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Benefits of Digital Gameplay for Older Adults: Does Game Type Make a Difference?

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ABSTRACT

Digital games can help older adults to entertain themselves, socialize with others, engage their cognitive functions, and enhance emotional states. This study surveyed 463 older Canadian adults to identify the digital games they had played and investigate whether playing them was associated with perceived socioemotional and cognitive benefits. The most widely reported socioemotional benefits were developing self-confidence, dealing with loneliness, and connecting with family. The most widely reported cognitive benefits were focusing, memory improvement, improved reaction speed, and problem solving. In the socioemotional category, connecting with current friends and connecting with family were both associated with strategy games, while connecting with current friends was also associated with sport games. In the cognitive category, both problem solving and speed in reacting/responding were associated with arcade games. Results show that playing digital games has the potential to be an intervention tool to improve older adults' wellbeing.

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Keywords: digital games, game type, older adults, socioemotional benefits, cognitive benefits

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Introduction

Advances in technology and medical sciences have resulted in increased longevity worldwide, together with a growing concern for older adults' wellbeing. A number of interventions can support older adults' cognitive, social, emotional, and physical wellbeing. Digital games are one example, as they provide opportunities for older adults to not only entertain themselves but also to socialize with others, engage in cognitive challenges, enhance emotional states, and do physical exercise [1,2]. Although results have been mixed [3,4], older adults have reported cognitive, social, and emotional benefits from playing digital games [5-8].

Although the terms are sometimes used interchangeably, researchers typically distinguish between video game type and genre. Following Grace [9], we distinguish game *type* as a description of game play, e.g., action, puzzle, or role play, and game *genre* as a description of the narrative content of the game, e.g., drama, fantasy, or mystery. Since researchers have yet to explore the benefits for older adults of playing different types of digital games, this research addressed game types and their associations with cognitive and socioemotional benefits of digital gameplay as perceived by older adults.

Research Questions

The study focused on the following questions:

1. What types of digital games are being played by older adults in Canada?
2. Are there associations between the types of digital games played by older adults and the socioemotional and cognitive benefits that they report from their gameplay?

Background

Digital Game Benefits for Older Adults

Game researchers and designers are increasingly interested in the potential roles that digital games can play across the lifespan, producing significant physical, cognitive, and socioemotional benefits [3,4,10,11]. It is clear that people are more likely to engage in activities that they find entertaining, enjoyable, and meaningful [12-14]. Digital games fit these criteria and may have unique features that build abilities, including working memory, perception, attention, and social communication with other players [15]. For example, Wang and Burton [16] claimed that massively multiplayer online role-playing games have motivational elements that can engage and maintain older adults' attention and decrease their anxiety about using technology.

A number of studies have found that playing digital games may help older adults to achieve their physical activity goals (e.g., [17,18]), and physical benefits from playing exergames have been associated with improved cognitive performance [19,20]. Playing digital games has been shown to enhance older adults' cognitive abilities, including interference resolution, working memory, and selective visual attention [21-24] and to result in social and emotional benefits such as improved self-concept, social interaction, and reduced depression [6, 25-27].

However, research methodologies have varied greatly, and studies have not always reported benefits. This may be due to factors such as small sample sizes, short-term interventions, activities called "games" that don't fit a clear definition of the term, and methodological issues [3,4,10].

Categorizing Digital Games

Based on selected game characteristics, researchers have proposed a variety of categorizing schemes for digital games. Because they reply on conceptual distinctions, we refer to these schemes as *typologies*, following Borgès Da Silva [28], and refer to individual categories as game *types*.

Crawford [29] defined two major types of video games. First, he suggested dexterity/action games, which primarily involve perception and motor skills. Most popular in the 1980s, this video game type is characterized by a real-time focus on graphics, sound, and the use of joysticks or controllers rather than the keyboard. The primary skills required from players are

good eye-hand coordination and a very short reaction time. These games are grouped into six sub-types: combat games, maze games, sports games, "bar" games (based on Pong 6 paddle games), racing games, and miscellaneous games (all that are not included elsewhere). Crawford's second grouping is strategy games, which place more emphasis on thinking than on manipulation. Crawford divided them into six categories: adventure games, role-playing games, war games, games of chance, educational and communication games, and interpersonal games [29].

