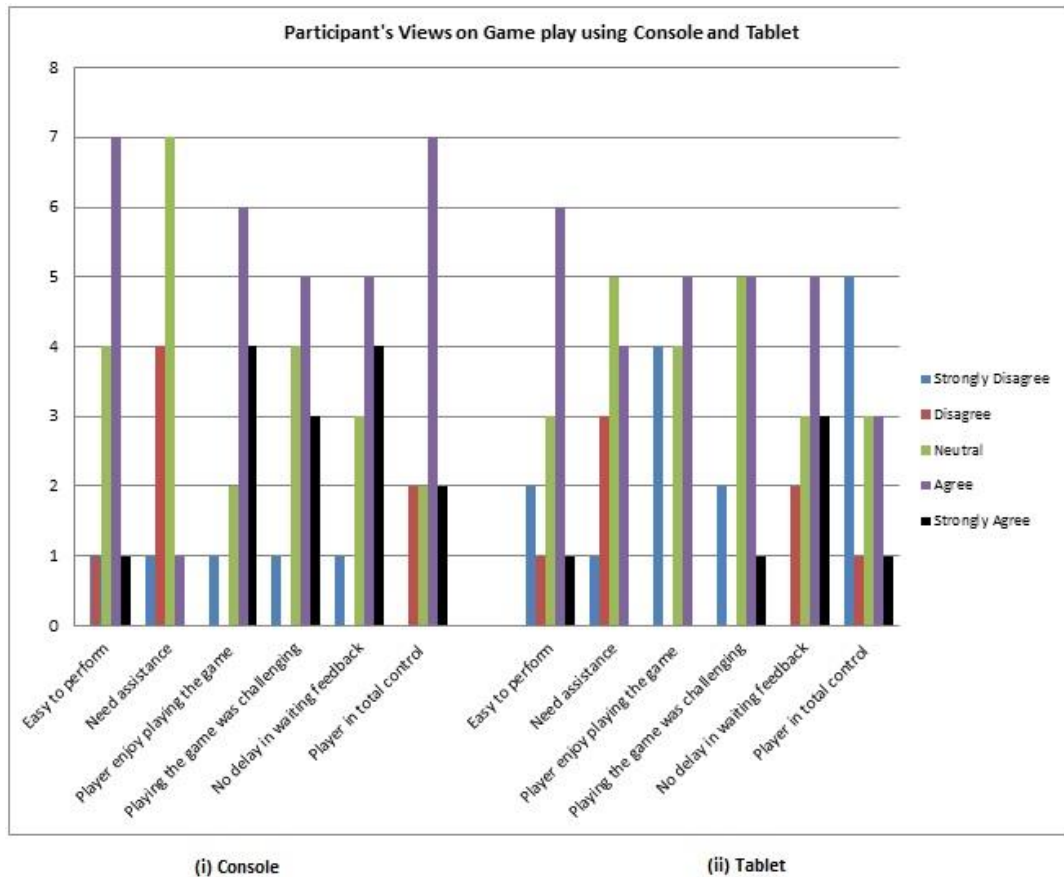


Fig. 2. Participant’s view on gameplay using console and tablet

4.3 Group Discussion on the Gameplay Experience

From our previous work (Jali and Arnab, 2016), there were three main components that we have highlighted; 1) the view on interacting with the different platforms, 2) views on digital games and 3) change of perspective.

Based on Section 3.3, a group discussion was conducted with the participants’ post-gameplay where they discussed about their interactions and experiences during the session, their views on the technology and their challenges faced while playing the game. This section elaborates on three key findings which are 1) Gameplay activities which lead to interaction types, 2) Interaction styles supported by the platforms

4.3.1 Gameplay activities

There were four games used in this study. They were *Kinect Sport (Bowling)* and *Kinect Sports: Season Two (Skiing)* which are console-based games. Meanwhile on a tablet, we used *Bowling* and *Car Racing* games. Each game was selected with regards to various skill and ability offered, and to trigger different reactions from the participants. Bowling and Skiing were chosen because these games stimulate movement and activity in a fun and challenging way. It also has the ability to entice excitement and also imitates real movement in a particular sport which indirectly leading to some form of exercising. Meanwhile, *Bowling* game on the tablet was chosen to obtain feedback from the participants to distinguish the differences of interaction and experience by using different platforms. *Car Racing* was chosen due to its ability to facilitate enjoyable experience and it is fun to

play. It also offers new skill (i.e. tilt) to the participants by imitates real driving environment (i.e. steering the wheel).

4.3.1.1 Interaction Types

Game is more engaging when it allows interaction between the player and the game itself or with other players; and gaming equipment are used as a medium of interaction (Prensky, 2001). According to Wilson et al. (2009), there are three types of interaction; the equipment, interpersonal and social. Learning while playing the game would be more interesting when there is an equipment interaction indicates how the player manipulates the game as for example player is allowed to pick up an object and manipulate it (i.e. kick it, throw it, swipe it). While interpersonal interaction shows the relation between players in the real world (acknowledge each other's achievement and involvement). The social interaction is the state when senses of belonging grow as interpersonal activity increases.

