Exploring older adults' engagement with video games

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Abstract

Research focused on older adults and video games leans towards how they can help facilitate maintenance or betterment of health, with research that seeks to understand older adults' general engagement or views and understanding of video games for leisure or hobby lacking. This thesis explores older adults' engagement with video games by providing information on their attitudes and perceptions, barriers experienced, current usage, and if they have any desire to interact with them leisurely. A mixed methods study, consisting of a survey and interview was conducted with 30 participants split into age groups of 50 – 64 years old, and 65+ years old. Analysis showed that older adults aged 65+ have limited engagement with and exposure to video games, and little motivation to adopt video gaming as a hobby, viewing it as a waste of time, and experiencing multiple barriers with previous attempted usage. Despite this, participants within this age group illustrated engagement with mobile puzzle and word games (which they did not consider to be video games) and stated a willingness to play these games to improve and maintain cognitive functioning. Those slightly younger, aged 50 - 64, also experienced barriers related to usage, however, generally illustrated a higher level of understanding and engagement with video games. Participants within this age range stated willingness to play video games, such as for relaxation, entertainment and for socialisation as well as for cognitive functioning. It is important to ensure that barriers to engagement with video games for older adults are mitigated so that older adults are able to interact should they wish to, and to ensure that those who are within the younger age category of 50 – 64 who did illustrate a desire to play video games, are able to engage with them as they age.

Authors Declaration

I declare that this thesis is a presentation of original work and I am the sole author. This work has not previously been presented for a degree or other qualification at this University or elsewhere. All sources are acknowledged as references.

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1. Introduction

This thesis aims to explore and understand older adults' engagement with video games. Older adults are defined by The World Health Organisation as those aged 60+ (World Health Organisation, 2024). Whilst this is the recommendation from the World Health Organisation, the threshold used varies across different sources, with the United Nations suggesting 60+ (The UN Refugee Agency, 2024), and the NHS also using 65+, but acknowledging that this can vary depending on the individuals being discussed due to differences in how quickly people biologically age (NHS England, 2024). The reason why an age range is applicable when discussing older adults is due to the trends caused by age related changes that can be seen within the demographic above this age. The chosen age threshold for older adults used in research changes depending on the type of research conducted, the location of the research and the availability of participants within the target age ranges. The threshold of 65+ is often adopted in HCI research (Czaja and Lee, 2007) due to the commonalities caused by age related changes that are seen within this group of the population (Lovden et al., 2020) and the impact that these have on their usage of technology. These age-related changes include occurrences of decline in cognitive functioning and processing (Lovden et al., 2020; Pais et al., 2020), physical capabilities (Wilson et al, 2021; Nikou, 2015) and a higher instance of disability (CDC, 2020), all of which impact technology usage within this group and result in them having lower technology adoption and acceptance than younger generations (Czaja et al, 2006).

This lower incidence of technology usage also applies to the uptake of digital technologies for leisure purposes, such as for gaming, with older adults lagging behind younger generations when it comes to playing video games (Statista, 2024). Despite the possibility that older adults may want to start gaming as a leisure hobby, for fun or for enjoyment, most of the current research on older adults and gaming focuses on how gaming can help older adults improve their health or wellbeing (Zang and Kaufman, 2016; Bleakley et al., 2015) by aiding in the maintenance of cognitive functioning (Anguera et al., 2013), increasing physical activity (Zang and Kaufman, 2016) and facilitating socialisation (De Schutter and Vanden Abeele, 2010). This is not an uncommon theme within HCI research with studies often focused on how health and wellbeing can be improved and technology or applications for older adults also often being targeted in this way (Cabrita, Tabak and Vollenbroek-Hutten, 2019; Czaja, 2017; Young et al., 2014).

Whilst contributing to health and wellbeing is important at any age, it is also important to understand that older adults should be able to engage in hobbies for enjoyment and fun, and not only to optimise or improve functioning. By focusing research predominantly on producing games or devices for older adults to engage with gaming as a means of optimising and improving health and wellbeing, it is possible that opportunities for increasing understanding of older adults experience with commercial digital games and commercial gaming devices are under researched and that the guidelines produced from the conducted research may not be applicable to games and devices that are not developed for this purpose. This is problematic as when it comes to commercial gaming, the devices and games that are readily available and popular in store, thus the ones that older adults are more likely to have access and exposure to, are not using specially designed input controllers developed for research studies, nor are they generally offering the games that are designed for these studies. As such the usefulness of these studies are limited in their commercial application, and consequently it may not be fully understood how to optimise older adults' experience with digital gaming for leisure when the games and devices are not specifically crafted, the motivation is not for self-improvement, and the games are not specifically designed for them.

It is also possible that by allowing research to focus on improving health and wellbeing, older adults are being misled about the other potential benefits that gaming could bring to their lives, especially for those who are dealing with disability and illness who may not feel that they would be able to engage in hobbies that require physical activity. In this instance, older adults may feel demotivated to engage with digital gaming as it is being advertised to them as predominantly a way to improve their functioning, and is therefore requiring either mental or physical effort to engage with - which not everyone can provide. This means that this demographic of older adults may not be aware that they can use digital gaming as a leisure hobby, a way to fill free time and to socialise, without substantial increased effort and are therefore missing out on other positive benefits that gaming may facilitate.

Whilst this is a substantially important point for those who do deal with illness or disability, it is also essential to note that for those who do not have to deal with this, not all older adults are constantly looking to improve their health and wellbeing, just as not all younger individuals are. Older adults are a diverse group, with a multitude of interests, experiences and needs, and by assuming that their main motivations for gaming would be due to their desire to retain functioning solely due to their age, we are potentially doing them a disservice by not facilitating the design and development of games for leisure, enjoyment and fun, when these are considered the main motivators for younger audiences. As such the games

commercially designed for these purposes may not be accessible for older adults if they do wish to engage with them.

This thesis aims to explore older adults' engagement with video games to understand if there is a desire to play them that is not linked to improving or maintaining an aspect of health. If older adults do want to play video games, then by developing a more holistic understanding of their previous experiences, and their level of desire to engage in video gaming, as well as the barriers that they may face, individuals working in the games industry would be able to effectively consider how to facilitate engagement and mitigate barriers for players within older age groups when designing games or devices. This could help reduce difficulty with engagement as well as potentially increase motivation for those who want to participate. This thesis also aims to contribute towards the research that currently exists surrounding the topic, in order to help develop a more holistic understanding of the attitudes, perceptions and experiences of older adults and video gaming as a hobby.

Through this thesis I aim to answer the following research questions:

1. What are the attitudes and perceptions of video games within this population and how does that affect individuals' personal adoption of video games?
2. What does older adults' engagement with video gaming look like?
3. Is there a desire for older adults to engage with video games as a leisure activity?
4. What are the difficulties that older adults may face when looking to adopt video gaming as a leisure activity?

2. Systematic Literature review

2.1 Method

A systematic literature review was decided on as it would allow me to assess the range of research conducted and to determine if there was a higher proportion of research surrounding health than other topics related to video gaming for older adults. This also therefore ensures that the remaining research, which would illustrate the landscape of non-health related research, was representative of the actual spread of literature, avoiding the risks of bias when selecting studies for inclusion in the review (Lame, 2019). Conducting a systematic review also ensures that the procedure is replicable, and that the breadth of research on the topic can be tracked and compared for future research (Liberati et al., 2009).

This systematic review aims to present an overview of the current research that exists on older adults and their experience with digital games for entertainment purposes to provide a baseline of understanding on the topic area and to help identify gaps for further research. It also aims to provide an understanding of the scope of prior research on the topic to assess whether there is a bias towards research being conducted for older adults with the purpose of maintaining, improving or measuring their health or wellbeing and if research that is not conducted for these purposes is lacking in comparison.

2.1.1 Search Strategy

To assess the scope of research surrounding older adults and their experiences with gaming, a search was conducted using three databases - ACM, Springer and IEEE Explore. These databases contain publications under the genre of Human Computer Interaction or Computing, both of which research on gaming is likely to fall under. It is important to note that not all video games research is Human Computer Interaction or Computer Science based, and that a decision was made for this review to contain the scope to research within these fields. The search terms used for all three databases were: ("gaming" OR "game" OR "games") AND ("older adult" OR "elderly" OR "grandparent" OR "older adults" OR "older people"). These search terms were chosen and purposely left broad to ensure that a wide range of all relevant research related to older adults and gaming would be returned. This search was conducted as a ‘Title’ search to ensure that the specific focus of the research was solely on older adults and gaming. It was possible to use the title search function on the IEEE and ACM database search engines, however, it was not possible to do this for both

sets of terms in Springer, as such, the remaining title search was completed in Excel after extracting the initial search results from Springer to generate the final search results for that database.

2.1.2 Search Results

Using the search terms stated previously a total of 276 results were returned, the specific breakdown from each database can be seen in Figure 1 (Fig.1).

Figure 1: Table showing Initial database search results from Springer, IEEE and ACM

Library	Results
Springer	154
IEEE	72
ACM	50
Total	276

2.1.3 Eligibility Criteria

This review is interested in understanding the current research related to older adults' experience with gaming for leisure. It is not interested in discussing the research related to gaming for the purpose of improving or maintaining older adults' health or for educational purposes, therefore any research with this as its aim or focus will not be eligible for inclusion.

When stating that this review is interested in “gaming” I am referring to “digital” or “video” gaming, which includes any gaming that is done with technology, therefore any research that is referring to other types of gaming will not be considered for the purpose of this review. Any research that uses these terms but is clearly not about digital gaming will also not be eligible for inclusion and will be considered “irrelevant” for the purpose of this review as it does not relate to the topic.

To be eligible for this review, the research needs to be focused on “older adults”. Older adults are defined by the World Health Organisation as being over the age of 60 years old (World Health Organization, 2024), however, the age bracket used in research can vary. To ensure that all the relevant research is covered within this review no age threshold has been used for eligibility. Due to the vast advances in technology and attitudes towards technology

over the years, only research published after 2010 will be considered eligible. Research not published in English will also not be considered eligible for inclusion.

2.1.4 Screening Process

After conducting the initial search, using the previously discussed terms, data was extracted from all the 276 returned papers. At this stage the data extracted included the authors, title, keywords, DOI and year of publication.

As the first step of the screening process duplicates were removed from the initial search results through a title review (Fig.4), this resulted in the removal of 3 papers. After this, for the second stage of screening, the remaining papers were reviewed by abstract, introduction and conclusion, with any papers not written in English, or those that were completely irrelevant to the topic (not about digital gaming) also removed, resulting in the removal of a further 7 papers (Fig.4).

At this stage the remaining papers were subjected to a full text review, during which they were coded and assigned the most relevant category out of the 6 available (Fig.2), with these being Physical Health, Cognitive Development/Cognitive Support, Design Guidelines/Heuristics, Entertainment/Gaming to Game, Understanding Older Adults and Other. These categories were chosen as they were identified as covering the basis of the potential research themes within the specific genre of gaming research for older adults. The initial categorisation of 20 papers was completed by two researchers, working independently. Upon review of these 20 papers, and finding that all coding matched, the remaining papers were subsequently coded by one researcher. The results of the categorical coding illustrated that the majority of the research returned by the original search was mainly focused on either physical (112 papers) or cognitive (79 papers) health/wellbeing (Fig.3). These papers were automatically excluded as they were not considered eligible for this review due to the focus being on gaming for leisure/enjoyment.

During the full text review papers that were not overall coded to be within the Physical Health or Cognitive Development/Cognitive support categories were found to still mention or discuss in their body of text that that their research was related to improving, maintaining or assessing an aspect of health, functioning or well being - as such these papers were also removed for not meeting the eligibility criteria. In total this resulted in 247 papers being excluded due to their content being linked to improving, maintaining or measuring an aspect

of health, wellbeing or functioning. Other papers excluded at this stage included papers written prior to 2010 (2 papers) and those that were considered too short, incomplete or deemed to be proposals (2 papers).