Herz [30], in addition to documenting the popular and critical history of electronic entertainment, examined games and the role they have come to play in an increasingly virtual world. Herz proposed a video game classification system using the following main categories:

- Action games: These have sub-categories such as shooting games, platform games (the player's character must move between platforms on the screen) and other types of games that rely on physical dexterity and reaction time.
- Adventure games: In most adventure games, the player must solve a set of logic puzzles with no time constraint in order to progress through the game's virtual universes.
- Combat games: These involve fighting characters controlled by artificial intelligence in the game or by other players.
- Puzzles: These (for example, Tetris) use logic, pattern recognition, etc. to solve a problem.
- Role play: In these games, players control the characteristics of certain characters or creatures, such as elves or wizards.
- Simulations: In these, the player must succeed in a challenge posed in a simplified depiction of reality. For example, a player might act as mayor of a city and have to control finances, build infrastructure, and so on.
- Sports games: These involve forming teams and playing sports such as soccer, hockey, or baseball.
- Strategy games: These are games in which the player must exercise strategy in, for example, controlling armies in battles or historical conflicts.

Garon's ESAR system [31] used gameplay activities to group games as involving exercise, symbols, creation, or rules. More recently, Sauvé, Renaud, Kaufman, and Duplàa [32] proposed a game typology for both non-digital and digital games based on game materials and play mechanics; their categories are board games, card games, token games, and dice games.

According to Frété [33], assigning games to categories is arbitrary and artificial, as video games are more and more mixtures of types. However, Frété distinguished three major categories of video games: skill-and-action, strategy, and adventure games. In skill-and-action games, the player plays a character and fights with different weapons against a large number of opponents. Strategy games and role-plays, often based on a warlike logic, require the player to take ingenious actions to achieve predefined goals. Adventure games are quests in which the player controls a character responsible for going to discover an unknown place, often located in an imaginary world and populated by strange characters. The player must collect objects that can be used at the appropriate time to find solutions, solve puzzles, or make choices. The worlds in which these games take place are variable and can be either medieval or futuristic.

Frété also proposed hybrid games that combine action and strategy. These games have in common the mixing of the action-game danger – the end of the game if the subject does not react in time – while adding elements of reflection, encouraging the player to also show common sense. Overall, Frété argued that classifying video games by type can be useful for an

exploratory study. but in a constantly evolving field, this sort of taxonomy is doomed to obsolescence, since overlaps between types, variants, and inventions continue to appear and create new types.

Separately from these typologies, distinguishing between *casual games* and other digital games is important for research involving older adults. Casual games are easy to learn and play. are widely available as downloads, not costly, and require short time commitments (often just one to 20 minutes) [34-36]. Examples include Sudoku and Candy Crush Saga (puzzle games) and Solitaire and Blackjack (card games). Casual games can be of any game type.

Types of Digital Games Played by Older Adults

Studies investigating the types of games that older adults play have consistently reported that casual games were their most common choice [37-39]. In terms of specific game types, Pratchett [39] found that United Kingdom gamers aged five to 65 years preferred to play puzzle, quiz, and board games. Another study [40] found that 16 older adults playtesting casual games rated casual puzzle games most enjoyable and easiest to learn and play. A questionnaire study of 68 older American adults [41] found that respondents preferred intellectually stimulating puzzle, educational, or strategy games; females, more than males, preferred social gameplay and familiar games. In Australia, researchers reported that older Australian adults played games primarily for mental stimulation [35].

Nap, de Kort, and IJsselsteijn [42], investigating senior gamers' preferences, motivations and needs, found that their participants played a limited variety of games and intended to play only those particular types of digital games for months or even years into the future. While their male senior gamers preferred more real-world graphics, female participants in the study intended to play casual games with cartoon-like graphics.

Belchior et al. [22] observed that after being trained to play the video games Medal of Honor and Tetris, senior participants' selective attention improved. However, their senior gamer participants learned the required gaming skills for Tetris more easily and found it easier to actively engage in playing Tetris. These results indicate that compared to the first-person shooter game, a puzzle-like game might be more attractive to senior gamers.

In a study of older adults' attitudes toward shooter video games, most participants indicated that they were unwilling to play a realistic first-person shooter game after seeing a video clip of the game. Of the six seniors who tried out the game, three did not want to play the game again. Compared to this game, acceptance of a non-violent cartoon first-person shooter game was much higher [43]. Festl, Scharkow, and Quandt [44] found through a cross-sectional survey that unlike adolescents, older gamers did not prefer first-person shooter games and generally had lower preference levels for role-playing games and first-person shooter games relative to adolescents and younger adults.

