Designing Meaningful Intergenerational Digital Games

Eugène Loos
University of Amsterdam [ASCoR] and Utrecht University
e.f.loos@uva.nl

ABSTRACT
This paper will focus on intergenerational digital games between grandparents and their grandchildren, which could enhance not only their physical and social well-being but also social bonding between them. This is a topic which has been neglected in digital game research. Therefore, after having discussed the relevance of intergenerational relations the paper will present empirical studies in this field. Then, attention will be paid to (1) the motivation of younger and older adults to play digital games and (2) the impact of age-related difficulties on playing digital games. Finally, the implications for the design of intergenerational digital games will be sketched.

Keywords: intergenerational digital games, design, motivation to play digital games; age-related difficulties on playing digital games, evaluation

1. INTRODUCTION

A rising number of not only younger but also older people are making use of digital devices which are more and more part of their everyday life (Loos et al., 2008, 2012). The frequent use of digital games (ESA, 2012) is a good example of the digitisation of our society (De Schutter et al., 2014) for a domestication perspective on the use of digital games in everyday life). In recent years, the potential of exergames as an instrument to motivate people to conduct physical activities has drawn considerable attention. As they consist of making movements with immediate performance feedback being provided to the players (Limperos & Smierbach, 2012), they could be good for people's physical health.

The question is to which extent such digital games can be considered to be meaningful play for users belonging to different generations. Empirical research has been conducted on a rather large scale to get insight into the use of digital games to promote physical activity in younger players (e.g. the literature review by Biddiss et al., 2010) and older players (e.g. the literature review by Hall et al. (2012)). Griffiths et al. (2004) and Mahmud et al. (2010).conducted studies *to compare* the way younger and older players make use of exergames and other digital games (such as social games) for their physical and/or social wellbeing.

This paper will focus on intergenerational digital games *between* grandparents and their grandchildren, which could enhance not only their physical and social well-being but also social bonding between them. This is a topic which has been neglected in digital game research. Therefore, after having discussed the relevance of intergenerational relations in section 2.1, the paper will present in section 2.2 empirical studies in this field (Kern et al., 2006; IJsselsteijn et al., 2007; Khoo et al,. 2007, 2008, 2009; Gamberini et al., 2008; Vanden Abeele et al., 2008; Mahmud et al., 2010; Vanden Abeele & De Schutter, 2010; Voida & Greenberg, 2012). Then, in section 2.3 attention will be paid to (1) the motivation of younger and older adults to play digital games and (2) the impact of age-related difficulties on playing digital games. Finally, in section 3 the implications for the design of intergenerational digital games will be sketched.

2. EMPIRICAL STUDIES IN THE FIELD OF INTERGENERATIONAL GAMES

2.1 The relevance of intergenerational relationships

Worldwide the number of older people is growing. In 2000 there were nearly 128 million people over the age of 75 in the world in 2000; this number rose to 155 million in 2010 and is expected to increase to 355 million in 2030. While there may be more younger adults (under age 25) overall, their population remains relatively stable at around 3 billion. (U.S. Census Bureau, 2013). Davis et al. (2008) argue that:

> It is well documented that ongoing social connection between the young and the elderly increase the sense of wellbeing of both parties. (...) There is an abundance of literature that describes the benefits from increased intergenerational contact. Some of these benefits include increasing positive images of the role of older people (see studies cited in Kaplan, Wagner, & Larson, 2001), a positive influence on contemporary parenting styles (Griff, 1999) and a heightened sense of well-being for seniors (Reisig & Fees, 2007). Grandchildren enjoy the support and guidance offered by mature companionship, whilst grandparents receive a sense of meaning and pride through caring and monitoring their grandchildren (Relationships Australia Victoria, 2005) (pp. 191, 193).

According to Davis et al. (2008, p. 193) intergenerational play could be instrument to enhance intergenerational interactions which are appealing to both grandparents and grandchildren. Where Davis et al. (2008) use ethnographic research to explore the nature of intergenerational play by using personal scrap books and the daily exchange of special items via a 'Magic Box', I focus in my article on the role of digital intergenerational games for the enhancement of appealing intergenerational interactions for both grandparents and grandchildren. Rice et al. (2012, p. 368) also underline the relevance of intergenerational relations

> being a crucial means of exchanging values, social norms and life-skills, while preserving cultural and historical knowledge (Lloyd, 2008). Intergenerational contact can reduce the prevalence of ageism, and significantly help improve the mental and physical health amongst the elderly (Lloyd, 2008). Similarly, within the family, strong

intergenerational relationships have been found to increase self-esteem for the young, and provide positive long-term psychological benefits for children as they move into adulthood (Antonucci et al., 2007).

Rice et al. (2012) show how brainstorming, group sketching and more refined storyboards can be used to develop (both traditional and digital) intergenerational games (see also section 3).