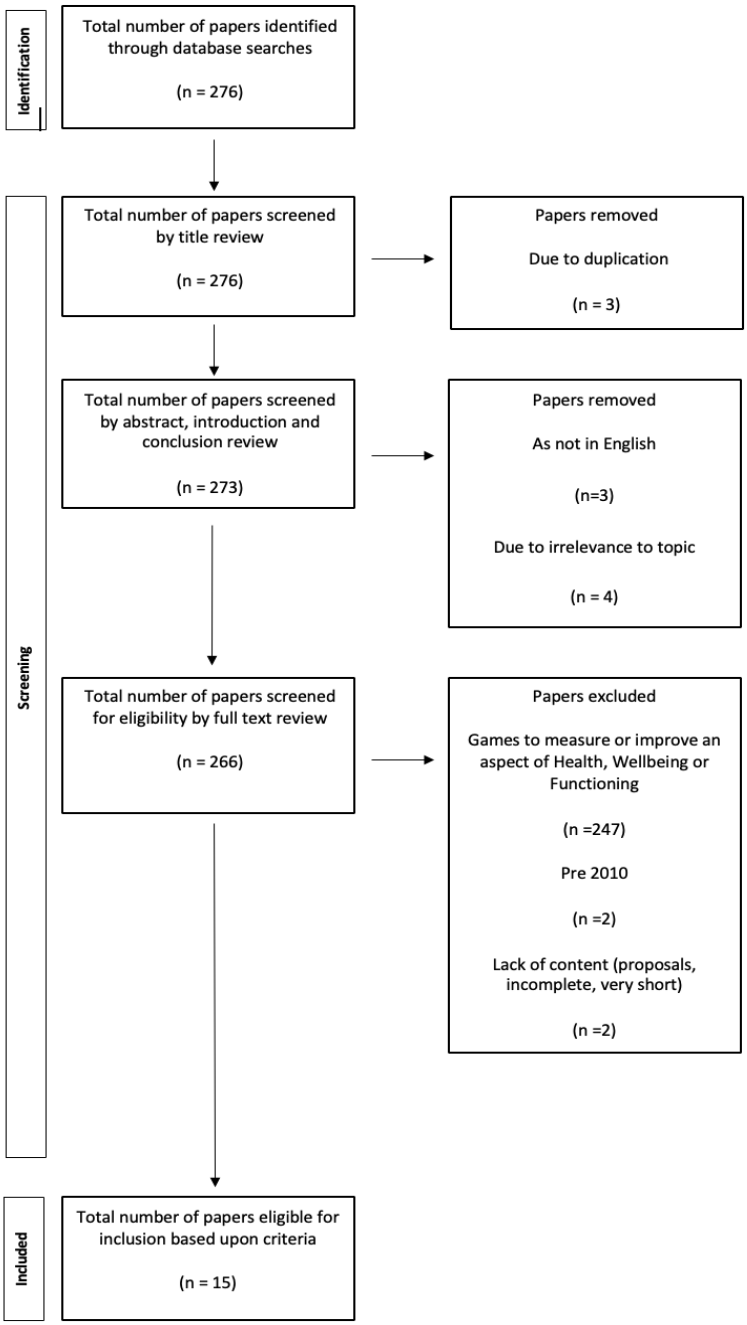
Figure 2: Table showing the categories assigned to the research

Categories
Physical Health
Cognitive Development / Cognitive Support
Entertainment / Gaming to game
Design guidelines / heuristics
Understanding older adults
Other

Figure 3: Table showing the initial assignment of research papers from Springer, IEEE, and ACM to the categories

Catagory	Springer	IEEE	ACM	Total
Cognitive Development / Cognitive Support	30	35	14	79
Physical Health	70	26	16	112
Understanding older adults	17	3	11	31
Design guidelines / heuristics	10	1	2	13
Other	24	4	3	31

Figure 4: PRISMA flow diagram of search results illustrating the process of refining and arriving at the final eligible papers



2.2 Results

Out of the 276 returned results, 15 papers met the eligibility criteria for inclusion in the review. These papers provide an overview of the research that exists surrounding the topic of older adults and digital gaming (Fig.5) that is not for the purpose of improving, maintaining or measuring an aspect of health, wellbeing or functioning.

Figure 5: Table showing the research included in the review and a brief overview of characteristics for each

Authors	Title	Year	Platform/s used for study	No. of participants	Participants age
Souza, G. et al.	Investigating Motivational Aspects of Brazilian Elderly to Interact with Digital Games	2016	Notebook, tablet, smartphone	5 older adults	60 - 77 yrs
Palacio, R. R. et al.	Usability perception of different video game devices in elderly users	2017	Kinect motion sensors, Computers, Projectors, Cameras, Audio devices, Xbox 360, Nintendo Wii, A Touchscreen	24 older adults 8 children	60 - 79 yrs 8 yrs
Brown, J. A.	Digital Gaming Perceptions Among Older Adult Non-gamers	2017	N/A	11 older adults	60+ yrs
Gerling, K. M. et al.	Game Design for Older Adults: Effects of Age-Related Changes on Structural Elements of Digital Games	2012	N/A	N/A	N/A
Doroudian, A. et al.	Designing an Online Escape Game for Older Adults: The Implications of Playability Testing Sessions with a Variety of Dutch Players	2020	Anroid tablet	30 older adults	65+ yrs
Brown, J. A.	Let's play: understanding the role and meaning of digital games in the lives of older adults	2012	N/A	7 older adults	61 - 79 yrs
Carrasco, R. et al.	Designing the Lost Self: Older Adults' Self-representations in Online Games	2018	iPhone, iPad, desktop computer, laptop computer	10 older adults	65 - 95 yrs
Salazar, J. et al.	Older adults and types of players in game-based systems: Classification based on their motivations	2022	N/A	N/A	N/A
Jali, S. K. and Arnab, S.	The Perspectives of Older People on Digital Gaming: Interactions with Console and Tablet-Based Games	2017	Xbox 360 console (kinect) and Android tablet	14 older adults	55+ yrs
Tang, H. and Gao, Q.	A Brief Study on Excessive Online Game Playing Among Older Adults	2021	Not stated	6 older adults	52+ yrs
Yu, R. W. L., Chan, A. H. S. and Ko, T. H.	Age and Gender Differences in Mobile Game Acceptance Amongst Older Adults	2022	mobile	60 older adults	50+ yrs
Yu, R. W. L., Chan, A. H. S. and Ko, T. H.	Effects of Physical Functions on Mobile Casual Game Acceptance of Older Adults	2023	mobile	40 older adults	55+ yrs
Ferguson, C. J., Nielsen, R. K. L. and Maguire, R.	Do Older Adults Hate Video Games until they Play them? A Proof-of-Concept Study	2017	Not stated	34 older adults	52–93 yrs
De Lima Salgado, A. et al.	Startup workplace, mobile games, and older adults: a practical guide on UX, usability, and accessibility evaluation	2019	Mobile	6 older adults	57 to 68 yrs
Pham, T. P. and Theng, Y.-L.	Game controllers for older adults: experimental study on gameplay experiences and preferences	2012	xbox 360, kinect, wii	24 older adults	Range not stated, mean of 75 yrs

2.2.1 Perception & Acceptance

Perceptions by older adults of video games within the reviewed literature include the ideas that video games are violent (Brown, 2017; Ferguson, Nielson and Maguire, 2017), non-social (Brown, 2017), addicting (Ferguson et al., 2017) and a “waste of time” (Brown, 2017, p. 223; Ferguson et al., 2017). These perceptions are widespread and differ among the older adult study participants (Ferguson et al., 2017).

In a study by Ferguson et al. (2017) it was found that perceptions and opinions on video games are “fairly diffuse and individualized” among the older adult participants (Ferguson et al., 2017, p. 923). Although the specifics were individualised, older adults within this sample did lean towards negative perceptions of video games in general, with the idea that video games might have negative effects on those who play them being common, and their perceptions not changing after being asked to play video games, despite having an enjoyable experience (Ferguson et al., 2017). In this study, before the participants played the video games “female gender (β = .476, p = .023) and lower openness (β = .433, p = .032) were associated with greater negative attitudes toward video games” (Ferguson et al., 2017, p. 922), whereas after playing video games only lower agreeableness (β =.664,p =

.025) was associated with greater negative attitudes toward video games”(Ferguson et al., 2017, p. 923). Whilst this study gives insight into older adult perceptions and opinions, it is important to note that it was conducted using a sample size of 34 older adults and is described by the authors as a “proof-of-concept study” (Ferguson et al., 2017, p. 925) due to this sample size.

Yu, Chan and Ko (2022) found that older adults' acceptance of mobile games was directly impacted by the perceived ease of use, with older adults more likely to “play games if they believe that mobile games are easy to play” (Yu et al., 2022, p. 654). It was also found that increased age negatively affected the perceived ease of use of the mobile games (Yu et al., 2022). As well as age, older adults’ physical functioning has also been found to affect their acceptance of mobile games as hearing and vision difficulties negatively impact perceived ease of use (Yu, Chan and Lu, 2023), making them less likely to play games if they believe they will have difficulties due to physical impairments they may deal with. This is in line with research that states older adults are less likely to use technology if they face difficulties due to disability and age-related impairments (Czaja and Lee, 2007).

2.2.2 Motivations

Salazar et al. (2022) states that for the older adult digital gamer there are “4 main motivators which are meaning, autonomy, relationships, and sense of achievement” (Salazar et al., 2022, p. 2). Under these categorisations, “relationships” is split further into “socialiser” and “influence”, with both aspects impacting older adults' decision to engage with digital games. Whilst this research categorises and states these motivators, it is brief and does not fully explain them nor go into further detail.

Based upon the reviewed literature, socialisation seems to be an important motivation for older adults when it comes to interacting with digital games, with the opportunity to increase time spent with others seen as a desirable outcome of gaming (Doroudian et al., 2020; Carrasco et al., 2018; Jali and Arnab, 2017; Brown, 2012). This includes interaction with both family and friends. In studies by Carrasco et al. (2018) and Brown (2012), older adults state that they enjoy playing digital games with their grandchildren, perceiving it as a positive way to spend time and engage with them (Brown, 2012) (Carrasco et al., 2018). The opportunity that gaming affords older adults to increase social interaction with family and friends is discussed as being a higher priority motivator than other general motivating factors such as “competition” by Palacio et al. (2017). Further to the knowledge that digital gaming

can aid socialisation, having family and friends specifically encourage the adoption of digital game usage can be a facilitating motivator as well (Souza et al, 2016).

However, whilst the knowledge that gaming could be used to aid socialisation is a motivator, the belief that it is only a solitary hobby could be demotivating. Older adults involved in a study by Brown (2017) stated that one of the reasons they would not be motivated to engage in video games, would be due to the lack of social interaction involved, preferring to spend their time engaging in hobbies that instead facilitated more personal interactions (Brown, 2017). Brown subsequently found that the older adults in this study were “largely unaware of how digital games could facilitate in-person socialization” (Brown, 2017, p. 224) and were therefore unaware that they could view digital gaming as a way to increase socialisation with others, instead of as replacement hobby that decreases socialisation. It is also important to note that whilst older adults need to be aware that they can use digital games to aid socialisation, they also need to know that they are able to play by themselves, and that digital gaming is not reliant on having other people around, as not all older adults will be able to have a support network around when playing games (Souza et al., 2016), nor will they all have the desire to play with others.

Older adults are motivated to engage with digital games through the perceived benefits that they have to offer them (Jali and Arnab, 2017; Souza et al., 2016), this includes the potential to reminisce about and help replace activities enjoyed during youth that they can no longer participate in due to age related or circumstantial changes (Carrasco et al., 2018; Brown, 2012). Carrasco et al (2018) studied older adults' self-representations in online games, finding that older adults used video games as an opportunity to relay aspects of their former self that may have been altered throughout the ageing process (Carrasco et al., 2018). Consequently digital games allow older adults to create identities similar to and experience activities from the past that they are no longer able to actively partake in anymore, as illustrated by one participant in the study by Carrasco et al. (2018) who despite being involved competitively in his youth, is no longer able to competitively shoot, and has taken up playing Battlefield as a replacement (Carrasco et al., 2018).

Another perceived benefit that digital gameplay can offer older adults is a way to actively pursue and achieve goals. In a study by Yu et al. (2022) assessing the impact of *“Age and Gender Differences in Mobile Game Acceptance Amongst Older Adults”*, it was found that “Older adults are likely to engage in mobile games if they think they are able to earn achievements throughout the games” (Yu et al., 2022, p. 654). Whilst this was found to be a motivating factor for older adults, it was also suggested by the results of this study that the

“health benefits of playing mobile games may not be a facilitating factor for motivating older adults to accept mobile games” (Yu et al., 2022, p. 654).

Brown (2012) suggests that an older adult's motivation to partake in digital gaming may be influenced by their previous and current technology exposure, with more technologically literate individuals being more willing to adopt digital gaming as a hobby (Brown, 2012). This is a finding that is in line with wider research, with older adults having been found to be less likely to learn new technology if they assume the learning experience will be difficult for their capabilities (Barnard et al., 2013). In her study Brown (2012) suggests that technology exposure could be linked to the age of her participants, with the younger (older adults) participants within her sample having more exposure to different types of technology, and earlier exposure to gaming than the older (older adult) participants, who were only introduced to video games once in an assisted living facility (Brown, 2012). Souza et al (2016) found that the reasons for older adults potentially not wanting to play video games were related to lack of confidence in their skills and abilities, this included older adults feeling demotivated due to their lack of experience with devices and the fact that they might “believe they do not have enough skills to play” (Souza et al., 2016, p. 198) due to age related impairments, previous bad experiences or perceptions about gaming. It is therefore thought that having had more previous experience with technology may positively impact motivation to participate in digital gaming. It is important to note that due to the speed of technological advancement, the literature included in this review from previous years may not be as applicable to the experience of older adults today and in the upcoming future. Individuals across the age category today may have increased prior experience with, or exposure to technology than the older adults that participated in the studies eligible for inclusion in this review.

2.2.3 Gameplay preferences

Regarding social gameplay preferences, Brown (2012) found differences in opinion across the ages of the older adult participants in her sample, with the older participants showing a preference for social gameplay with others, and the younger preferring non-social gameplay (Brown, 2012). Brown (2012) states that this may be explained due to the living situations of the participants, with the older participants living within assisted living facilities (Brown, 2012). Differences in the opinion on social gameplay preferences within the older adult groups have also been found between the different genders, with a study run by Yu et al. (2022) involving 60 participants (30 men and 30 women) concluding that “the correlation

between older females and social interaction was found to be more positive than that of older males" and that when "deciding whether or not to play mobile games, older females were more influenced by the social aspect of mobile games than older males" (Yu et al., 2022, p. 654). This indicates that there may be differences in preferences between demographics within the older age group, as such it is important that future studies include a wide range of ages, across the genders, in order to assess this further. Whilst these studies show that older adults may illustrate preferences regarding socialisation in gameplay there is a gap in knowledge within the eligible literature when it comes to information regarding other gameplay aspects such as: narrative preferences, genre comparisons or player perspectives/point of views.