Based on our findings, 11 out of 14 participants mentioned that they like to play *Bowling* and *Skiing* games on the console. This is because those games imitate the real life experience with playing *Bowling* and *Skiing*. Participants also indicate that these games are more interesting and fun to play as well as more challenging to them where they need to move physically (i.e. body movement) and mentally active (i.e. strategy to win). Besides that, these games encourage active social interaction among participants and emphasise cooperation/competition between them. While playing *Bowling* on the tablet was considered boring as it only involves limited functions such as zoom-in, zoom-out and swipe with one finger with no body movement involve. One participant compared playing the *Bowling* game on both platforms by stating *"I'll get bored with that actually 10 minutes flash (Bowling game on tablet). This is not physical at all. I just used my finger"*. The participant also asserted, *"To me, that game on tablet you can't completely control a game. On the console thing, it's a physical game. On that (tablet), it's more like just any other game where you just having some move character around with you finger"*. The participant also mentioned that playing the *Bowling* game on tablet will remove all the physical aspect from it and it becomes pointless.

As for the *Car Racing* game, all participants enjoy the gameplay while comparing their time lapse with their fellow friends. For female participants, they found playing car racing is something new and exciting. Besides that, the game also encourages active social interaction among participants and emphasises cooperation between them. The participants demonstrated an interest in playing games on the device after participating in the study. For example, one participant (who has 'hand tremor') was impressed to see that he could play the *Car Racing* game using tablet which he would have never thought of before. He learned to play the games by tilting the tablet to the right and to the left similar to steering a real car. *"I was pleasantly surprised by some features on the tablet (mainly the steering by tilting it – I hadn't thought of that as an option before the session), and the details visible were better than I would have thought beforehand."* It showed that the participant learned new knowledge and gaining new experience, when playing the *Car Racing* game on the tablet and learned new skills by discovering the functions on the tablet (tilting to imitate steering a wheel).

Based on the andragogical perspective, it would be easier for someone to learn something or use something new if it has relevance or beneficial to them. People will only interact with something familiar, interesting, meaningful and beneficial to them. As mentioned by one participant, *"... if you would to offer me a serious driving... to improve your driving skills or an aircraft simulation or something. I might be more interested. But, that's maybe because I am an engineer and more interested in that type of thing"*.

4.3.2 Interaction Style Supported by the Platforms

After the gameplay sessions, there was a balanced number of participants (n=7 each) choosing either platform; console and tablet. Based on the findings, both platforms have their own advantages and disadvantages, and this contributed to the selection of platform to the participants – on which they favour the most. Half of the participants prefer to play games on a tablet; the main reasons being that they can play alone (i.e. when they want to), its portability (can play anywhere at any time) and easy to use and play (less setup process). Pointed out by one participant, *"I prefer using a tablet. If you've got pain or disabilities, much easier to use a tablet. And you don't have to be home to do that. It's much portable. You can do it on a train or bus, or sitting and waiting"*. Another participant indicated that the size would make people to select it from another platform, *"That's convenience that can be it, because of the size. Can put it in, carry it in a bag and probably isn't that too long. If some see shape like that and about the size of the book... so they not going to think"*. The other half of the participants stated that they found that the console platform has comprehensive displays (better graphics,

big screen), which enabled better control, more fun (i.e. social aspect) and provided immersion (i.e. flow), as well as offer physical movement. One participant stated, *"I like to play on that Xbox because you can immerse yourself in the game. And it's not dangerous and you don't need special equipment... You're in the flow and you're doing exercise while doing it. It's easy to understand what you're doing"*.

Despite of the advantages of both platform, several disadvantages also been highlighted. For console, the downfall due to the cost barrier and it requires the participant to learn some technical skills prior to playing the actual game. *"That one (Xbox), I would hate to do that (setting up). Anything technical like that I'll dumb foul. If somebody set it up, shows how to do it ... then I got it, and I can do it"*. While participants indicated that tablet has smaller screen and lack of physical elements compared to console make them lost interest in continue playing. One participant mentioned that she needs more time to understand the instruction (not clear on tablet screen) and sometimes delay in response from the system made the tablet games boring and frustrating to her.

The participants aged 66-70 showed a higher level of engagement during gameplay using console due to the comprehensive displays, encourage social interaction and involve physical movement. *"Console games were very attractive to me – greater possibility of whole body interaction than I previously thought."* However, tablet technology has gained place and widely accepted among the participants. This may be due to its relatively lower price and portability factor. The participants perceived the technology as difficult. *"Identifying controls may have taken a bit of time, but that would be expected for a first time with a particular item of equipment."* However, upon discovering some real-life benefits to the gameplay, their perceptions towards the technology changed. One participant stated, *"They were generally stimulating and relaxing at the same time."*

4.3.3 Gameplay Interactions and Challenges Associated to Ageing

When it comes to challenges usually faced by older people, it will be associated with age-related changes. Normally, older people will go through countless changes in different levels such as changes at the perceptual, cognitive and psychosocial (Kaufman et al., 2014). Mentioned earlier in Section 2, to capture the adequate interaction between players and the games, the aspect of user experience, needs and interests should be considered and examined.