2.2 Younger and older adults' motivation to play digital games

If we want to develop an intergenerational which is attractive for both younger and older adults, the first thing we need is insight into their motivation. Digital game has to be meaningful for them. De Schutter & Vandenabeele (2008, p. 1) refer to the concept of meaningful play by Salen & Zimmerman (2003, p. 32) and underline the importance of intrinsic motivation (Malone, 1980). From their design research study of meaningful play in elderly life (conducted among 35 respondents between 50 and 72 years old) by a combination of contextual inquiries and participatory design sessions they conclude that digital games "should not only include themes that are associated with elderly life, but more importantly 1) foster connectedness, 2) cultivate one self and others and 3) contribute to society" De Schutter & Vanden Abeele (2008, p. 1). De Schutter (2011) concluded from an exploratory survey which he administered among 124 individuals between 45 and 85 years old that "the most popular motive among respondents was challenge, while social interaction proved to be the most important predictor for the time that respondents invested in playing digital games" (p. 155). Nap et al. (2009) conducted two focus groups (with each five respondents, age 65 or older) and a contextual inquiry with for seniors (also age 65 or older) to gain insight into seniors' motivation to play digital games and concluded that the main motivations to play games were "fun and relaxation" and that "important underlying motivations were to escape from reality, to stay in touch with society, and to give meaning to the day" (p. 261). In line with the respondents of a study conducted by Aison et al. (2002) the seniors had "negative feelings about violence in digital games" (p. 261).

What about the motivations of younger adults to play digital games? Nap et al. (2009) refer to Sherry et al. (2006), Poels et al. (2007) and Vorderer et al. (2003). As Vorderer et al. (2003) do not mention the age of the respondents who participated in their field experiment and online survey, I only present the results of the other studies. Sherry et al. (2006) conducted focus groups with four to eight participants (age 18 to 22, U.S. American undergraduate students, N = 96), adopted a Uses and Gratifications perspective and concluded that (1) arousel, challenge, competition, diversion, fantasy and social interaction were the motivations for the participants to play video games, and that (2) "while there is evidence for use of games to equilibrate emotions, the most prominent of the motivations for games use are more social in nature" (p. 24). Poels et al. (2007) conducted four focus groups with gamers (age 19 – 37 years) and used the results to present a comprehensive categorization of digital game experience with the following nine dimensions: enjoyment, flow, imaginative immersion, sensory immersion, suspense, competence, negative affect, control and social presence which they linked to in-game and post-game experiences.

Most of the studies presented above are characterized by a low number of respondents. Although future research should be conducted on a larger scale, to see if the results are significant, they give us some insight into possible common patterns of younger and older adults' motivations for digital game use. So, older people's motivations fun and relaxation are closely connected to younger adults' motivations diversion and enjoyment, escaping from reality comes close to fantasy and imaginative immersion, and social interaction and connectedness are quite similar to social presence.

2.3 The impact of declining vision, visual-motor ability, useful field of view and hearing on the play of digital games

Section 2.1 gave us insight into the motivation of younger and older adults to play digital games. To design intergenerational digital games it is not only necessary that both groups are *willing* to play but they must also be *able* to play (see also the capability model, presented by Heres & Mante-Meijer (2005) for the factors underlying the use of new digital devices). Loos & Romano Bergstrom (2014) argue that there are "numerous well-known age-related cognitive limitations that affect learning and that may influence Internet user experience" (pp. 315), see also Loos (2012, p. 19). They also state that

> (…) usability studies (e.g., Hawthorn, 2003; Czaja & Lee, 2001, 2009; Olmsted-Hawala, Romano Bergstrom & Rogers, 2013; Romano Bergstrom, Olmsted-Hawala & Jans, 2013) and gerontechnology research (e.g., Graafmans, Taipale & Charness, 1998; Mendelson & Romano Bergstrom, 2013) clearly demonstrate that as people grow older, there is no escaping the fact that age-related limitations that are due to declining vision, hearing, cognition, and motor functions occur more and more (p. 316).

They illustrate their point by the presentation of the following Table:

Table 1. *The impact of age-related decline on user experience*

Age-related decline in...	... leads to user experience issues, such as ...
Vision Normal aging of visual functions (Bouma, 2000, p. 72; Czaja & Lee, 2009, p. 24; Corso, 1992; Kline & Schieber, 1985; Schneider & Pichora-Fuller, 2000, pp. 168-178, 194-201)	• Difficulties seeing and processing cluttered online content (Lunn & Harper, 2009) • Difficulties reading the screen (Charness, 2001, pp. 14-16), Charness et al., 1992; Echt, 2002, pp. 67-71)