2.2.4 Devices

Understanding device preference is important as older adults are more likely to enjoy playing digital games when they feel comfortable and in control of the device they are using to play games (Jali and Arnab, 2017). The reviewed literature shows that the devices used by older adults who currently play games are varied with smartphones, tablets, laptops and computers all being used (Carrasco et al., 2018; Jali and Arnab, 2017).

When looking at the experiences of 14 older adults playing both console (Xbox 360) and tablet (android) games, Jali and Arnab (2017) found that the preferences were split among the group, with 50% preferring the console and 50% preferring the tablet (Jali and Arnab, 2017). The reasons why the older adults stated they preferred the tablet included references to ease of use, portability, and disability, whilst the reasons for preferring the console were attributed to larger screens, increased movement, facilitation of social interaction and increased immersion (Jali and Arnab, 2017). Contrarily, disadvantages of the tablet were stated to include, the smaller screen (compared to the console), potential boredom and the lack of "physical elements" (Jali and Arnab, 2017, p. 87), whilst disadvantages of the console included the cost and the increased complexity resulting in the need to learn new technical skills (Jali and Arnab, 2017). Whilst the preferences were divided among the group due to these reasons, it was noted that the participants who prior to the study stated they owned tablets illustrated "interest in playing games on the device after participating in the study" (Jali and Arnab, 2017, p. 88), therefore when it comes to considering adopting digital gaming, current and previous device ownership may influence initial choice with income and cost also potentially being a factor (Souza et al., 2016).

Choice of device may not only be a preference but may also impact success within the game for older adult players as suggested by Palacio et al. (2017) who investigated the experience of 24 older adults with different video game devices, specifically looking at the Xbox 360, Nintendo Wii, Kinect, and a touchscreen device (Palacio et al., 2017). During this study the participants played Angry Birds on the devices and both their successful and unsuccessful throws were calculated, the results of this were that “Xbox averaged the highest effective throws and Wii the highest missed throws” (Palacio et al., 2017, p. 110) indicating that older adults had the best gameplay performance using the Xbox, then the Kinect and touchscreen, and the worst using the Wii. The success of participants using the Xbox was explained as being due to the increased amount of control the controller provided and that less body coordination was required compared to the other devices (Palacio et al., 2017). Regarding the Kinect, Palacio et al. (2017) state that the older adults had difficulty due to the motion control it required, however it is also noted the setup used was not optimal and may have contributed to the difficulty experienced (Palacio et al., 2017), similarly, movement and coordination was also a concern raised for the usage of the Wii. No specific difficulties were mentioned regarding the touchscreen device, however it was noted the sensitivity of the screen may have negatively impacted the older adults control of the game (Palacio et al., 2017).

Differently to the findings of Palacio et al. (2017) in a study by Pham and Theng (2012), involving 24 older adult participants and also looking at the experience of older adults with different devices (Xbox 360, Kinect and Wii), it was found that the older adults were actually more successful using the Wii remote than the Kinect gesture control or the Xbox 360 controller (Pham and Theng, 2012). In this study it was found that despite the fact the older adults were more successful using the Wii, they stated that their device preference was for the Kinect gesture control, with Pham and Theng acknowledging that this preference may be due to the older adults belief that there are “benefits of playing games for exercise” (Pham and Theng, 2012, p. 2).

Research included in this review that specifically discusses the experience of older adults with different devices presents different findings in device effectiveness and is not representative of the devices (Palacio et al., 2017; Pham and Theng, 2012) that are readily commercially available for older adults to play digital games on in 2024. This illustrates the importance of research being conducted with larger sample sizes in order to increase reliability in the findings and to understand if there are consistent themes when it comes to older adults' experience with different devices for gaming. It also highlights how research that has been conducted for older adults concerning gaming uses outdated devices and is

therefore not applicable or useful for those developing games today. Out of the 266 papers that were returned from the original database search, 21 used the Nintendo Wii and 53 used a Kinect - neither of which are currently easily available for commercial gaming due to discontinuation. A lack of research and understanding of older adults' experiences with current commercially available devices reduces the likeliness of both the device, and the games developed for those devices being adapted for older adults.

2.2.5 Usability

Throughout the reviewed literature, issues with device controls are observed, this includes issues with Xbox 360 controllers due to the dexterity and perceived complexity involved (Pham and Theng, 2012), the Wii remote due to coordination and movement and the Kinect gesture control due to the physicality and full body movement required (Palacio et al., 2017). When speaking to older adults Brown (2017) found that those who had attempted to play games in the past mentioned issues with game controls as one of the barriers they experienced, along with difficulties caused by pacing of the games (Doroudian et al., 2020; Brown, 2017; Souza et al., 2016) and their own physical capabilities (Brown, 2017), these same difficulties were observed in different studies by Doroudian et al. (2020) and Souza et al. (2016). When testing an escape room game designed for older adults Doroudian et al. (2020) found that using virtual joysticks to navigate the environments was problematic and “turned out to be the most significant source of frustration for players” (Doroudian et al., 2020, p. 604). Difficulty with commercially popular game controls illustrates a lack of consideration for and testing with older adults when it comes to the design and development of games and devices. This is further evidenced by the limited literature available concerning the topic, and indicates that further research into optimising controls for older adults is needed. Conducting and being able to reference research completed with a varied participant base could help ensure that the frustrations associated with controls can be mitigated in its role as a potential barrier to playing video games.

Other usability issues identified in this test included the instructions and feedback not being sufficient enough for the players, the puzzles not obvious enough and the pacing too fast, these are all problematic as the inability for the older adult players to figure out what to do, or complete tasks within the game in this instance resulted in a reliance on guidance from other people (Doroudian et al., 2020). The belief that older adults need help from others to help them access technology reduces their confidence and independence when interacting with new technology (Barnard et al., 2013). This could potentially negatively impact their uptake

of gaming as a leisure hobby if they believe they are unable to play a game without help. Whilst the need to ensure that instructions are effectively designed for older adult players is discussed within the reviewed literature (Doroudian et al., 2020) there is no research that explores the impact of this on future gameplay, nor is there research included that provides insight as to older adults preferences and opinions concerning the topic of onboarding, tutorials, instructions or support in any substantial depth.

As with Douroudian et al. (2020) Souza et al. also found that pacing and instructions were problematic for older adults, however in addition they also observed that the participants in their study had difficulty with the size of the elements on the screen (De Lima Salgado et al., 2019; Souza et al., 2016). As mentioned previously these findings provide a baseline understanding of how adjustments can be made to improve games for older adults, however as evident from the information presented in this literature review, research concerning the usability needs of older adults playing video games needs to be updated and extended in order to provide a range of in depth findings that can help improve contextual understanding for those working to make games/devices and facilitate advancement in design that are relevant for today's older adults.

2.2.6 Design guidelines

The reviewed literature offers suggestions in the manner of design guidelines to help improve older adults' experience when playing video games.

Ensuring older adults are able to identify elements on screen is important to facilitate successful interaction. It is suggested that elements on screen are large, easily visible and easy to identify, this includes both indicators (De Lima Salgado et al., 2019) and text (De Lima Salgado et al., 2019; Jali and Arnab, 2017) as well as other UI elements (Jali and Arnab, 2017; Gerling et al., 2012). Ensuring that the layout and UI elements are accessible and can be adapted to older adults’ needs is not only important to facilitate the relay of information but also to ensure that items are easy to click on screen (De Lima Salgado et al., 2019). In addition to clicking, some input devices may present increased challenges for older adults to engage with due to age related changes that affect their motor skills, physical mobility and cognitive abilities, as such it is suggested by Gerling et al. (2012) that games allow for adjustable and simplified input sequences to help reduce the impact of this on gameplay (Gerling et al., 2012).

Older adults have a need for clear instructions and feedback that may be considered more in depth (Doroudian et al., 2020; De Lima Salgado et al., 2019; Jali and Arnab, 2017) and ensuring that these are both helpful (Souza et al., 2016) and using language that is easy to understand for older adults is recommended (De Lima Salgado et al., 2019; Jali and Arnab, 2017).

Adapting game mechanics so that older adults feel less pressured and are better able to deal with the speed and pace of the games (Jali and Arnab, 2017; Gerling et al., 2012) can be implemented to help mitigate the impact of age-related changes (Gerling et al., 2012). Game content should be considered and geared to not only be of interest to older players but to include achievable goals (Gerling et al., 2012) and provide different options for older adults to adapt to their unique circumstances, for example Gerling et al. (2012) suggest allowing older adults to choose between different multiplayer modes to facilitate their socialisation preferences (Gerling et al., 2012) and Souza et al (2016) suggests that older adult players may need to play for shorter periods of time (Souza et al., 2016). This indicates that studies conducted with older adults playing video games would need to be adapted to more accurately represent their behaviour whilst gaming. This includes offering the option of shorter gaming sessions, and using equipment and environments that would mimic what they would have access to at home. It is important to explore how these findings could be incorporated into commercial video game design, and how this could positively impact older adults' experience when playing these video games.

2.2.7 Excessive game playing

In a study looking at older adults and excessive game playing, Tang and Gao (2021) found that certain aspects of an older adult's life and circumstances may be facilitating factors for excessive gameplay, as well as identifying potential negative outcomes. During this study six older adults were interviewed and whilst it was about excessive game playing, the older adults that took part stated that they felt in control of their time spent gaming (Tang and Gao, 2021). It is also important to note that not only is this sample size small, but out of the six participants interviewed only 2 participants spent over three hours a day playing video games (Tang and Gao, 2021), as such the definition of what time thresholds constitute excessive game play should be kept in mind when discussing this study within this literature review. According to the World Health Organisation, instead of using time thresholds to decide whether gaming is considered excessive, gaming disorder is defined “as a pattern of gaming behaviour (“digital-gaming” or “video-gaming”) characterised by impaired control

over gaming, increasing priority given to gaming over other activities to the extent that gaming takes precedence over other interests and daily activities, and continuation or escalation of gaming despite the occurrence of negative consequences" (World Health Organisation, 2020, para. 1). By this definition the individuals included by Tang and Gao (2021) might not actually be considered to exhibit excessive gaming behaviours, especially since it is stated that they felt in control of their gaming behaviours.

Lifestyle factors found to potentially facilitate excessive gameplay include increased free leisure time, the desire to escape from reality, depression, less available hobbies and desire for achievement and fulfilment (Tang and Gao, 2021). Tang and Gao (2021) warn that there are signs that can be indicative of excessive game playing within older adults to look out for, such as "physical changes after long-time game playing, delays for meals and housework, and conflicts with families" (Tang and Gao, 2021, p. 160). Potential negative consequences that may be caused or exacerbated by excessive gameplay include; mental & physical illness and lack of exercise (Tang and Gao, 2021). It is suggested that excessive game playing by older adults can potentially be mitigated by increasing the social experiences available to them both in real life and in game, as well as by ensuring that games are designed with older adults in mind, including mechanics to help reduce the impact of potential negative effects by reminding them of their health (Tang and Gao, 2021).

Considering the lack of supporting literature on older adults and addictive gaming behaviours as well as the lack of mention surrounding the topic in all the other literature eligible for this review, it is possible that excessive gaming behaviours are not as much of a concern for older adults. This could be further supported by the fact that the individuals included in the study by Tang and Gao are a small sample size and might not be considered to be experiencing excessive gaming according to the definition of gaming disorder by the World Health Organisation (World Health Organisation, 2020). More research is needed on this topic to better understand the prevalence of older adults' experience with gaming addiction.

2.3 Conclusions and further research

This systematic review was conducted to understand the research that has been published on the topic of older adults and gaming for leisure. This was done due to the perceived comparatively large amount of research that was returned during searches about older adults and gaming that seemed to be related to health, fitness, wellbeing or education. I wanted to understand the amount of research that has been conducted and not stated to be

related to these categories, as older adults may want to play video games for leisure or adopt them as a new hobby instead of for maintenance or self-improvement. The overall process of conducting this systematic literature review illustrated that the research is slanted towards these categories with 247/276 of the original search results being excluded from the final review due to their content being linked to improving, maintaining or measuring an aspect of health, wellbeing or functioning. It is important to note that the databases selected for this review (ACM, Springer and IEEE) meant that the research encountered was biased towards being Human Computer Interaction (HCI) and/or Computer Science (CS) based. This could potentially provide context for the high instance of functional and health applicable research encountered, as games research within these fields is susceptible to funding and publishing pressures. Video games research has strong foundations in both Humanities and Computer Science. The decision to focus this literature review within HCI was made as HCI research traditionally has a strong focus on exploring and evaluating user needs, digital design, and digital accessibility. Whilst not in the scope of this project, future research could expand, compare and contrast upon this literature review by exploring the landscape of video games research for older adults across the humanities landscape as well.

Out of the original 276 returned search results, only 15 papers met the eligibility criteria for inclusion in the review. The reviewed literature provides a basic understanding of some of the aspects affecting older adults' interaction with digital games, however it is important to note that sample sizes are generally small and therefore the extent to which the reviewed literature can be applied across the population of older adults is limited. It is also essential to understand that not all older adults are the same and that these findings should not be treated to be applicable to everyone over a certain age (Petrie, 2023), especially in instances where the sample sizes are small and the age threshold used for older adults is lower, such as in some of the research included in this review.