The fast pace of some digital games may awaken a sense of competition among younger players. However, older adults with declining reaction speeds may find these kinds of games frustrating, decreasing their desire and willingness to play more. West et al. [45] provided evidence that game navigation can have an impact on cognitive structure, and this impact is mediated by a person's learning strategy. Also, individual differences can be important in terms of benefits perception. Therefore, before designing digital games for seniors, it is critical for researchers and game designers to know which types of digital games seniors are playing and the perceived benefits associated with playing these types of digital games, particularly for different groups of older players [46,47].

Methods

This study used a cross-sectional survey aimed at understanding older adults' experiences of

playing digital games and their perceptions regarding them. The survey targeted adults aged 55 years and older who played digital games. A total of 875 participants in a western Canadian city completed the survey about their overall gameplay patterns and opinions. Of these, 463 reported that they had played digital games at some point within the past year and were included in this study.

Research Instrument

The questionnaire was developed and refined using an iterative process. Questions were taken from research standards, existing surveys and other sources found on the Internet [8,38,48-54], along with team discussions.

An initial question set was created by the investigators to address the study objectives. Each draft of the survey was sent to members of the research team, including gerontologists, educators, computer scientists, and four graduate students in education. Feedback received on each draft was integrated into a revised version of the survey that was sent out for additional feedback. This process continued for six iterations until no further changes were suggested. The last version was finalized after being reviewed by approximately ten older adults.

The questionnaire was print-based, with the majority of items close-ended "multiple choice" or "select all that apply" and a few partially open-ended questions. The final survey consisted of 34 items, including eight demographic questions and 26 questions about respondents' main leisure activities and digital and non-digital game-playing patterns. For digital games this included questions about games played, frequency of playing, self-rated digital game and computer skill levels, devices used for playing digital games, people with whom respondents played, perceived gameplay benefits, and difficulties playing digital games.

Procedures

The survey was administered to individuals aged 55 or older in shopping malls, local community centres, nursing homes, and seniors' centres after receiving permission from management for public recruiting. Recruitment letters were also emailed to relevant organizations to ask for permission to survey their clients/residents. For privacy, respondents remained anonymous when completing the survey. Each participant received a $5 gift card as compensation for involvement in the study.

Dependent Variables

Categorizing digital games. Fourteen game categories were used in the categorization process, based on the Frété categories described above (Table 1). These were arcade, adventure, fighting, shooter, simulation, role-playing, strategy, puzzle, word, trivia, sport, educational, card/board/tile, and other.

Older adults who reported that they had played digital games in the past year were asked to list up to three specific games that they had played. Nearly all respondents identified at least one digital game. Each response was coded into two variables: the game title and a variable that classified the response into a game type. The type assignment for every individual game that older adults reported was carefully assessed by two researchers. Researchers assigned a "0" to a respondent for a type if the respondent did not report playing any games of that type. A "1" was assigned to a game type if any of the games listed could be placed in that category, e.g., if a respondent reported three digital games, with two of them being arcade games and the last one being a word game, then the researcher would assign a 1 in arcade game type and a 1 in the word game type for that respondent, with all other types coded as 0.

Perceived gameplay benefits. Data on perceived gameplay benefits were collected for seven socioemotional and four cognitive benefits. For these, questions asked "In your opinion, has playing digital games increased or decreased the following:" followed by a list of items to which respondents could indicate Increased, No Difference, or Decreased. Because only a few respondents selected Decreased in any of the categories, responses

to these questions were recoded into the binary measures Increased and No Difference/ Decreased. Responses were coded as either a 1 or 0 in each of the categories: 1 for Increase and 0 for No Difference or Decreased.

Table 1 Comparison of Frété's Digital Game Categories with the Categories Used in this Study

Frété Category*	Frété Definition*	Study Category	Typical Games
Plateau	Moving through a series of levels in an upward direction	Arcade	Angry Bird, Diamond Dash, Super Mario
Adventure, Interactive Fiction, Quest	Often situated in a fantasy world that is explored in a quest in which the goal is set at the start and needs to be attained through several levels	Adventure	Crow, Star Trek Fighters, Action Games, Alone
Combat	Direct and violent confrontation in which the player must position himself correctly to avoid physical contact with adversaries	Fighting	Tekken
Combat / Massacre	The player fires on multiple adversaries and/or potentially harmful objects	Shooter	Medal of Honor, Shooter Game, Halo
Simulation	The player manages a model based on reality in which the parameters can be modified	Simulation	Farm Town, F1 Racing, Star Wars, Sin City
Role-playing	Adaptation of the plateau game type and War	Role-playing	World of Warcraft, Diablo III, Dungeon Siege, Beowulf
Strategy	Strategic skills are necessary for success but the player must have good reflexes or intuition to win	Strategy	Risk, Rummy Cub, Chess, Yahtzee
Social	Games inspired by or adapted from existing social or non-digital games	Puzzle	Tetris, Sudoku, (Spider) Solitaire, Hidden Objects
		Word	Scrabble, W.E.L.D.E.R., Spelling Puzzles
		Trivia	Trivial Pursuit, Password, Trivia Quizzes, Jeopardy
		Card/Board/ Tile	Mahjong, Bridge, Poker, Blackjack
Sports	Games adapted from classic sports games	Sports	Wii Bowling, Wii Sports, World Golf Tour
Educational	Games with learning as their principal objective. Structured with elements such as points, feedback, learning assistance	Educa-tional	Dora the Explorer, Sustainability Games, Mathematics
	Cannot be otherwise categorized	Other	Casino Games

