

Can seniors' quality of life be enhanced through the use of digital games? Definition and Measurement

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Abstract

Our Canadian project is investigating the use of digital games to enhance seniors' quality of life. By digital games we mean games played face-to-face or online on a computer, handheld device, or videogame machine. A shift is occurring towards an aging population as the proportion of people aged 60 and over is growing rapidly. Successful aging, that is, maintaining an independent, positive and meaningful quality of life, is a continual challenge for seniors, yet it is paramount for individual seniors, their families, and society. The potential for technology to support seniors living well and experiencing things that make life worth living has received much less attention than the mental and social challenges they face. However, evidence suggests that technology can provide people with meaningful and engaging activities that are stimulating, enjoyable and fun. In particular, technology-based games promise many benefits to seniors, but research evidence is sparse about whether and how these can be obtained.

What do we know about quality of life measurements needed to create effective online educational games for seniors? A literature review was conducted as part of a development project to flesh out a number of issues: (1) Can seniors' quality of life be enhanced through the use of digital games? (2) What is the definition of quality of life? (3) How can it be measured? (4) Which dimensions and items could best capture this concept as an outcomes impact of digital games on seniors? This article presents some researches on quality of life and gaming, as well as a variety of approaches to measure quality of life; it also discusses some recommendations for future studies in order to enable them to take full advantage of the positive impact game design can have on seniors' quality of life.

Keywords: digital game, educational game, senior, quality of life.

Introduction

Over a third of seniors aged over 50 years old use internet to play digital games alone or in a group (Cefrio 2012). What are the impacts of these games on seniors' quality of life? In other words, what are the impacts of digital games on the different aspects of people's daily lives, taking into account the emotional and social functions as well as purely physical conditions? Some recent studies examine the effectiveness of digital games on seniors' quality of life. First, the study by Allaire et al. (2013) shows a significant difference between the occasional and moderate senior players and non-player seniors in socio-emotional dimensions such as quality of life, positive and negative moods, and depression. Second, the study of Rosenberg et al. (2010) shows that seniors using an "Exergame" (Nintendo Wii) whereby participants play different sports (golf, tennis, bowling, baseball, and boxing) get significant improvements from baseline in depressive symptoms and quality of life. Qualitative feedback from this study was also positive with the intervention described as being fun, varied, motivating, challenging to improve, and provided good feedback on progress. Positive qualitative feedback on Wii Balance exercises was also reported by Young et al (2011). Another study by Rowe and Kahn (1998) shows an improvement in seniors' quality of life through social interaction and social engagement due to the use of digital games. Other studies link digital games with the establishment of social interaction (De Schutter & Abeele 2010; Khoo & Cheok 2006). Moreover, digital games would break the isolation and reduce the feelings of loneliness (Wollersheim et al 2010). Finally, some studies (Stebbins 2007; IJsselsteijn et al 2007) identify the development and maintenance of personal relationships, and as a result, an improvement in quality of life.

Performing a meta-analysis of the effects of games on physical health, Bleakley et al.(2013) concluded that the impact of games on seniors must be questioned in the light of an inconsistency in the game design and a weakness of the measured concepts definitions.

Indeed, an increasing number of studies (Dahlin, Nyberg, Backman & Nelly 2008; Rosenberg, Deep, Vahia, Reichst, Plamer & Kerr 2010; De Schutter 2011; Diaz-Orueta, Facal, Herman Nap and Ranga 2012; Astell 2013.) have demonstrated that computer games can have a positive impact on seniors: digital games can provide physical training for seniors and can improve their quality of life. These studies also show that the effects of these games depend on the needs and individual characteristics of seniors and that systems need to be developed that are capable of adapting to the demands of this population. An inappropriate design can act as a barrier to seniors' use of games, thus reducing the games' physical, cognitive and social benefits and consequently seniors' health and quality of life (Whitlock, McLaughlin, & Allaire 2011). It is therefore important to ensure that games offered to seniors have appropriate ergonomics design.

The comparative studies concerning seniors quality of life through the use of digital games found a high level of methodological heterogeneity. The results are difficult to analyze and the data cannot be pooled for meta-analysis. So the concept of quality of life refers to several different scales. For example: health based on SF 36 (Short Form Health Survey)(Rosenberg et al. 2010); SF 36 mental health scale (Studenski et al 2010); Quick Inventory of Depressive Symptoms Scale (Rosenberg et al 2010); Depression questionnaire CES -D (Allaire 2013; Radloff 1977); Physical Activity Enjoyment Scale (Graves et al 2010); Positive and negative affect schedule (PANAS) (Watson et al 1998); Qualitative feedback : fun, enjoy, etc. (Young et al 2011); Social interaction (Stebbins 2007; IJsselsteijn et al 2007). It is therefore important to define this concept of quality of life to adequately measure the effect of digital game on seniors.