The age threshold used throughout the reviewed literature for older adults varies, as such the findings presented in this literature review, whilst indicative of older adults may lean towards being more representative of those on the younger end of the spectrum. The research reviewed that discusses device evaluation and usage looks at devices that are outdated and no longer being actively produced for commercial sale such as the Kinect, the Wii and the Xbox 360. Whilst this is useful to provide understanding of how controller types may affect older adults experience, the fact that these devices are no longer available for sale means that this research is not as relevant for older adults who may be looking to adopt video gaming as a hobby in 2024 onwards, nor is it particularly helpful for those looking to

improve older adults experience within the commercial gaming industry on platforms and devices that are currently available. More relevant and recent research into the experiences of older adults with current and future gaming technology is needed.

The reviewed research is also generally descriptive, not delving far below surface level. More in depth research on a larger scale is needed to provide further insight into older adults' experiences, perceptions, motivations and barriers with video games, as well as to validate and build on the findings from the reviewed literature. Ensuring that consistent and appropriate age thresholds are applied for older adult participants will also help validate future research across the older adult population.

This research project aims to fill in some of these identified gaps in the literature review by identifying and exploring the barriers that older adults face with adopting video gaming as a hobby. The aim is to provide further insight into older adults' experiences with video gaming as well as the difficulties they face. This research could be helpful in increasing understanding of this space and providing information to aid improvement within the industry.

3. Research Study

3.1 Rationale

In order to understand older adults' engagement with video games and to collect data that would provide an overview of their opinions and perceptions on them, a mixed methods study was decided on. This would involve participants first doing a survey to collect demographic and basic information about their video game engagement and technology usage, and then interviews would be conducted with each participant.

Interviews were decided to be an appropriate method to ensure that the data collected on the topic was rich and to provide a holistic view of the space when looked at in conjunction with the quantitative data from the surveys (Sofaer, 1999). Survey data alone would not likely be able to provide detailed and a wide enough data set to answer the research questions alone (Queirós, Faria and Almeida, 2017). Interviews are a research method that allows for participants to provide in depth information and responses through conversation (Jain, 2021; Aspers and Corte, 2019). This allows the participants to discuss their points and ideas in a more natural manner with the researcher than would occur if they were asked to fill in this information through a survey. Asking participants to provide this type of information through a questionnaire would not only potentially risk limiting their expression and the depth of data collected, but could also introduce the risk that the information they are relaying may be informed by looking up or asking others for information whilst filling out their responses. It is also important that the participants feel comfortable and motivated to participate in the study, with it being possible that asking participants over the age of 65+ to type out long responses to pages of a survey may impact their willingness to participate in the study.

Originally the plan was for this research to be separated into two studies, with Study 1 focusing on exploratory research with older adults aged 65+ to understand the general landscape of video game opinions and usage within the age group, and Study 2 then looking at how video games could be co-designed with older adults to ensure they are more accessible and to address the pain points found from Study 1.

During data collection for Study 1 it became evident that there was no desire for the participants within this group to play video games for entertainment purposes. It was felt that continuing with the original plan to carry out study 2 was not relevant and would be due to study design, not following the needs or wants of the target group. Prior to any data analysis

being completed, the decision was made to instead continue running study 1 but lowering the age threshold to 50, allowing for data to be collected for those in the 50 - 64 age range as well as the 65+. This would allow for development of understanding if engagement differs across these age groups, and if there will be older adults in the near future who may want to play video games for purposes other than for their health.

3.2 Materials

A questionnaire (Appendix A1) was created to collect data from the participants. The data collected from this survey is grouped by three sections, the first section is demographic information, the second section is background technology competency, and the third section is gaming background information. The background technology competency section aims to collect information about the participants' current overall technology competency by asking them to rate their technology knowledge, confidence and willingness, using 5-point Likert Scales with 1 the lowest score and 5 the highest per question.

The questionnaire was structured as follows, with participants moving through each of the three sections:

1. Demographic data: Participants were asked for their age, gender, highest level of completed education and current employment.
2. Background technology competency: Participants were asked what technological devices they own, how they would rate their knowledge of technology, their confidence using new technology, and their willingness to use new technology.
3. Gaming background information: Participants were asked for information regarding their gaming experience, if they had ever played a video game, if they consider themselves someone who regularly plays video games, the frequency that they play video games, what devices they use to play video games, and what type of video games they play.

An interview script (Appendix A2) was created to provide structure for the interviews, this aimed to prompt conversation and uncover information surrounding the topic of gaming from the participants. This script was semi structured to facilitate conversation, and to also allow for redirection and engagement from the participants. As the type of information that this study aims to collect is wide and the purpose is to understand experiences, perceptions and difficulties, having a stringent, specific interview guide would limit the depth and breadth of

information that could be collected from the participants (Queirós, Faria and Almeida, 2017). The same reasoning was applied to the creation of the question prompts that were included in the script, with them being relatively open and not specifically calling out any assumptions. This helped to mitigate the impact of potentially leading questions, allowing the participants to recall and relay their own answers with minimal guidance or introduced bias.

3.3 Procedure

Participants were invited to participate in a study regarding “gaming” and informed that no experience with video games was required. They were sent the project information sheet and informed consent forms via email, and they were informed that this study would require them to fill out a short questionnaire and then to have a discussion, they were then asked to complete the survey and to schedule a time for the discussion provided they were happy to participate.

After completing the questionnaire participants took part in an interview. This started with participants being informed that the call was being recorded, and with the participant being asked to confirm that they had completed the survey and that they gave their consent to participate in the study. After confirming that they were happy to continue, participants were engaged in a discussion following the interview plan (Appendix A2). This plan was used flexibly due to the exploratory nature of this study to allow for rich data collection and included alternative prompt questions for use depending on if the participant seemed to play games or not. Questions were also added naturally during conversation in order to ensure that other discussion points mentioned organically could be explored.

3.4 Participants

After gaining ethics approval from the School of Arts and Creative Technologies ethics committee, participants were recruited through word of mouth and snowball sampling. This included contacting participants who had participated in previous studies with the university via email, and posting on Whatsapp and Discord chats and groups. No incentive was offered, and the only inclusion criteria was that participants were over the age of 50. Participants were split into two different groups for analysis, with one group including individuals aged 50 - 64 years old, and the other group including older adult participants 65+

years old. The 65+ age threshold for the older adults was informed by the threshold commonly used in HCI research (Czaja and Lee, 2007) and the NHS (NHS England, 2024) definition of an older adult. The age category of 50 - 64 years old captures the individuals in the age threshold below older adults, with this informed by the inclusion of individuals in their fifties within 6/15 studies included in the systematic literature review.

65+ years old: 18 participants were 65+ years old, with a mean age of 72 years old and a range of 65 - 92 years old. 12/18 participants identified as male (66.7%), and 6/18 identified as female (33.3%).12/18 participants stated that they were either retired or semi-retired (66.7%)

50 - 64 years old: 12 participants were aged between 50 - 64 years old, with a mean age of 56 years old and a range of 50 - 64 years old. 4/12 participants identified as male (33.3%), and 8/12 identified as female (66.7%). 1/12 participants stated that they were retired (8.3%).

4. Results

4.1 Quantitative Findings

This section outlines the findings from the surveys for both the 65+ age group and the 50-64 age group.

4.1.1 Technology usage

65+ years old: 15/18 own a tablet (83%), 17/18 own a smartphone (94%) and 15/18 own a computer (83%). Only 1/18 participants in this group stated that they own a gaming console (6%), filling in that they own a Nintendo Switch and a Playstation 3.

50 - 64 years old: Contrarily in this group, all of the participants (12/12) own a smartphone (100%) and all of the participants (12/12) own a computer (100%), with 11/12 participants owning a tablet (92%) and 5/12 participants owning a gaming console (42%).

4.1.2 Technology knowledge, confidence and willingness

65+ years old: Self-reported (5 point Likert Scale) knowledge of technology in this group averaged M= 3.00, SD= 1.029, whilst self-reported confidence using new technology averaged M= 3.22, SD= 1.003, and willingness to use new technology averaged M= 3.78, SD= 0.808. Regarding willingness to use new technology only 1/18 participants (5.5%) stated that they were unwilling, whilst 5/18 (27.7%) claimed to be neutral and the remaining 12/18 (66.7%) stated they were either willing or strongly willing.

50 - 64 years old: Self-reported (5 point Likert Scale) knowledge of technology averaged M= 3.33, SD=0.888, whilst self-reported confidence using new technology averaged M=3.67, SD= 0.651, and willingness to use new technology averaged M= 4.08, SD= 0.289. In this group all participants (100%) stated that they were either willing or strongly willing to use new technology.

4.1.3 Gaming Background

65+ years old: When asked if they have “ever played a video game”, 4/18 of the participants answered no (22%), whilst 14/18 participants answered yes (78%). Further to this when asked if the participants would consider themselves “someone who regularly plays video games” 15/18 participants responded with no (83%), while only 3/18 responded yes (17%).

Despite only 3/18 participants stating that they would consider themselves someone who regularly plays video games, when participants were asked the question “How often do you play video games (this includes games on your phone, computer, iPad, and other gaming devices such as Playstation or Xbox)” (Fig.6), 7/18 participants stated that they played video games “daily” (39%) - this includes 4 participants who stated previously in the questionnaire that they do not consider themselves to be someone who regularly plays video games. 7/18 participants within this group also stated that they “Never” play video games (39%).

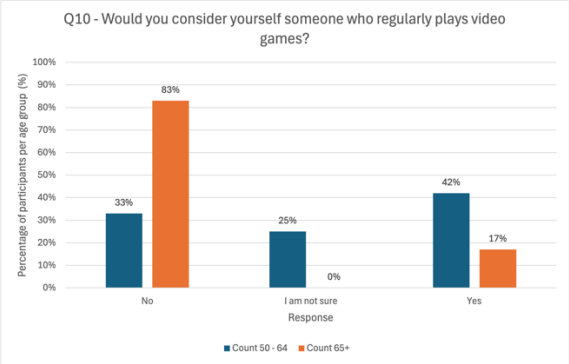
When looking at the devices that participants in this group have played a video game on before (Fig.6), 7/18 participants stated that they have played video games on a tablet (39%), while 6/18 have played on a smartphone (33%) and 6/18 have played on a computer (33%). When it comes to gaming consoles, 3/18 participants have played on a gaming console (17%). In terms of genre of video games, the most popular genres played by the participants in this group are puzzle games with 10/18 participants answering that they play them (56%), followed by word games with 7 participants stating that they play them (39%).

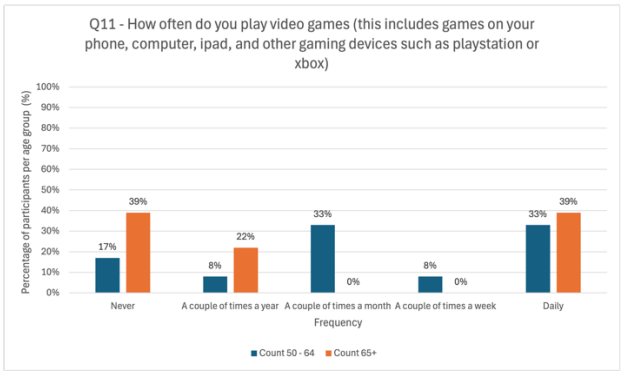
50 - 64 years old: When asked if they have “ever played a video game”, only 1/12 of the participants in this group answered no (8%), whilst 10/12 participants answered yes (83%) and 1/12 participants selected “I am not sure” in response to this question (8%). In addition to this, when asked “Would you consider yourself someone who regularly plays video games” (Fig.6), 4/12 participants responded with no (33%), 5/12 participants answered yes (42%), while 3/12 participants stated they were “not sure” (25%).

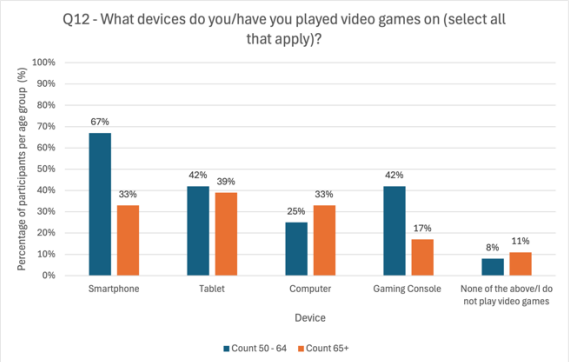
Regarding the frequency of playing video games within this group (Fig.6), 4/12 participants state that they play “daily” (33%), 1/12 participants play “a couple of times a week” (8%), and 2/12 participants play “never” (17%). 1/4 participants who stated they would not consider themselves someone who regularly plays video games went on to state that they play video games “daily”, as did 1/3 participants who stated they were “not sure” if they would consider themselves someone who regularly plays video games.