Feedback and suggestions from the participant's interaction and experiences were taken into consideration. Similar to findings by (Whitcomb, 1990; Ijsselsteijn et al., 2007; Flores, 2008), age-related declines such as in physical and cognitive functions could influence gameplay (i.e. needs, preferences) for older people. Participants emphasised that simple, relevant information and clear instructions are important (i.e. written, auditory) and should be included in the game. One participant mentioned that *"...be viable both ways because actually when you looking at screen, something in your ear telling what to do is good, for me... There are people don't hear very well. So they got to have it and on the screen"*. While another stated *"They must not be written in a lot of technical jargon"*. Simple and less elements in interface design was preferable (i.e. not require too much working memory) as this indicated by one participant, *"I also think you don't want too much extra stuff on the screen that you don't need. I just want to see what the stuff that I got to deal with, not allowed other stuff around. Noise... screen-noise that's what I mean"*.

Participants also added they would like to have adjustable interfaces (i.e. font type and size, screen resolution) *"Need to make sure the printing is big. I couldn't see so that straight. My glasses need changes. Older people needed big, bold print"*, while another stated he wanted a control over the brightness of the screen and also the volume of the platform which could be helpful for those who have eyes sight and hearing problems. Participants also reported that no timer should be included in the game, as suggested by two participants, *"I don't like time-limited thing. This is because some people take longer to learn things than others"*. The participants also asserted that they would like to play games that required less strength and memory where playing game with less hassle which involves no input device (i.e. controller) and includes body movement (i.e. physical game – *Bowling, Skiing*). One participant suggested a tutorial or instruction screen need to be included and displayed before they start to play the game. This screen will briefly show what they will see and what they have to do in the game. This screen also can be skipped and referred back when needed. This is important to be included as older people are likely to encounter decline in cognitive abilities. As stated by the participant, *"My dad nearly 91, and he got very bad short term memory so you can tell him something - but you know... he said 'yeah, it's fine.' If you set him off and play it. He enjoyed doing it, but the next time he picks is up he not remembers what he got to do. He's very much a target person that would be useful to get him to do*

something slightly different because he needs to exercise his brain to retain the ability to do things". On the other hand, typing can be replaced by voice recognition while touch screens can be helpful when having difficulty with wrist/elbow movement that the mouse needed. The natural interaction offers in console become the main attraction to the participants.

Based on the findings, it also shows that the older people prefer to have control over what they do. This is associated with andragogical perspectives where the older people are an independent self-concept and who can direct/control his or her own learning (Knowles, 1984). This is showed in our study when the participants mentioned they have a total control playing game using console compared to tablet. Feedbacks from two participants on their experiences playing *Bowling* game on tablet as stated below.

A: *"Yeah, the ball doesn't go where it supposed to go. *Chuckles* You know, you think it go ...You don't get the control ability"*

B: *"... on tablet you can't completely control a game. On the kinect thing, it's a physical game. On that, it's more like just any other game where you just having some move character around with you finger" (P1F3)*

The study findings also show that participants preferred tablet over console which is influenced by 3 factors which are cost, technicality and portability. We also found that size, weight and battery lifespan of the tablet could be the reasons why older people prefer tablet than console. One participant mentioned, *"Anything that I said about that one. That particular tablet, it's quite heavy.... Again, if you talk to older people who may well find their wrists are not that strong, it might be awkward to manipulate. Because it's quite heavy"*.

Feedbacks from the participants show that the platform physical characteristics needed to be taken into account as a serious consideration when included older people in the studies. Size and weight of the tablet would affect those people who have joint pain (i.e. arthritis). Therefore, a selection of size and the lightweight platform is important in this research so that it will not bring any effects to the participants. Hence, it requires less strength. Meanwhile, tablet battery lifespan also needs to be prolonged to show the reliability of the technology in order to gain acceptance within the participants *"... I think, for me the issues always about how reliable the technology is and in terms of battery life to remember ... you know, if it... while I touch stuff on my last phone I had. The battery drained so quickly"*.

Interaction is needed in designing a game for older people in order to promote active social interaction. Confidence barrier such as afraid of taking part when it involves new technology might be among the challenges that caused the older people not interested in technology besides no self-confidence (i.e. interact, try new thing, involve in activities, etc). Therefore, interaction is needed to ensure the older people can be more confident when interacting with others even with the technology (especially digital games). While participating in a game playing, participants were encouraged to work with others (team-based) where working collaboratively can stabilise strategies more rapidly than play as a single player. Besides that, the participants will find the gameplay is more fun and more challenging and motivating.

5. Conclusion

The results of our study show that there are three key components that should be considered when investigating the interaction and experience of older people with digital games. They are 1) the interaction types and the experience provided by the game itself, 2) the game interaction styles which is supported by the platforms and 3) gameplay interaction and challenges associated with age-related changes. These findings are an addition from the existing work which is not included in this paper.

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