Useful Field of View	
Useful field of view (Ball et al. 1988)	• Difficulties detecting items in the periphery of screens (Romano Bergstrom et al., under review)
Visual-motor coordination	
Movement control (Czaja & Lee, 2009, pp. 24-25; Rogers & Fisk, 2000)	• Difficulties using a keyboard and mouse; selecting links and scrolling pages, especially when targets are small (Lunn & Harper, 2009; Moffatt & Mcgernere, 2007; Smith et al., 1999; Walker et al., 1996) • Difficulties related to speed of behavior (Verkruyssen, 1997) • Difficulties using a mouse to position a cursor on a screen (Walker et al.k, 1997)
Hearing	
Age-related changes in the outer, middle and inner ears (Charness, 2001, pp. 16-18); Czaja & Lee, 2009, p. 24; Schneider & Pichora-Fuller, 2000, pp. 159-168, 175-178, 186-194)	• Difficulties in detecting high-frequency alerting sounds (beeps or pings) (Czaja & Lee, 2009, p. 24)

In addition to these age-related factors, usability studies conducted by Tullis (2007), and Pernice & Nielsen (2002), as well as studies cited in the reviews by Chisnell & Redish (2004, 2005), Arch (2008) and Loos & Mante-Meijer (2009), show that older adults are much slower than youngers adults in the use of websites. The factors presented in the above presented studies and Table 1 which investigated age-related decline leading to user experience issue. Hawthorn (2003) uses the term 'age-restricted users' in this regard and Bouma (2000, pp. 71-72) comments that age-related functional limitations occur with a certain regularity from age 75 on, and are common from age 85 and up. Other studies focused on the impact of age-related factors on gaming experience which could hinder older adults playing digital games if they are not taken into account by those who design such games. The following risk formulated by Pernice and Nielsen (2002, p. 4) could not only apply to the design of websites but also to the design of intergenerational digital games:

> Websites tend to be produced by young designers, who often assume that all users have perfect vision and motor control, and know everything about the Web. These assumptions are rarely upheld, even when the users are not seniors. However, as indicated by our usability metrics, seniors are hurt more by usability problems than younger users. Among the obvious physical attributes often affected by human aging process are eyesight, precision of movement, and memory.

3. IMPLICATIONS FOR THE DESIGN OF INTERGENERATIONAL DIGITAL GAMES

If we want to design intergenerational digital games it is not enough to take into account common motivations of younger and older adults, and age-related factors such as declining vision, useful field of view, vision-motor ability and hearing for the older adults. We should follow a human-centered research procedure (Vanden Abeele & Van Rompaey, 2006) to design intergenerational games *for and with* younger and older adults. I strongly recommend to create intergenerational games by using intergenerational design workshops (see also Rice et al., 2012) with younger and older users, designers of different ages and game researchers with expertise related to the design and evaluation of such games. Such workshops could be carried out as an 'academic workplace' which is

> a promising initiative that has already in existence for a few years in the Netherlands and aims at bringing academics and practitioners together, on a continuous basis, to work on a common project, in order to make practice more evidence based as well as to make academic evidence more practice based. One big advantage is that the involved researchers come into contact with the dilemmas that that appear in the implementation of a health program – dilemmas that are often not dealt with in their own scientific peer-reviewed articles. On the other hand, practitioners learn to look at their work from new perspectives and to reflect on the choices they make, and they are invited to make explicit their often hidden assumptions" Van Woerkum & Renes (2010, p. 573).

Acting in this way avoids the pitfall of I-methodology (see Akrich, 2005; Oudshoorn & Pinch, 2003; De Schutter & Vanden Abeele, 2008):

> The I-methodology refers to a design practice in which designers consider themselves as representative of the users (Akrich, 1995). Akrich describes the I-methodology as the "reliance in personal experience, whereby the designer replaces his professional that by that of the layman" (Akrich, 1995, p. x). This is often an unconscious process: the designer is not aware of the fact that the user representation he or she is using resembles himself or herself. In contrast to the images created by designers and what people expect, implicit methods are often more powerful than explicit methods in shaping the design. (Oudshoorn et al., 2004, p. 41).

Designing meaningful intergenerational games should also imply to take into account which type of games could be attractive in the eyes of both younger and older adults. But before asking the younger and older adults to make a choice for a specific type of intergenerational game another decision should be taken: should the intergenerational game be competitive or cooperative (see Vanden Abeele & De Schutter (2010) for the design of intergenerational competitive digital games, Voida & Greenberg (2012) for cooperative intergenerational digital games, and Rice et al. (2012) for case studies on both kind of intergenerational digital games)? Finally, the game researchers in the academic work place should discuss with the other participants (the younger and older users and the designers of different ages) which of the following theoretical frame works will be used to evaluate the generational game. The Social Determination Theory (Ryan et al., 2006), the Uses and Gratifications Theory (Sherry et al., 2006; De Schutter (2011) or the Domestication Theory (De Schutter et al., 2014) which have been used to evaluate digital games can also be used to evaluate *intergenerational* digital games.

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