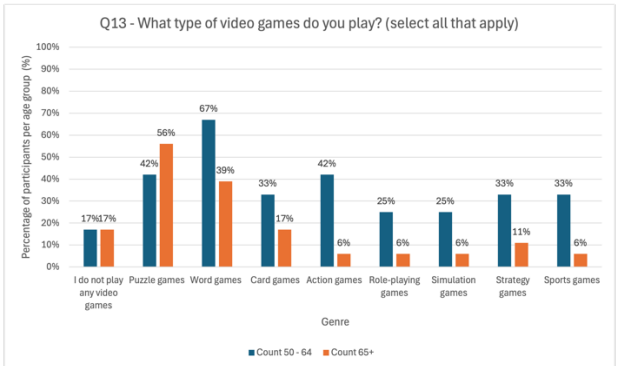
Regarding devices that the participants in this group have played video games on (Fig.6), 8/12 have played on a smartphone (67%), 5/12 on a tablet (42%), 5/12 on a gaming console (42%), and 3/12 on a computer (25%). The most common genre of game played is Word games, with 8/12 participants in this group stating that they play this genre (67%).

Figure 6: Graphs showing gaming background for 65+ years old and 50 - 64 years old









4.2 Quantitative discussion

The systematic review conducted prior showed that older adults have difficulty with the control schemes and devices used for gaming consoles, as such the findings from this survey illustrating a low ownership of gaming consoles within the 65+ age group (6%) are in line with these findings in the literature (Brown, 2017; Pham and Theng, 2012). This percentage of console ownership is lower than the age group below them, with closer to half (42%) of the participants within the 50-64 year old group owning a gaming console. Whilst prior existing research on the topic indicated that older adults would be interested in games or consoles that encouraged more active movement, with the Wii and the Kinect sensors being specifically used (Palacio et al., 2017) - it can be noted that none of the older adult (65+) participants owned these devices. Whilst this may be due to these devices being outdated and not commercially sold anymore (Thubron, 2023; Langley, 2013), it is recommended that future research and development is targeted at the devices already owned and easily accessible to older adults with console gaming not seemingly popular within the 65+ age group.

Mobile devices, such as a smartphone and tablet have also been targeted in prior research as potential devices for older adults to game on (Lee et al., 2021; Oppl & Stary, 2020). The findings from this survey indicate that there is a high ownership level of both of these devices within the 65+ group (smartphone 94%, and tablet 83%) and as such this could potentially indicate a higher familiarity level with these devices within this age group than gaming consoles. Consequently this supports the reasoning that the older adults within this group could find mobile gaming with a touchscreen to be more easily accessible than console gaming, with this being a potential platform to focus on for those looking to develop games for older adults. The following interviews should help provide more contextual understanding of the participants device usage, and their experiences with gaming on these devices. It is also expected that the interviews will allow participants to discuss previous difficulties that they may have experienced engaging with controls on any of the technological devices they have used to play games.

For participants in the 65+ group their average score for self-reported knowledge of technology (M = 3.00) and confidence using technology (M = 3.22) was “Average” from a 5 point Likert scale (scale from “far below average” to “far above average”). As a self-reported measure it is possible that participants were scoring this based off their perceptions of the rest of their age group or the people surrounding them, as such it is possible that this may not be an accurate representation of their ability. Through the following interviews participants will be able to provide contextual understanding of their technology usage and abilities. Regarding new technology adoption the results indicate that the majority of participants in the 65+ group are either neutral, willing or strongly willing to use new technology (M = 3.78), this is in line with prior research on the topic (Czaja and Lee, 2007) and all participants (100%) within the 50-64 age group stated that they were either willing or strongly willing to use new technology. This could indicate that older adults may be willing to adopt new gaming technology, however it is also possible that there may be a distinction drawn between what types of technology older adults are willing to adopt - this is an idea that the interviews should also be able to provide more insight on.

Daily video game usage within the 65+ group (39%) was slightly higher than the 50-64 group (33%) despite having a lower percentage of individuals who stated that they would identify themselves as someone who regularly plays video games (17% for 65+ years old opposed to 42% for 50 - 64 years old). This could be related to the idea that video games do not follow the same definition per individual, with certain genres or devices not considered as playing “video games”. Participants' understanding of video games should hopefully be

explored in more detail in the interviews in order to help explain this data, and to understand if there is a difference in the understanding of what a “video game” constitutes.

The games most commonly played by individuals within the 65+ age group were puzzle (56%) and word games (39%). This is in line with the suggestions from literature that older adults are potentially more interested in games that they perceive to be mentally stimulating (Blocker, Right and Booth, 2014). Word games were also the most popular genre for the 50 - 64 group (67%) with this potentially indicating that there may be an interest in playing video games for cognitive health reasons within this group as well. The interviews should help explore the reasons for why all the participants play these games, if it is for cognitive health reasons and if there is a desire to play games past this.

Whilst the survey has provided data regarding the participants technological and gaming habits, this is an overview of the participants engagement with video games and has not provided information that allows for development of an understanding of their experiences with, perceptions of, opinions of or understanding of video games in more depth. The next stage of this thesis involves carrying out interviews with the participants to explore their engagement on a deeper level and to uncover data that, in conjunction with the survey data, can provide a more holistic understanding of the space.

4.3 Qualitative findings

This section outlines the findings from the interviews. The interview data was processed and then analysed using inductive thematic analysis. Thematic analysis was chosen as the method for analysis due to the fact that it is a suitable method for handling large amounts of qualitative data (Braun and Clarke, 2006). The flexibility of thematic analysis also meant that the data could be analysed without preconceived notions ensuring that unexpected or unanticipated findings could be relayed, as well as allow for similarities and differences across the data sets to be identified (Braun and Clarke, 2006). The process used for thematic analysis of this data follows a modified version of the 6 step process outlined by Braun and Clarke (2006), with the addition of consensus coding to check reliability in the coding process during step 2 and the adaptation of the data being viewed in isolation during steps 3-6 to allow for the separate thematic analysis of the two different age groups.

The first step in analysing the data involved reading through the transcripts and increasing familiarity with the data set. After this, as part of the second step, codes were generated with

2 researchers individually coding the same 6 transcripts and then discussing the findings to check that the codes matched. Once this consensus coding was completed and the codes were found to match with satisfaction from both researchers, the rest of the transcripts (all the remaining participant data) were coded by one researcher. After codes were assigned for all the transcripts, as part of the third step the codes were translated into themes, after which steps four and five were completed to review and then further define the themes for each of the age groups. Once steps 1 - 5 were completed, step 6 involved further analysis and writing up the findings. It is important to note that for this process steps 3 - 6 (searching, reviewing, defining and writing themes) were carried out separately for each of the age ranges in this study to avoid potential crossover or bias during analysis. After themes were consolidated and written for each of the age groups independently (during step 6), they were then able to be viewed together allowing for commentary on differences and similarities across the age groups.

4.3.1 Experience with, and exposure to video games

65+ years old: The participants in this group had varied prior experience when it came to playing video games, ranging from some having played arcade games when they were younger, to most having played with or watched their grandchildren or children play video games. The participants who claimed to have never played video games still spoke about having some form of exposure through seeing other people play at some point in their lives, whether on transport or through family members. Most participants stated that gaming was not typically a point of conversation with friends.

> *P1: "Yeah, that's yeah, that's the Nintendo, Mario Kart and all the same Nintendo ones. I know. And I played them with my grandchildren"*

> *P14: "Well, in the past, I played them on my phone and on PC in the distant past, by which I mean probably on a PC, probably in about the 90s, perhaps even late 80s."*

Knowledge about video games varied, however was generally limited, with multiple participants stating that they were unsure when asked open questions surrounding the topic and a few participants stating that the opinions they are relaying may be biased. The limited knowledge surrounding video games within this group appears to be due to a lack of interest in the concept and narrow exposure, resulting in their views and understanding of gaming being dependent on what they have seen or heard from those surrounding them or from media portrayal.

P5: “my information is really limited, um, to a few, you know, a handful of people. So my opinion is based on that. Um, so now I'm sure, I'm sure as I'm talking, my, my information is really limited”

P10: “I don't know enough about them, to be honest, because I've never been interested to find out.”

As previously stated, the participants main exposure to modern day video gaming is through their family members or through media portrayal, with most of the older adults in the group mentioning that they know of, have seen, or have played what they consider to be “video games”, through their children or grandchildren.

P4: “Well video game is usually one where, the ones that I've seen my grandchildren do is one where they have to make their way across different things and shoot guns and capture things and all that sort of thing”

50 - 64 years old: Experience with video games within this group was mixed with some participants stating that they had played video games when they were younger, some playing video games currently, some playing with their children or younger family members, some stating that they only play word or puzzle games, and a few stating that they do not currently play any video games. Participants who claimed that they do not currently play any games discussed still having attempted to play with their children at times, as well as still being exposed to video games or consoles in the house.

P19: “that's how I remember my childhood. It was all about those type of games. Yeah, I really enjoyed it. That's how I got into it.”

Games that participants in this group mentioned recently playing on either console or PC included Fallout 4, Fifa, GTA 5 and City Skylines. Games mentioned as being played on mobile or tablet were generally word or puzzle games such as Wordle and Candy Crush, except for one participant who regularly played a shooter called Pure Sniper on his phone.

Summary: Current video game exposure within the 65+ group was mainly through younger family members such as children or grandchildren with their knowledge of video games being low and influenced by what they have seen or experienced with these younger individuals, or from the media that they have been exposed to. This was similar for participants who did not play video games within the 50 - 64 age group. The fact that exposure to video games is coming from playing with or seeing younger family members play video games indicates that there may be opportunities for non-gamers to still participate when it is a bonding activity, as has also been reported beneficial by other literature (Costa and Veloso, 2016), with Pecchioni and Osmanovic (2018) finding that shared gaming between grandparents and grandchildren increased relationship closeness in their study on the matter. Social interaction with family members is incredibly important to older adults' health (Bath and Deeg, 2005) and the possibility that video gaming could be playing a role in these interactions means it is important that those developing games ensure that older adults are still able to participate when they wish to - even if this is not a regular occurrence or as a solitary hobby.

The low level of knowledge and absence of self-motivated exposure to video gaming illustrates that the participants within the 65+ age group have a lack of engagement with non-word or puzzle video games, fitting with research suggesting that older adults prefer these genres (Blocker, Wright and Boot, 2014). The participants within the 50 - 64 age group who did play video games illustrated a higher level of knowledge and exposure, with them discussing a range of video games and demonstrating a higher level of understanding of games, genres and different gaming devices than the participants within the 65+ age group. This could indicate that whilst video game engagement is low within the current 65+ population, it may increase in coming years as younger generations who currently play video games age.

4.3.2 Puzzle and Word games

65+ years old: When asked about video game experience the older adults in this study spoke about the games commonly played by younger people, or the arcade games that they might have experienced themselves when younger. Whilst this may give the impression that the participants do not at the time of the study play any video games themselves, this is false as some of the participants in this group played puzzle, word and card games on their digital devices - with frequency ranging from irregularly to kill time, to everyday as part of a routine.

P11: “something tweaked that actually I do participate in some games every day. I'll do Wordle or Quordle or New York Times stuff. I'll do that in crossword or online. So if that is the definition of, well, I wouldn't call myself a gamer, but, you know, that's my limit. And I've never thought of that as gaming.”

As the impactful exposure older adults recall is through their grandkids or kids, “Video games” are stated to be what they have seen based off of those experiences. The understanding from the participants in this group was that “video games” were the type of games that they had seen younger people play, with these being fast, involving animated scenes, potentially violent and played on specialist devices such as a console or with controllers.

P16: “Well, I think about my grandson who, okay, he doesn't say much now, but used to spend hours doing Minecraft and Fortnite and things that I actually have absolutely no interest in. And he was completely obsessed at one stage. To me, that is more of a video game than me sitting and doing a jigsaw puzzle on my iPad or a card game or whatever.”

These perceptions of what constitutes a video game are not in line with what participants think of the games that they regularly play, with these played on their mobile phones or tablets, and not relaying the same type of graphical intensity or content that they expect from a “video game”. The participants in this group did not consider the games that they played to be video games, with there being a clear distinction in their minds between “video games” and the games that they play. When discussing their opinions and perceptions on video games in this study it is important to consider the fact that the participants are not referring to puzzle/word/card games unless explicitly stated otherwise.

P5: “I suppose my information comes from my grandchildren. Who I watch or have watched playing, doing gaming, they call it gaming. And what I do seems to be very different, you know, and they wouldn't look, they wouldn't do what I do. So it just seems a different order of things really”

50 - 64 years old: The understanding of what a video game is, is varied within this group, with some participants stating that video games encompass a wide range of games across different types of technological devices, whilst other participants stated that they would not consider video games to be those that are played on a mobile or tablet device. This conception was stated to be mainly due to both the controls that are used for the game and the genre of the game, with these participants not initially considering word or puzzle games to fall under the same veil as the faster/action games they have played or seen played. With some participants a distinction was drawn between these types of games and other "video games".

> *P22: "If it's a Mario Kart or a FIFA or a, you know, what's it? Dungeons and Dragons or whatever. Funnily enough, that I would consider video. But if it's like a wordle or Candy Crush, that I would just consider a phone game."*

Summary: Participants within the 65+ age group who play word and puzzle games do not consider themselves to be playing video games, with video games considered to be the faster, more graphically intensive, and potentially violent games played on consoles. This understanding was also exhibited within the 50 - 64 age group for similar reasons. Contrary to this finding, the term "video games" is often used in research as a categorical term that encapsulates multiple different genres of games including both puzzle and word games (Pallavicini, Ferrari and Mantovani, 2018; Blocker, Wright and Boot, 2014). This difference in understanding of what a "video game" is could indicate that the definition of what is being referred to when discussing a video game needs to be made explicitly clear when running research with older adults to ensure accuracy in results. This also means that it needs to be made clear that the 65+ age group participants' lack of engagement with video games as found in this thesis is not referring to puzzle and word games, but to other genres of video games (Blocker, Wright and Boot, 2014; De Schutter, 2011).