The article by Sauvé, Renaud, Kaufman & Duplaa (2014), entitled *Ergonomic Criteria for Creating educational online games for seniors*, investigates the issue of game design. In this presentation we examine the impact of digital games on seniors' quality of life.

What is quality of life? What dimensions are associated with it? And what approaches are used to measure this concept?

Defining Quality of Life and its various dimensions

Quality of life is a global concept describing the daily life of people, taking into accounts the emotional and social functions as well as purely physical conditions. Even though there does not seem to be a consensual definition (Kuyken 1995), the most widely used definition is the World Health Organization's (1993). Quality of Life is defined as "individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns. It is a broad ranging concept affected in a complex way by the person's physical health, psychological state, level of independence, social relationships, personal beliefs and their relationship to salient features of their environment." (http://www.who.int/mental_health/media/68.pdf, p.1)

This concept takes into account physical (autonomy and physical abilities), psychological (anxiety, depression, emotion), social (family, social, professional), and symptomatic (impact of the disease and its treatment) dimensions.

The quality of life concept encompasses individual and multidimensional aspects since, in terms of their health state, desires and life goals, each person appreciates various changes in their life according to various dimensions (physical, social, psychological and symptomatic). For example, a physically disabled person could claim to have a good quality of life, while a person enjoying all his physical abilities could define his quality of life as poor. Similarly, a Canadian living in a city and an African living in the desert may not share the same needs in terms of quality of life. This is a subjective concept surrounded by some uncertainty (Rejesky & Mihalko 2001). The broadness of this concept invites us to systematically examine this construct. Let see how can we measure it?

Approaches to measuring Quality of Life?

Two complementary approaches are used to measure quality of life (Mercier & Schraub 2005): psychological interviewing (qualitative evaluation) and psychometric measurements (quantitative evaluation).

Psychological interviewing allows a more comprehensive assessment of quality of life from the subject's point of view. However, it is difficult to standardize, expensive, and has been found difficult to implement on a large scale.

Psychometric tools are scales or questionnaires (self-evaluation) that assess quality of life on a standardized basis, allowing to get valid information about a group of people. To capture the individuality in this case, the tool is complex since it must take into account the subject as their own reference, explore and analyze all domains composing quality of life, compare them with each other, in terms of their importance for each individual.

Measuring instruments

Regarding quality of life, the scientific literature offers several scales and measuring instruments. There are two distinct types: generic and specific instruments.

Generic instruments comprehensively assess the various dimensions of quality of life: health, psychological functioning, and social environment of the subject. These instruments allow comparisons between groups of people worldwide.

According to Mercier & Schraub (2005), the quality of life scales that are validated and most commonly used in French and English are:

- SF- 36 (MOS Short Form 36) (Leplege et al 1998; McHorney et al 1993) with 36 items grouped into 8 scales: physical functioning, limitations due to physical state, physical pain, perceived general health, energy/fatigue, social functioning, emotional well-being, limitations due to emotional problems.
- NHP (Nottingham Health Profile) (Hunt et al 1981), with 45 items grouped into six scales;
- WHOQOL (WHO Quality Of Life assessment), with 100 items;
- WHOQOL BREF (Brooks et al 1996) with 26 items grouped into four scales.

Specific instruments are centered on one particular theme and one particular group of individuals. They respond to a specific inquiry. However, the comparison between the results of different populations is difficult to achieve.

For example, Allaire et al (2013), wanting to measure the impact of digital games on seniors' quality of life, mood, depression and social relations, have developed a specific questionnaire by combining three of them:

- 1 - They used three scales from SF- 36 (MOS Short Form 36) (Leplege et al 1998; McHorney et al 1993) to measure general health, social functioning and emotional well-being.
- 2 - They used the depression questionnaire CES -D (Radloff 1977) where 20 items were used to identify the signs of depression.
- 3 - And finally, the positive and negative mood was captured by the PANAS (Positive and negative affect schedule, Watson et al 1998) which examines ten positive states (enthusiast, alert, etc.) and ten negative ones (hostile, stressed, etc.).

Items to be measured

Our study leads us to measure the physical, psychological and social dimensions of quality of life. We must remember that quality of life is a subjective concept and its understanding is complex. The literature review showing the multitude of existing generic or specific questionnaires point out that there is no single measurement. We are at the stage of our research where the definition of quality of life forces us to specify the items that will be used to measure the impact of digital games. The choice of items will suggest validated measurement scales.

Dimensions of quality of life	Items that can be measured
Physical state	Sleep Physical abilities (disabilities) Eating habits Active life style Physical pain Overall health

Dimensions of quality of life	Items that can be measured
Psychological aspects	Depression Isolation Loneliness Positive or negative mood Emotions Emotional well-being Self-esteem Peace of mind Harmonious personality development
Social environment	Interactions with family Interaction with friends Professional interaction (retired working part-time) Interactions with others Standard of living Way of life or lifestyle

During the analysis of these items and appropriate scales, the main aspects of quality of life have to be integrated into a more comprehensive questionnaire evaluating other elements, including game ergonomics and cognitive skills. To facilitate data collection, we opted for a self-administered questionnaire. It is therefore desirable to use scales with a limited number of questions to reduce the time it takes to answer the questionnaire.