*Translated from French to English

Data Analysis

The data were collected and coded into an SPSS format, and IBM SPSS Statistics v.21 was used to carry out the statistical work. As noted above, only respondents who indicated that they had played digital games in the past year (*n*=463) were included in subsequent data analyses. Frequencies were calculated on the questionnaire's demographic variables, including sex, age, language, ethnic group, living arrangement, education level, retirement status, and working status. Cross-tabulations were

conducted to investigate the significant associations between type of digital games and cognitive or socioemotional benefits reported. The Chi-squared statistic was calculated for statistical significance and the level of significance was set at p=0.05.

Results

Participant Demographics

Almost two-thirds of respondents were females (females = 62.1%, males = 37.9%). The difference in the percentage of respondents between the age groups of 55-64 (*n*=195, 43.8%) and 65-74 (*n*=168, 37.8%) was not large, but only 18.4% of participants (n=82) were more than 75 years old. Most respondents were native English speakers (*n*=397, 85.7%); 14.3% spoke other first languages such as Mandarin/Chinese (*n*=49, 10.4%), Japanese (*n*=8, 1.7%), Cantonese (*n*=5, 1.1%), and German (*n*=4, 0.9%). The majority of respondents were Caucasian (*n*=287, 62.8%); the "Other" ethnic category was primarily Asian (*n*=148, 32.0%), with a small representation of Aboriginals (*n*=11, 2.4%).

The majority of respondents lived with others (*n*=303, 66.3%), either as part of a couple, as a part of a family, or as part of a group of friends. The other 154 respondents (33.7%) reported that they were living alone. Overall, participants were well-educated; 33.8% had a college degree (*n*=106, 23.1%) or a two-year degree (n=49, 10.7%), and 172 (37.6%) reported having post–secondary education or higher; these included four-year degrees (*n*=78, 17%), professional designations (*n*=42, 9.2%), master's degrees (*n*=43, 9.4%), and doctoral degrees (*n*=9, 2%). Just over one quarter had a high-school education or its equivalent (*n*=102, 22.3%) or less (n=29, 6.3%).

Unsurprisingly, most respondents were retired (*n*=353, 77.6%). However, 174 respondents (39%; 72 more than reported not being retired) reported that they were still working full-time or part-time, indicating that some who identified as retired were working, possibly in a casual or a volunteer environment.

Research Question 1: Which types of digital games are being played by older adults in Canada?

Table 2 lists numbers and percentages of respondents reporting playing games of each of the 14 types. Altogether, respondents reported playing almost 100 different games. As this was an open-ended question, some older adults simply listed a generic type such as card games or puzzle games. Some entries, such as "Wii" or "casino games," were unclear or not specific enough and were coded as the "other" type.

Table 2 Numbers of Participants Playing Digital Games by Game Type*

Game Type	Participants *n* (%)	Game Type	Participants *n* (%)
**Puzzle	216 (46.7)	Simulation	7 (1.5)
**Card/Board/Tile	133 (28.7)	Adventure	6 (1.3)
**Strategy	74 (16.0)	Role-playing	4 (0.9)
**Word	58 (12.5)	Trivia	4 (0.9)
**Arcade	34 (7.3)	Educational	4 (0.9)
**Sport	18 (3.9)	Fighting	1 (0.2)
Shooter	13 (2.8)	Other	95 (20.5)

*Each of 463 respondents could identify games of than one type.

**Game types that were included in further data analysis

The most common type of digital game played by older adults in this study was puzzle games, played by 216 respondents (46.7%). Card/board/tile games were second highest in terms of frequency, with more than a quarter of respondents (*n*=133, 28.7%) listing this type of game on the survey. Eighteen respondents (3.9%) reported that they had played sports games; because some sport games might have been described as Wii games and coded as "other," the number of respondents for this type might actually have been higher.