The engagement with puzzle and word games within these groups could indicate that there is a willingness to play video games for reasons related to cognitive health, and could suggest that the focus on developing video games to maintain and improve cognitive functioning for the over 65 age group, as found to be prevalent by the previous systematic review (Fig.3) is relevant and desired. Developers looking to target or engage the current 65+ population in video games may find that there is a higher proportion of that population that will engage if it is a puzzle or word game.

4.3.3 Concerns about the effects of playing video games

65+ years old: Generally opinions on playing video games were mixed, with most participants in this study stating that whilst video gaming is not something that they are interested in as a concept, it is fine if someone else wants to do it in moderation. Whilst this was the general attitude, there were opinions on both sides of the spectrum with one of the younger participants (under 70 years old) stating that he felt video games were brilliant as a hobby and great for motor skills development, whilst the oldest participant in this group, P18 (over 90 years old) had the most negative views of all the participants in relation to perceptions of people who play video games, stating that people who play video games are morons.

> *P1: "I think to develop a skill, head eye coordination. It's brilliant. Absolutely brilliant."*

> *P18: "I think there's a word for it, a moron."*

Despite the majority of the participants' overall views about gaming seeming to be neutral - this is caveated by the perceptions and concerns that they hold about video gaming, with gaming as a hobby seen to be fine as long as these concerns are not actualised. The main concerns discussed being addiction, violence, and isolation.

The topic of video game addiction was mentioned by participants when referring to the amount of time that a person may spend playing video games. This term was, however, used loosely and was not quantified by the participants. The main concern voiced related to video game addiction was the amount of time that a person would potentially spend playing video games, with it taking away from actively participating in other activities. When discussing addiction participants did compare the possibility of a gaming addiction to other addictions such as gambling or smoking, with the contextual caveat that addiction can arise from other activities as well, and is not a unique concern regarding gaming. When talking about gaming addiction contextually, participants did not seem to be overly concerned about it for the general population, relaying the understanding that addiction is variable and dependent on factors such as a person's personality and susceptibility. It is important to note that the topic of addiction was brought up by the participants initially, not prompted by the interviewer.

> *P4: "And then I think once you do start doing those games and things, you could get hooked on them. Addicted."*

P13: “I suppose if people are susceptible to a form of addiction, gaming might be one of them. Same with gambling”

Despite stating that they are not concerned generally about gaming addiction, some participants made statements about how they would be concerned if their grandchildren started to spend large amounts of time playing video games. This concern was linked to the idea that spending large amounts of time gaming could result in people spending less time on hobbies deemed to be more constructive or spending less time on educational commitments such as homework.

P2: “you know, if, if it's stopping you from doing other things. For example, doing your schoolwork. And I do think that it is of concern.

Another concern mentioned was violence, with the participants within this group under the impression that video games often involved violent themes. The topic of violence in video games and its impact on the individuals who play them was voiced by the participants. Whilst participants stated they were unsure of the actual impact violent video games had on an individual, concern was illustrated regarding the topic, with participants stating that they do think that violent games can potentially contribute towards negative behaviour. Participants stated that media portrayal surrounding gaming can often be negative and may influence their perceptions, referencing coverage about shooters being linked to video games. Some participants compared video games to other forms of media such as books, tv shows and movies, recognising that these can also contain violent themes and that opinions on consumption of these other forms of media were not as negatively linked despite this, with this idea making them question their perceptions on the link between video games and violence.

P16: “I mean, I very rarely have I seen a video game playing, but the odd time, especially the war ones. It is so realistic. It is so violent. It can't be good to watch that all the time. I mean, I really don't think it can be good for one. Whether it actually makes people more violent, I don't know, but it's almost as though it makes it permissible to be violent.”

Social Isolation was mentioned as being a concern as the older adults in this group view video gaming as more of a solitary activity. Some participants state that individuals who regularly partake in playing video games may be doing so to compensate for a lack of social

interaction, and may be playing video games instead of going out and interacting with other people. This is related to the perception from a few of the participants in this group that those who play video games may be less socially adept, nerds or may be lacking personality wise. Despite it being stated that gaming seemed to be more of a solitary, isolated activity, some participants did mention that they were aware that gaming could be social and involve interaction with other people over the internet.

> *P8: "it can be a compensation for not having social relationships or others or other types."*

> *P14: You just feel in some ways that people who spend excessive amounts of time doing this could be in some way socially inadequate."*

50 - 64 years: Some participants within this group refer to video games being addictive. The main concern that manifests with this topic of conversation is that if someone is playing video games regularly for a long duration of time, then this may be at the detriment of other tasks that can be deemed to be more important, such as; work, in person socialisation, education or household chores. Whilst these participants bring this up as a potential concern, they do also mediate the concern by stating that it is dependent on the time spent and whether it impacts an individual's other activities. A few participants discussed how they would restrict their children's time spent playing video games to moderate this. Participants illustrated awareness that the likelihood of addiction to video games might also be dependent on the individual with certain individuals potentially more susceptible to addiction in general.

> *P28: "I think everything in moderation, and as long as it's not taking over someone's being, I would hate to, I would hate to think that some people who were on benefits, who are too lazy to go to work would like to play video games all day because it is addictive"*

Violence is another concern that participants voice associated with video games. The participants who discuss this topic, mention the media portrayal they have seen that associates video games with violent events that have occurred, as well as the violent content such as shooting or killing, that they have themselves seen in games. Similar to the concern with addiction, the participants that discuss this topic illustrate understanding that this can be dependent on the individual and on the games, with certain individuals potentially being more at risk of influence from violent video games. Participants also spoke about this

potentially influencing children, with as a consequence, age restriction and certification mentioned as being important to adhere to and be cautious with, as well as parents needing to be aware and restrictive of the games that their children might be playing.

> *P25: "It gets a bit of a bad rep in the news. So like some of these kids who play some of these really violent ones, like those are the ones that hit the headlines, like some of the murders and things"*

Concern was voiced by a few participants over the interactions that may occur with other gamers when playing games online, this includes issues with potential racism, sexism, and exploitation.

> *P29: "also the online side of things can be quite volatile. There's a lot of racism, a lot of sexism over headsets if you choose to listen to it."*

Summary: General views surrounding video gaming as a hobby were mixed but concerns such as addiction and violence were discussed by the participants in both age groups indicating that these topics are intertwined with both the 50 - 64 and the 65+ age groups understanding and perceptions of video gaming. This is in line with the findings from previous research on the topic that indicates that both the potential of addiction and the violent content in games can be a concern for some older adults (Ferguson et al., 2017). Another concern voiced in the 65+ age group was that video gaming was an isolating activity which attracted and facilitated antisocial behaviour, despite participants showing understanding that it can occur socially as well.

However, whilst these topics were discussed and participants indicated that there was concern surrounding them, there was understanding that it is also dependent on the individual who plays the games and that the extent of which video games facilitate and contribute to these concerns is unknown. Consequently, despite these concerns coming to mind when discussing video gaming, the participants within this group were not found to be overly worried about the impact of them on a non-vulnerable individual providing gaming is experienced in moderation. This understanding can indicate that there are therefore other reasons than these concerns that could explain why the participants who do not play video games in both groups, do not wish to do so.

4.3.4 Barriers experienced with playing video games

4.3.4.1 Physical Barriers (65+)

The physical barrier most commonly discussed by the participants was difficulty with the controls. When exposed to video games in the past and given a controller to use, participants recalled struggling to use it, with this negatively impacting both their experience with the game and their willingness to participate again in the future. Participants found the experience of using a controller difficult to use and overwhelming, as the majority of the participants usually play their puzzle/word/card games on either their mobile phone or on their tablet.

> *P11: "So just holding controllers or whatever is just kind of freaky for me. That's what I'm trying to say."*

Related to participants' issues with controls is the discussion of the motor skills and the dexterity that is needed to play the video games that they have been asked to, or seen their grandchildren and kids play, with a few participants stating that they find it difficult to cope with the fast actions or exact timings required by the games.

> *P1: "You need fine motor control and hand-eye coordination. And that's why I think it's really good that the kids can develop that and probably better if the adults can develop it as well. Because that's one of the skills that start to go as soon as you get old."*

Participants discussed the speed of video games, stating that they seem to be generally fast paced. This was cited as problematic as not only do some participants state that they have no desire to interact with a fast game, but that the requirement of fast actions and inputs means that these games would be difficult to interact with. A few participants specifically mentioned that reaction time declines with old age, and that they would be concerned about being able to keep up with the game.

> *P5: "the genre always involves speed, you know, instant instant action. No pause for thought really. Um, doesn't encourage you to think much, uh, speed, very speedy. I think as I get older, I don't want things that are speedy."*

P18: "…maybe I would not be quick enough or fast enough or understand enough how the game works."

The last physical barrier mentioned by participants is eyesight, with some participants stating preference for playing their games on a tablet over a mobile phone due to the increased size of the screen aiding in visibility.

P16: "I only started playing once I had my tablet. I've never done it on my phone. I wouldn't be able to see it. It would be too small on my phone, something like that."

4.3.4.2 Emotional Barriers (65+)

Participants spoke about their lack of confidence when it comes to playing video games, with this making them feel apprehensive to participate in them when asked. Generally, this lack of confidence was stated to stem from a lack of knowledge, time to practise, and confidence with the controls. This was also mentioned to be linked to general lack of confidence with their technology proficiency. A few participants spoke about the expectations from their grandchildren/kids to be proficient when asked to play, with one participant stating that this makes him feel uncomfortable as he needs some time to get to grips with the game.

P12: "yeah, I get. What's the word, sort of scared, sort of. If, if she thrusts this on me and expects me to get going immediately. Because I can't do that."

P2: "I'd be willing but I have a bit of a fear I think… I may not just be able, maybe I won't be able to grasp, you know what it is."

This is linked to the fact that some participants stated that they feel that they would not have a chance of winning if they participated. The potential embarrassment of a poor performance or struggling was discussed as being demoralising for participants.

P10: "possibly I would feel quite embarrassed if it was against other people…"

P14: "I know I would be beaten and I'm innately competitive to a degree."

4.3.4.3 Technological Barriers (65+)

Participants also discussed their lack of confidence with technology in general, with this impacting their general views and reducing their likelihood of adopting unfamiliar or new technology such as video gaming. Participants talked about having difficulty using technology with a few participants stating that they would be worried about being able to get a video game to work.

> *P18: "that I might have a problem with the technicalities of actually playing it and manipulating the whatever device you have to do to make it work. That would probably be too difficult for me"*

4.3.4.4 Physical Barriers (50-64)

The main barrier mentioned by participants that do not regularly play console games within this group was controls - with this specifically referring to issues with using a controller to play a console game. Participants discussed having difficulty adapting to the variety of input methods required to play with a controller, with this being different depending on the games and it not being something that they are used to, especially for those who regularly only play games on a mobile phone.

> *P20: "I'm very bad at manoeuvring that stick or console or whatever, you know, to use your thumbs and your fingers to manoeuvre it. So I really, really, I think I still struggle with that."*

4.3.4.5 Other Barriers (50-64)

A few participants within this group noted that they have felt inadequate when playing games with their children, with their children playing at a much higher level of competence than them. This feeling of being "bad" at the video games they have been asked to play can lead to embarrassment and a lack of confidence and motivation to engage with those types of video games in the future.

> *P20: "…he was obsessed with Football Manager, whatever that game was. So a couple of times he did ask me to play with him. And I was so bad that I was only*

invited twice. And he kicked me out halfway. And I have never played a video game since."

One of the reasons why participants state this difference in skill level occurs is due to the complexity of the games, with it being difficult for them to quickly pick up what they are meant to be doing, and not having or being given the time to practise when playing with somebody younger. When playing solo, difficult games that require time and effort to master can also be overwhelming with participants having to make repeated attempts at the same task negatively impacting motivation to play. A game being too complex to understand or learn would also negatively impact motivation to play.

P27: "if I get a game, and I'm sort of going through it and then there's a bit that takes me ages to get through and you have to keep going back to the start and all that sort of stuff. And then, like, so I'll be like, Oh, this is annoying."

A few participants within this group mentioned cost when talking about reasons they would not play video games - with the inflated price of new games being mentioned as well as the initial cost of buying a console or other equipment for gaming.

P29: "I won't spend the money on new games. I would not buy the latest FIFA for 60 pounds. Because you need your head examined."

4.3.4.6 Summary (both age groups)

When engaging with "video games" the participants within the 65+ age group experienced physical, emotional and technological barriers that made interaction and prolonged participation difficult. Physical barriers discussed in this study included difficulty with using controllers (Pham and Theng, 2012), issues with the complicated controls and inputs on consoles, and problems keeping up with the fast pace and speed of input required (Souza et al., 2016). These were stated by the participants to be related to their motor skills, dexterity and reaction speed that they feel is not sufficient to keep up with the requirements of modern-day games and consoles. This is supported by research that discusses the age-related decline of these skills (Baudouin, Isingrini and Vannest, 2019; Dayanidhi and Valero-Cuevas, 2014; Hoogendam, 2014) and the impact of cognitive changes on technology uptake in older age (Czaja and Lee, 2007; Van Hooran et al., 2007).