The Items in bold character were used to evaluate a digital game called *Live Well, Live Healthy* that has been validated by the elderly. We will now briefly describe this digital game.

Our digital game for seniors

According to a survey of 932 Canadian seniors (Kaufman, Sauvé, Renaud & Dupl a 2014), the Bingo game was found to be the most frequently mentioned by respondents. Moreover, the nutritional status of older adults is directly related to their quality of life (Sylvie, Jiang & Cohen 2013). Different studies also demonstrate the beneficial effect of an active lifestyle: the ability to maintain physical and functional independence when aging is associated with improved health and quality of life for seniors (Freitas, Santiago, Viano, Leao & Freyre 2007; Figueira, Figueira, Mello & Dantas 2008 cited by Pernambuco et al 2012). Finally, benefits from social interactions are also related to the « aging well » concept or to a good quality of life (Chappell & Funk 2011).

Based on these informations, we have developed *Live Well, Live Healthy* game. (Figure 1) represents the *Live Well, Live Healthy* game interface which is divided into three parts: a) the Bingo card, rules and tutorial; b) information on the game's progress: the type of game, randomly drawn ball, and the Bingo button for ending the game; and c) information related to the players' actions: players' names and scores, as well as the microphone and chat control buttons.

Live Well, Live Healthy! was developed using a generic shell for educational games (<http://cvje2concepteur.savie.ca>). The game's educational objectives are the following: to increase knowledge about nutrition and physical activities, to decrease risk situations (or to improve prevention situations) and to identify the importance of social interactions with friends and family members.

The *Live Well, Live Healthy* game offers a mechanism to display a question every time the number of a randomly drawn ball is on one or more players' card. If the player answers the question correctly, a token appears in the box and the player earns points (20 points for an easy question, 30 points for an average question and 50 points for a difficult question). If the player does not answer the question correctly, the token will not appear in the box and the player loses half the points allocated to the question. The 92 questions included in the game are distributed as follows: 31 questions about nutrition 24 about physical activities, 18 about prevention situations and 19 about social interactions.

The *Live Well, Live Healthy* game must provide feedback to support learning of the preset content. Immediate feedback, related to each learning task, allows the players to identify successful activities

and those they have failed. The game incorporates mechanisms (Figure 2) that: (1) highlight the results of each learning activity through visual or audible feedback (success or failure) such as a smiley face or a sad one (A), positive or negative sounds, or earned points that increase a player's score; (2) the correct and incorrect answers through textual, visual or audible feedback (B) on the content of the learning activity or provide additional information to sustain interest in the case of positive responses; and (3) allow players to see what they have learned by providing an overview of the results of the game's learning activities, together with teaching materials to review subject matter that has not been learned.



Figure 1: Live Well, Live Healthy



Figure 2. Question card

For more details about this digital game and a good preview, please read Sauvé & Renaud (2014). This game (<http://cvje2.savie.ca>) will promote active living and healthy eating among seniors and will give them opportunities to interact with others, illustrating these themes with good quality images, videos and animations.

Ethical Issues

This project has been approved the four universities ethics committee. The recruitment will be carried out through elderly associations, retirement homes and shopping centers. Every participant will have to sign a consent form and may at any time interrupt his participation without any prejudice. A list of human resources available in their region will be provided to them if needed.

Conclusion

The evaluation of the impact of digital games on seniors' quality of life is based on adequate measurement focusing on the quality of life concept's various dimensions. The measurement of quality of life through the health, social environment and psychological aspects dimensions should consider the users' point of view. Although subjective, the concept's understanding can be achieved through questionnaires using validated scales. These questionnaires are easy to use, but one has to make sure that they are reliable, validated and easy to complete. Within our project's framework, the physical dimension will be discussed in terms of nutrition and physical activity. As for the psychological aspect and social environment, we will examine isolation, mood and social interactions with family members and other seniors. We must now investigate more closely the various questionnaires and identify the scales we consider the most appropriate to answer our research questions.

We believe that a deep study of the quality of life concept as one of the impact of digital game among seniors will provide the scientific community with a robust methodology based on the literature review, since we compare apples with apples instead of comparing them with a fruit basket.

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The project's goal is to examine, through the use of online games designed for seniors, the key factors for effective implementation of digital games for this audience. More specifically, our study has the following objectives: 1) to develop and promote online educational games for maintaining or adopting healthy lifestyles for retired seniors 55 years and older; 2) to test these games with our target audience to evaluate their ergonomic quality (design and user-friendliness) and 3) to test these games with the target audience in order to assess the effect on their quality of life.

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