Game types with at least 18 responses were used for further data analysis. The final selection of game type included puzzle (*n*=216), card/board/tile (*n*=133), strategy (*n*=74), word (*n*=58), arcade (*n*=34), and sport (*n*=18). Due to its ambiguous definition, the "other" type was excluded from further analysis, although it had 95 responses.

Research Question 2: Are there associations between the types of digital games played by older adults and the socioemotional and cognitive benefits that they report from their gameplay?

Socioemotional benefits. Table 3 shows the frequency of responses for perceived socioemotional benefits. The most widely reported socioemotional benefit was developing self-confidence, identified by 175 respondents (42.1%). The next two benefits reported were dealing with loneliness (*n*=140, 34.3%) and connecting with family (*n*=134, 32.8%). All other benefits except for dealing with depression were reported by over 25% of participants.

Table 3 Frequencies of Recoded Responses for Perceived Benefits of Playing Digital Games*

Benefit	Increased *n* (%)	No Difference** *n* (%)	Total *n* (%)
Socioemotional Benefits			
Developing New Friendships	109 (25.6)	317 (74.4)	426 (100.0)
Connecting with Current Friends	109 (26.6)	301 (73.4)	410 (100.0)
Connecting with Family	134 (32.8)	275 (67.2)	409 (100.0)
Connecting with Various Age Groups	111 (27.8)	288 (72.2)	399 (100.0)
Developing Self-confidence	175 (42.1)	241 (57.9)	416 (100.0)
Dealing with Loneliness	140 (34.3)	268 (65.7)	408 (100.0)
Dealing with Depression	93 (23.7)	299 (76.3)	392 (100.0)
Cognitive Benefits			
Focusing Attention	309 (71.9)	121 (28.1)	430 (100.0)
Memory	301 (69.4)	133 (30.6)	434 (100.0)
Reasoning	240 (58.1)	173 (41.9)	413 (100.0)
Problem Solving	273 (64.8)	148 (35.2)	421 (100.0)
Speed in Reacting/Responding	276 (65.7)	144 (34.3)	420 (100.0)

*Survey question was: "In your opinion, has playing digital games increased or decreased the following:"

**Includes a small number of respondents who reported a decrease

Cognitive benefits. Table 3 also shows the frequency of responses for each of the items in the perceived cognitive benefits category. Overall, cognitive benefits were more frequently reported than socioemotional benefits, with 71.9% (*n*=309) identifying focusing and 69.4% (*n*=301) reporting memory improvement as benefits. Improved reaction speed and problem solving were both reported by approximately 65% of participants, and reasoning was identified by 58.1% (*n*=240).

Associations between reported benefits and types of games played. A total of five statistically significant positive associations were found between the types of digital games played and perceived benefits. In the socioemotional category, connecting with current friends and connecting with family were both associated with strategy games, while connecting with current friends was also associated with sport games. In the cognitive category, both problem solving and speed in reacting/responding were associated with arcade games. In summary, arcade and strategy games showed positive associations with two benefits each, and sport games showed one significant positive association.

Discussion

The aim of this research was to identify which digital games are played by older adults in Canada and to search for associations between the types of digital games played and older adults' perceived benefits from their gameplay. Most older adult respondents reported that they played predominantly six types of digital games: puzzle, card/board/tile, strategy, word, arcade, and sport. These results are similar to previous research in that most of the games played were "casual" ones such as card games and puzzle games. Very few respondents reported that they played shooter, simulation, adventure, role-playing, trivia, educational, or fighting games. Pratchett [39] showed similar results, finding that adults in the United Kingdom aged between 51 and 65 years old preferred to play puzzle, quiz, and board games. Chesham et al. [40] reported that older adults preferred puzzle games because they are both enjoyable and particularly easy to understand, learn, and play. These authors suggest that nonviolent and joyful game themes contributed to players' enjoyable experience. McKay and Maki [43] confirmed this, finding that older adults would be less willing to play a realistic shooter game than less-violent alternatives. De Schutter [55] found that older adults tend to dislike games that require fast reaction speeds or that are very violent or overly sexualized.