Emotional barriers included lack of confidence (Souza et al., 2016), embarrassment and the desire to win - a goal that the older adults feel is unobtainable. Similar emotional barriers concerning ability to play and win were also found in a study by Mclaughlin et al. (2012) in which they state that “starting to play a new game with beliefs such as these may handicap older players more than might actual age-related decrements in ability” (Mclaughlin et al., 2012, p.17). These beliefs might be linked to the previous technological barriers that these participants face, with those who have experienced previous difficulty potentially less confident in adopting related hobbies (Berkowsky, Sharit and Czaja, 2017).

Difficulty with controls, motor skills and feelings of inadequacy and embarrassment were also discussed by participants in the 50 - 64 age group, with the addition of the fact that gaming is a costly activity, also being mentioned by this age group.

All these barriers impact motivation to partake and reduce the likelihood that the individuals across these age groups could adopt gaming as a hobby if they wanted to. Working on solutions and implementing options that could help mitigate these barriers could therefore facilitate smoother experiences for older adults when they do participate, even if this is just with their grandchildren or children, making the experience more positive and less difficult. This could potentially increase the likelihood of future interaction and remove these barriers as the reasons for early churn.

4.3.5 Time

65+ years old: There was an understanding in this group of participants that gaming was an activity that was not worth the time investment that it took from an individual. This understanding in conjunction with participants not seeing video gaming to be productive, real or offer tangible benefits resulted in participants labelling video gaming as a “waste of time”.

> *P17: “I'd rather do something practical, like make something or do something or go somewhere than sit in front of a screen. It just does not interest me.”*

Not only did participants see gaming as being an activity that people had to invest large amounts of time in, but a few participants also stated that it was something that took a lot of practice and time investment to be good at. Regarding how they wished to spend their time, all of the participants mentioned having better things to do, or things that they would much rather do with their time than playing video games. Instead of playing video games the older adults in this group discuss other activities they would rather do, specifically, things that are

active or outdoors. Participants also state that they would rather be spending time with people, than playing video games, despite a few participants illustrating understanding that gaming can be done with other people for social stimulation.

> *P16: "I'd much rather be outside doing things and going for walks and things like that. It's probably a complete generational thing in that I -- it just doesn't interest me at all."*

50 - 64 years old: Participants within this group spoke about time in relation to video games, discussing the lack of time they have as one of the reasons why they may not play video games. This lack of time was stated to be due to the participants' work and chores that take priority over playing video games. The idea that an individual may be playing video games instead of completing other life tasks was seen as being a largely negative one. This extended to participants' views on their children playing video games, with one participant stating that she restricts her children's access to video games and the amount of time they spend on them, using it in instances as a reward for doing tasks such as homework. A few participants mentioned that the time could be spent taking part in an active hobby instead. Despite being cautious of the amount of time that video games may take up, participants did state that they understand that this is a balance, seeing the positives in spending time playing video games as well.

> *P24: "I think it's good downtime. I suppose if you play it too much, the theory is it's not very good for you. Whether that's true or not, I'm not really sure. There's probably an opportunity cost of playing video games which could be exercising or going out or interfacing with real people.*

Summary: Participants in the 65+ group thought video gaming to be an activity that was time consuming and a waste of time, with their preference to participate in activities that offered tangible benefits, were social, active or outdoors. This concept of video gaming being perceived to be an activity that is a waste of time has been found in previous literature (Brown, 2017), and the importance of perceived benefits in adopting new technology (Mitzner et al., 2010) and video games (Mclaughlin et al., 2012) has been highlighted. Due to the perceived lack of benefits it is likely that these participants would not engage with video games leisurely unless they are unable to do the other activities they deem more worthwhile.

In contrast whilst participants in the 50 - 64 group also discussed the amount of time that video games take, this was in relation to the fact that time spent on video games needed to be moderated as spending too much time on them and consequently not completing other

tasks was thought to be detrimental. Gaming to the detriment of other tasks has been used to discuss gaming disorder in the wider literature, with gamers themselves identifying that this is an indication of problematic behaviour (Colder Carras et al., 2018). Participants in this group also relayed the positives of video gaming but discussed not having enough spare time to play them due to other responsibilities, families and their jobs. It is possible that shorter video game experiences and those on easily transportable devices may be more attractive for individuals within this age group with limited spare time.

4.3.6 Motivation & desire to play video games

65+ years old: Participation in gaming within this group is impacted by the perceived benefits of partaking in the activity.

> *P6: "Well, I really just don't want to get in the game. I can't see a big benefit from it."*

The main reason why the participants within this group play the word and puzzle games that they currently do, is due to the perception that it is good for their mind. As such, opinions on video games to keep one's mind active are positive within this group, with this being a key motivation for them in playing a video game - despite the fact that they do not consider these types of games to be video games. Participants state that it is possible they could be more motivated to play video games if they were aware of the cognitive benefits of doing so.

> *P13: "I play a series of things, not games, I wouldn't call them games, but things that keep my mind stimulated, numbers, Sudoku, that type of thing. Try and keep my memory going. Try and keep my brain occupied."*

As previously discussed, video games may need a higher level of dexterity, which is a barrier for older adults. However, the development and maintenance of these skills through playing video games was stated by a participant to be a potential motivation to start playing video games as well, highlighting that dexterity was important to be maintained as an individual ages.

> *P1: "You need fine motor control and hand-eye coordination. And that's why I think it's really good that the kids can develop that and probably better if the adults can develop it as well. Because that's one of the skills that start to go as soon as you get old."*

When asked if there was an instance where older adults may increase their video game usage or start playing video games, participants within this group stated that they could potentially see this happening in the instance they become immobile or were more restricted in their activities. Whilst mobile and healthy, their preference would not be to spend time playing video games.

> *P5: "As I get older, when I get very elderly and not able to move very much, I would probably, I might, I might, um, if I became more sedentary, uh, I might, I could envisage playing more."*

Participants within this group state that they have no interest in playing video games. Generally, they would be willing to play if asked in a social situation or with kids/grandchildren, however they state that there is a lack of interest in gaming itself as a concept. This is both related to the assumed content of the games and the act itself of gaming on a console/pc.

> *P11: "You know, the thought of switching on a smart TV or a laptop or whatever, whatever it is, to participate in an online game that involves you going through several layers of fantasy or whatever just doesn't appeal."*

They are generally not interested in the content that is featured in games, citing what they have seen from their kids or grandkids when they play video games. When the participants were interested in the content of a game, they stated that they were more likely to engage in the game, but that this was not enough to convert them into playing video games more frequently by themselves. This could be related to the idea relayed by some participants that video games are not "real" and playing them can be seen as a form of escapism from the "real world".

> *P14: "It strikes me as a construct rather than a real activity."*

> *P9: "living in a fantasy world it seems a bit bizarre to me quite alien"*

50 - 64 years old: One of the motivators within this group to play all video games was for relaxation and escapism, with participants stating that they used video gaming as a way to decompress from work and as a break from their day-to-day activities. With this sometimes forming part of a daily routine. These participants stated that they found gaming to be a form of stress relief, with it allowing them to focus on an activity for a period of time without thinking about other worries.

> *P19: "I step away from work and I just get involved in a game and just yeah, just relax to be honest. It's pretty relaxing for me and just switching off from other things that generally going on in my day-to-day life."*

The main motivator for playing word or puzzle games was stated to be for mental stimulation. Participants within this group, who did not consider themselves to be regular gamers, stated that the cognitive benefits associated with playing these types of games would motivate them to start to play as they age. The ability to use gaming to maintain cognitive functioning and mitigate cognitive decline was appealing to them and was viewed as a positive motivator to increase or adopt game usage.

> *P20: "I work full time, I manage my home, I like to watch bits and things on television. So I don't have a lot of spare time where I would be able to sit down and play a game. So I think that also comes into it. But if it was good for my cognitive functioning, I would make time, like 15 minutes a day"*

Participants who regularly played video games within this group stated that they use gaming as a form of entertainment, with a few participants discussing how they use gaming in a similar way to other forms of media consumption such as watching TV. Further to this one participant stated that they usually play games on their phone while they watch TV.

> *P27: "Like I said before, it's, it's the same as a book or a film might do but just in a different way because you're being more interactive"*

Another motivator for participants was stated to be the social aspect of gaming, this was illustrated in a variety of different ways across participants, this included participants playing against strangers online, with friends online and locally. Even participants who stated that they were not regular gamers discussed playing video games with their children or with other family members, as a way to spend time with them or to bond and show interest.

P19: “general social gaming with friends, that generally happens after work where there's a set time, everybody has dinner and then we probably meet for like an hour after like between eight and nine and play.”

Summary: Within the 65+ group the main motivation as to why the participants play their puzzle and word games is due to the belief that it is a good way to improve and maintain their cognitive functioning, as suggested by previous research, with Boot et al. (2013) explaining low compliance with an action game, as opposed to a brain training game in their study to be due to this belief. This suggests that further research is needed to help explore the impact of cognitive games and to help facilitate the targeted development of them.

Participants within this group indicated that they may be willing to play video games socially with their children or grandchildren, or to help improve motor skills, but there was little interest in partaking in video games as a leisure activity otherwise, with this caveated by the fact that participants stated that they may increase their engagement if they were unable to partake in other activities due to infirmity or disability.

This finding indicates that participants in the 65+ group have little motivation to play video games other than for the cognitive benefits they perceive to gain from playing them and therefore there may not be any desire from those within this age group to play other video games.

While participants within the 50 - 64 age group discussed a desire to play word or puzzle games for cognitive stimulation, they also stated other reasons for playing games, which have been reported in other literature looking at gamer motivations; such as for entertainment purposes, socialisation, relaxation and escapism (Kiraly et al., 2022; Demetrovics, 2011). This indicates that the participants within this age range may be more inclined to play video games than those in the age range above them, and may continue to play more video games as they age.

4.3.7 Age & Gender

65+ years old: Age was commonly brought into the conversation with video games considered to be a younger person's hobby by the older adults in this study. When discussing ideas or concepts, younger people were commonly referred to and the older adults spoke about their children or grandchildren's experiences with video games.

> *P5: "I think maybe most people my age and older would think games are for younger people or all the, you know, um, yeah, we'll probably think that gaming was for younger people."*

Participants also stated that they feel there is a generational divide in the uptake of video gaming. Explaining that the differences in the state of the world now and the fact that younger people have technology ingrained in their daily lives means that the younger generations would be more inclined to play video games. The participants explained that they were not as used to technology and that they had to learn how to use it later in life, which may have impacted their adoption and perception of video gaming.

> *P1: "The technology is going so fast, so quickly that I'm sure that every adult when they've been brought up with the gaming system and with the computer technology, they will have a different level of what I'm talking about now because I never had it…"*

When asked if they think video games are designed with older adults in mind the majority of the participants stated that they did not feel that games were designed for an older age group. Whilst the majority of the participants stated that they would have no interest in video gaming, despite in the instance of infirmity or to prevent cognitive decline, a few participants noted how they think this will be different for the current younger generations, believing that they will want to play video games as they age.

> *P4: "I do think probably in the future that they will cater for that because the young people of today and the ones that are doing it today, they are going to grow – as they grow older, they are going to continue using it and therefore then technology has got to cater for them."*

50 - 64 years old: When discussing the people who they know that play video games, some participants noted that they were talking more about males playing video games than females. Whilst a few of these participants noted that this may just be due to their specific exposure to video games and the people they interact with who play them, there were a couple participants who stated that they did feel that gaming was a hobby more common with the male gender. One of the reasons why participants stated that this gender bias occurs is due to the content of games, such as sport or shooting games, being more appealing to males.

> *P20: "I think that fills their need because it's kind of like how the male brain works. And I'm being very sexist here, but I just don't know any women that play games."*

Participants within this group illustrated a willingness to play video games to prevent cognitive decline as they themselves age.

> *P22: "I think there is a big movement, as I said to you before, now to engage and to, you know, use games as a preventative thing."*

Summary: Video gaming is considered to be a younger person's hobby by participants who do not play them within both age groups in this study.

Those aged 65+ discussed how the generational divide in technology and how the fact that they didn't grow up using technology integrated into their lives in the same way that younger people have, has likely also impacted their willingness and ability to partake in video gaming. This concept of age-related divides in relation to exposure to technology and its impact on technology uptake in older adults has been reported in related literature (Neves, Amaro and Fonesca, 2013) and has been previously implicated in explaining the differences in video game ability across generations (Aarsand, 2007).

These participants within the 65+ group state that they assume that younger generations will continue to play video games as they age, with those in the 50 - 64 age group supporting this assumption by showing increased exposure and illustrating a willingness to play video games as they age.

5. Thesis Discussion

This thesis aimed to explore older adults' engagement with video games in order to provide a holistic understanding of the space in which this topic exists. It consisted of both a quantitative and qualitative study looking at two groups of older adults, all over the age of 50, and was able to provide further understanding of their usage of, experiences with, understanding of, barriers with, motivations for playing and perceptions of video games. Through this study design answers were provided for the following research questions stated in the thesis introduction.

1. What are the attitudes and perceptions of video games within this population and how does that affect individuals' personal adoption of video games?

Older adults (both 50 – 64 years old and 65+ years old) discuss concerns with video games. These concerns predominantly pertain to video games containing violent content and their addictive potential, with those aged over 65 also concerned as to whether they facilitate antisocial behaviour. Despite discussing these concerns and stating that they are considerations, these are not the main reasons why older adults do not engage with video games and are not a large concern for older adults as long as video games are consumed in moderation. This is due to the fact that the older adults seem to understand that there are many factors that impact these concerns becoming a reality and that it also depends on the vulnerability and susceptibility of the individual.