There are several reasons why older adults are more likely to choose these casual digital games. First, many digital games that were reported by older adults are digitized versions of traditional non-digital games. Older adults choose these digital games because they are more familiar to them [56,57]. Second, the current commercial market lacks digital games that have been designed specifically for senior audiences. Most commercially available games require fast reactions or complex responses, which makes them difficult for older adults to play. IJsselsteijn et al. [47] indicated that many studies to date have revealed potential benefits of digital games played by older adults when the digital games employed were specifically designed for the elderly. This age group may find that they experience problems playing these games because of issues with eye-hand coordination and cognitive processing [47]. This was consistent with our results, which found no associations between playing shooter, adventure, role-playing, or fighting games and perceived benefits.

Overall, the types of digital games and their perceived benefits as reported by older adults showed few associations. Relatively few participants reported benefits in social or emotional areas. On the other hand, they were more likely to report cognitive benefits from playing digital games. The majority of respondents reported that playing digital games was beneficial to them cognitively in terms of focusing attention, memory, reasoning, problem

solving, and speed in reacting/responding. The motivation for many older adults to choose to play digital games could relate to their belief that this activity is good for their brains and for their mental health. An 84-year-old player indicated in an interview that the reason she chose to play digital games was that she just liked playing, that she felt that playing digital games stimulated her, and that it kept her mind active [35]. In one survey [35], 76% of respondents thought that playing digital games could help to increase mental stimulation, followed by 61% of respondents who believed that digital games could be used to fight dementia. It is noteworthy that 55% of respondents in that study supported the idea that playing digital games could help maintain social connections for successful aging. However, in this study, playing digital games had fewer reported social and emotional benefits compared to cognitive benefits. The reason that older adults reported fewer increases in social and emotional aspects may be due to the nature of the digital games that they played. Most of the digital games reported by survey respondents were designed to be played alone, so they are not likely to be effective for increasing connections with family, friends, and new people. Also, many respondents chose casual games such as Sudoku in the puzzle games type and Blackjack in the card games type. Encouraging older adults to play more social networking games might improve the way in which they socialize with others [5].

Strategy games showed two associations – connecting with current friends and with family. Respondents who played arcade games were more likely to report an increase in problem solving and speed in reacting/responding than those who did not play this game type. This is consistent with early studies on arcade games, which showed that older adults who played arcade games experienced improvements in reaction time tests and processing speed tests [58-60]. Enhanced and self-confidence were also benefits observed after older adults played digital games (60), but this was not found in the current study. Whitbourne et al. [5] reported that older adults who played the arcade game Bejewelled Blitz reported perceived cognitive benefits. Since several studies including ours showed a positive association between playing arcade games and improvements in certain cognitive abilities, older adults are encouraged to play arcade games for their enjoyment and cognitive health. Games such as Angry Bird, Diamond Dash, and Super Mario appear to provide benefits to older adult players. Sport games were associated with connecting with current friends. This is an interesting finding as sport games are often played among youth and family members.

Study Limitations

This study had several limitations. The first is that the data were mainly collected in shopping malls and seniors' communities, i.e. recruitment used convenience sampling that was limited to in-person settings, which may not be representative of the population being studied. Also, the benefits used as outcome variables in our analyses were self-reported. Therefore, the findings of this study should be interpreted with caution. Further experimental research is needed to confirm these findings.

Although the sample size of almost five hundred respondents is relatively large, only six types of digital game categories had enough respondents to be adequately included for data analysis. This study provided a preliminary investigation into these six types of games, but more comprehensive research needs to be conducted using a larger sample size and greater resources to cover more types of digital games.

Finally, it should be noted that the amount of time spent playing these types of games may be an important intervening variable between type of game and benefits and should be taken into account in future studies.

Conclusions

By obtaining a more detailed understanding of older gamers' profiles, the types of digital games

that they play, and the benefits that they perceive from playing each type, professional game designers can create games that more effectively address the needs of older adults. The results of this study showed that playing digital games has the potential to be an intervention tool to improve the older adults' subjective wellbeing. Our findings also suggest that types of digital games may be associated with enhancing of older adults' socioemotional and cognitive capacities. Whether using digital games to improve older adults' cognitive abilities, increase their social connections, or decrease their feelings of depression and loneliness, the type of digital games they play may make a difference. A recent study showed that playing at an intermediate and advanced level can provide greater benefits than playing at a beginner level since the cognitive demands are greater [7]. Gaining a better understanding of which types of digital games older adults should play, and of the benefits provided by these types, could help contribute to their successful ageing.

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Ethics Statement

This study received ethics approval from the Simon Fraser University Office of Research Ethics (file number 2012S0689).

Statement of Conflict of Interest

The authors declare no conflict of interest in this research.

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