Instead older adults (65+) state that they have little interest in the content that they perceive video games to offer, with this being based on what they see in media or through their younger family members. They do not see a benefit in interacting with video games, and they state that they believe them to be a waste of time. It is this lack of interest in the concept and content, as well as the inability to see tangible benefits from the time spent on these interactions that result in a lack of motivation to adopt video games. This does not translate into older adults' views on puzzle and word games though, with them considering these to be separate to other video games, and positive content to engage with due to the perception that they are actively stimulating their minds. Despite also illustrating willingness to play video games for cognitive benefits, some participants within the 50 – 64 group engaged with video games for other purposes, not sharing the view found in the older age group that it is a waste of time and stating positive aspects to engagement.

2. What does older adults' engagement with video gaming look like?

Whilst some participants aged 50 – 64 discussed interacting with video games for entertainment and relaxation purposes, older adults aged 65+ do not actively engage with what they consider to be video games, this includes games that they see younger individuals playing with. These games are often considered to be fast and demanding, as well as to contain topics that do not interest them such as violence, with these often being referred to as games that are on consoles and require the use of a controller. This does not include genres of video games such as puzzle and word games which some individuals in both age groups actively participate in and regularly engage with, mainly for cognitive reasons. When playing these games, the older adults illustrate a preference for mobile touchscreen devices such as smartphones and tablets, finding them easier to use and having a higher ownership level of these devices. Older adults' exposure to video games otherwise, is predominantly due to the interactions they have with younger family members, with them showing a willingness to play with their children and grandchildren, as well as what they observe from the media.

3. Is there a desire for older adults to engage with video games as a leisure activity?

As stated previously, older adults (65+) view video games to be a waste of time, seeing minimal benefits from them and therefore have little desire to engage in video gaming as a leisure activity, apart from instances where they socialise with their grandchildren or apart from puzzle and word games that they consider to be beneficial to their cognitive development/maintenance. They can see their uptake increasing in the instance of infirmity or disability if they are not able to participate in hobbies that they see as being more worthwhile. Whilst there is no desire for older adults within the 65+ age group, there is evidence that those aged below within the 50 - 64 age group are more willing to play video games for other reasons, including for entertainment purposes, for relaxation and for socialisation.

4. What are the difficulties that older adults may face when looking to adopt video gaming as a leisure activity?

Older adults aged 65+ experience physical, emotional and technological barriers when attempting to play video games that affect their overall experiences, with those aged 50 – 64 also experiencing some of the same physical and emotional barriers. Physical barriers found in this research included; difficulty using controls and controller inputs, keeping up with the

speed of the game, and dealing with the precision of movement and input needed. Emotional barriers included; lack of confidence, embarrassment and the feeling that there was no point in participating due to the fact that they have no chance to win or succeed. In the 65+ age group these were closely related to the technological barriers that the participants mentioned, with past issues and a lack of knowledge and confidence with technology stated as being a contributing factor to hesitance to use new technology such as gaming devices. All these barriers can cause friction when older adults attempt to, or consider playing video games.

6. Conclusion, suggestions for further research and implications for industry

6.1 Conclusion

Whilst the participants within the 65+ age range illustrated a lack of interest in playing video games other than for cognitive stimulation and instances of social interaction, they did state that they felt there was a generational aspect involved in this disengagement and that individuals younger than them will want to play video games as they age. This was supported by the participants within the 50 - 64 age group who stated willingness to play video games to relax and for entertainment purposes, and who had a higher ownership of gaming consoles. While there may not be a desire for current older adults (65+) to play non puzzle and word video games leisurely on a regular basis, it is still important to ensure that when they do interact with video games, this interaction is frictionless so that they are able to participate socially with family members, and so that those who do wish to play more regularly are able to do so. This will also ensure that the younger generations who may wish to play video games as they age will be able to.

6.2 Implications for industry

Current older adults who do want to play games, whether for leisure, health or socially, should be supported in doing so. In addition to this, game development processes can be long, and it is possible that the games that enter development in the coming years may be played upon release by today's 50 - 64 year olds, who do want to play video games when they are older.

From the research conducted in this thesis the following suggestions can be made for those working in game development.

6.2.1 Accessibility Settings

Developers should consider implementing solutions that can help mitigate the physical and emotional barriers found in this research, so that older adults are more able to play their games. Examples of potential settings or accessibility features that could potentially be explored to help mitigate these barriers include: control remapping, allowing the ability to use

a mobile device or touchscreen as a control device instead of a traditional controller, settings that allow the adjustment of required reaction time, implementing assistive features and or difficulty levels, and tutorials that are slow, thorough, use simple language and can be easily revisited.

6.2.2 Usability Testing

It is important that usability testing during game and console development includes or is conducted with older adults, as they may have different usability issues than the participants commonly used in usability testing, and as such games may be shipped with issues that could easily be resolved or have solutions implemented for older adults. Running usability testing in the game development process with older adults could aid in reducing the impact of some of the age-related barriers that were discovered through this research that may impact both present day and future older adults who decide that they wish to play video games, either with their grandchildren or alone. It can also be pivotal in understanding if the proposed solutions or implemented accessibility settings are sufficient in mitigating these barriers.

6.2.3 Appeal

It can also be suggested that games geared towards engaging older adults as an audience focus their development on touch screen mobile platforms such as smartphones and tablets as opposed to consoles to help mitigate issues with accessibility, cost, learning curve and controls that may reduce motivation to play games. Enabling games to be played on mobile devices may allow access to a whole audience of older adults that might otherwise not have heard of, or been able to play a game. Due to the desire to play games in order to maintain cognitive functioning and prevent cognitive decline, there is potential that video game companies looking into increasing older adults' engagement could do this through developing games that are able to facilitate this.

6.3 Strengths and weaknesses

Strengths of this research included the use of a large sample size of participants, including 30 participants in total, of which 18 were over the age of 65 and 12 were between the ages of 50 - 64, with the gender split being 53.3% male and 46.7% female. By having a relatively equal amount of female and male participants the impact that gender biased views might

have on the results could be mitigated and by having two different age groups that were segmented for analysis similarities and differences in data between individuals ages 65+ and those in the 50 - 64 age range could be identified. Using two different data collection methods in interviews and surveys allowed for a larger range of data to be collected and for a more holistic overall data set (Queirós, Faria and Almeida, 2017) than using only one of these methods.

Weaknesses of this study included that it was conducted remotely, this means that it is possible participants were self-selecting in being able to communicate using technology and being comfortable enough with technology to schedule and participate in an interview using it. Participants were also selected using snowball sampling, using area groups and through previous research participants, this meant that they were potentially part of a similar demographic, socio-economic bracket, and of a higher technology competency than would be representative of the overall population.

6.4 Suggestions for future research

Regarding future research there are widespread opportunities in exploring how mobile video games can help to maintain and facilitate cognitive health for both current and upcoming older adults, as well as how younger generations can be supported in retaining video gaming as a hobby as they age. This includes exploring the desire that younger generations may have to game as they age and how age-related issues can be mitigated in the game design process to enable these generations to smoothly maintain or even increase their current gaming practices. As the main motivator for older adults over the age of 65 is to maintain or increase cognitive functioning it is important to understand how video games can be designed to help improve and maintain cognitive health for individuals within this age range, with this also opening up the possibility that research could explore other mobile gamified experiences to aid in the maintenance or improvement of health.

Due to the fact that current exposure to non - word and puzzle video gaming was predominantly through younger family members, further research could be conducted to explore the role that video gaming may play in facilitating social interaction between older adults and their younger family members. Violence and addiction were concerns noted by the older adults when it came to playing video games, however, due to their lack of exposure and knowledge, they claimed they were unable to accurately comment on the connection between these concepts and the types of impacts that they were worried about.

Understanding how widespread these concerns are and if they change upon more exposure to, or upon developing a more detailed understanding of video games could provide more context for these perceptions.

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Appendix

Appendix A: Materials

A1: Online Questionnaire

Start of Block: Start

Intro Thank you for volunteering to take part in research for the University Of York.

This survey is about understanding your experience with gaming (no experience is needed!) and should take no longer than 5 minutes to complete.

Before continuing please confirm that you have read the participant information sheet and the consent sheet sent to you via email below.

Consent Do you confirm that you have read the participant information sheet and the consent sheet sent to you previously via email and give your consent to participate in this study?

- ○ I confirm I have viewed both sheets and give my consent to participate
- ○ I do not give my consent

Skip To: End of Survey If Do you confirm that you have read the participant information sheet and the consent sheet sent to... = I do not give my consent

Age I confirm that I am over the age of 18

- ○ Yes
- ○ No

Skip To: End of Survey If I confirm that I am over the age of 18 = No

End of Block: Start

Start of Block: Your Unique Participant ID Number

Number Please copy/write down the number shown below somewhere safe. You will need to give us this number if you wish for your data to be deleted.

Your unique participant ID number is: **${e://Field/Random%20ID}**

End of Block: Your Unique Participant ID Number

Start of Block: Demographics

Q1 What is your age?

_____

Q2 What is your gender?

- Male
- Female
- Non-binary / third gender

Q3 What is your highest level of completed education?

- Primary School
- Secondary School
- Undergraduate Degree
- Postgraduate Degree
- Doctorate Degree
- Technical qualification
- Other

Q4 What is your current employment?

_____

End of Block: Demographics

Start of Block: Technology Competency

Q5 Do you own any of the following technological devices (tick all that apply)

- [ ] Tablet
- [ ] Smartphone
- [ ] Computer
- [ ] Gaming console (please specify what console if you know)
_____
- [ ] Other (please specify what device if you know)
_____
- [ ] None of the above

Q6 How would you rate your knowledge of technology (1 lowest, 5 highest)

- ○ 1- Far below average
- ○ 2- Somewhat below average
- ○ 3- Average
- ○ 4- Somewhat above average
- ○ 5- Far above average

Q7 How would you rate your confidence using new technology (1 lowest, 5 highest)

- 1- Very unconfident
- 2- Unconfident
- 3- Neutral
- 4- Confident
- 5- Very Confident

Q8 How willing are you to use new technological devices (1 lowest, 5 highest)

- 1- Strongly unwilling
- 2- Unwilling
- 3- Neutral
- 4- Willing
- 5- Strongly willing

End of Block: Technology Competency

Start of Block: Gaming Background

Q9 Have you ever played a video game?

- No
- I am not sure
- Yes

Q10 Would you consider yourself someone who regularly plays video games?

- ○ No
- ○ I am not sure
- ○ Yes

Q11 How often do you play video games (this includes games on your phone, computer, ipad, and other gaming devices such as playstation or xbox)

- ○ Never
- ○ A couple of times a year
- ○ A couple of times a month
- ○ A couple of times a week
- ○ Daily

Q12 What devices do you/have you played video games on (select all that apply)?

- ☐ Smartphone
- ☐ Tablet
- ☐ Computer
- ☐ Gaming Console
- ☐ None of the above/I do not play video games

Q13 What type of video games do you play? (select all that apply)

- [ ] I do not play any video games
- [ ] Puzzle games
- [ ] Word games
- [ ] Card games
- [ ] Action games
- [ ] Role-playing games
- [ ] Simulation games
- [ ] Strategy games
- [ ] Sports games
- [ ] Exercise games

End of Block: Gaming Background

A2: Interview Script

Interviews:

Researcher Checklist:

- Check they have done the survey
- Check all recording is on, and inform of recording
- Check for verbal consent again

Interview Section 1: Understanding (same for all)

- What is a video game?

Interview Section 2: Gaming background (same for all)

- What is your experience with video games?
- Have you ever played a video game?
    - What? Why? When?
- Do you regularly play video games?
- What type of devices have you played video games on?
- What type of video games have you played?

Interview Section 3: Exposure (same for all)

- Do any of your friends regularly play video games?
- Do any of your family regularly play video games?

Interview Section 4: Perception (same for all)

- What are your thoughts on video gaming as a hobby?

- What type of people usually play video games?
- Do you feel that video games have any impact on the people who play them?

Section 5: Motivation (non-gamer)

- Why do you not play video games?
- Why do you think other people play video games?
- What would motivate you specifically to play video games?
- Would you want to play video games? (adjust according to previous answers if appropriate)
- What are some of the reasons you might see yourself playing games in the future?

Section 5: Motivation (gamer)

- How did you become involved in playing video games?
- Why do you play video games?
- When do you play video games?
- What impact do video games have on your life?
- Would you recommend other people your age to play video games?

Section 6: Barriers (non-gamer)

- If I asked you to play a video game right now, how would you feel about that?
- Is there anything that you would be worried about before you started playing?

- Is there anything that you feel would prevent you from playing a video game if you did decide to start playing? (non-gamer)

- Do you think that video games are designed with older adults in mind?

- Has there ever been a video game that you have wanted to try but you haven't?

Section 6: Barriers (gamer)

- Have you ever experienced any difficulties with playing a video game?

- Is there anything that you feel would prevent you from playing a new video game?

- Has there ever been a video game that you have wanted to try but you haven't?

- Do you think that video games are designed with older adults in mind?

Activity: Exposure (same for all)

- Have you heard of any of the following games? (miro)
    - Have you ever played or wanted to try play any of these?

- Have you heard of any of the following gaming devices? (miro)
    - Have you ever played or wanted to try play any of these?