

# ASSETS 2013 Doctoral Consortium Project Summary: Motion-Based Game Interaction for Older Adults

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## ABSTRACT

Decreased activity reduces life expectancy, yet many institutionalized older adults lead sedentary lifestyles: age-related changes and impairments limit the number accessible leisure activities, and nursing homes struggle to provide mental and physically stimulating activities for their residents. In this context, motion-based video games – games that integrate physical user input – are one opportunity of fostering physical activity, and research suggests that these games have a variety of positive effects on the well-being of older adults. However, currently available games are too demanding for this audience. My research will help foster the design of accessible and safe motion-based video games for older adults. In my PhD research, I explore motion-based game interaction design for older adults. By creating enjoyable video games for this audience, my research will help encourage cognitive and physical activity among nursing home residents, thereby increasing their quality of life.

## Keywords

Accessibility, interaction design, entertainment, older adults.

## 1. INTRODUCTION AND BACKGROUND

Institutionalized older adults often lead sedentary lifestyles. Decreased activity adversely affects an individual's life expectancy, frequently leading to sedentary death syndrome [7]. Despite various efforts [5], few activities remain accessible to institutionalized older adults, and it is difficult to motivate them to remain cognitively and physically active as the impact of age-related changes grows: Common age-related changes include decrements in posture, balance and gait as well as fine motor skills [1]. Aging also negatively affects sensory processes such as vision and hearing [1]. Additionally, age-related changes negatively influence cognitive processes such as short-term memory, attention and vigilance [1]. Motion-based video games integrate physical user input to engage the player [6]. Much work has focused on creating sports-like experiences to fight sedentary lifestyles among younger audiences. Despite research results suggesting positive effects of such games on player cognition [2] and physical health [8], little research regarding the application of such systems for older adults is available. In this context, age-related changes and impairments have an impact on game accessibility; motion-based game controls extensively build on the player's physical abilities. Therefore, it is important to consider the needs of older adults when designing motion-based game interaction to provide safe and enjoyable gaming experiences.

## 2. PROBLEM AND MOTIVATION

The overall goal of my research is to address the issue of decreasing levels of physical and cognitive activity among older adults through the design of motion-based video games. To be able to create video games that are accessible and engaging, it is important to understand the impact of age-related changes and impairments on player experience in general and game accessibility in particular. In this area, little research with a focus on motion-based games for older adults is available. The current generation of motion-based video games is largely designed for younger, able-bodied players. Therefore, many games are not suitable for older adults as they do not meet their needs in terms of game accessibility: input gestures may be too challenging for older adults, the pacing of games may not be appropriate, and game concepts targeting younger generations may not appeal to older adults. As a result, nursing homes struggle to offer video games as an enjoyable leisure activity, and many older adults require assistance when playing motion-based games, and cannot obtain the full benefits of engaging with these games despite their large potential to fight sedentary lifestyles.

## 3. PROPOSED SOLUTION

In my research, I will address this issue by investigating how motion-based game interaction can be applied in a way that is accessible and enjoyable for older adults. In this context, it is important to examine motion-based game design for older adults from two perspectives. First, it is important to understand how older adults interact with motion-based game controls. Second, integrating suitable input methods into appealing game concepts is another crucial aspect of the deployment of motion-based video games for older adults. A number of steps have to be completed to reach this solution. My dissertation work includes five studies that investigate different aspects of motion-based game interaction for older adults.

1. Examining differences between sedentary and motion-based game controls to determine their overall feasibility for older adults. This part of my research has been completed, and results show that motion-based game controls are suitable for older adults [3].
2. Exploring whether motion-based game controls are suitable for institutionalized older adults, and how they would have to be implemented to be accessible and enjoyable for this audience. Results show that full-body motion-based game controls can be made accessible for older adults, but various challenges have to be addressed [4].

Based on the results of these studies, I plan to implement three motion-based games addressing different challenges in motion-based game design for institutionalized older adults.

3. Because many nursing home residents use walking assistance, the inclusion of wheelchair-based input is an important step towards the general accessibility of motion-based games for older adults. The first game will investigate wheelchair input for motion-based games for older adults.
4. The second game will implement principles of casual games to facilitate the long-term deployment in a nursing home environment to determine whether motion-based games appeal to institutionalized older adults over a longer period of time, and what challenges need to be addressed to allow players to interact with games without external facilitation.
5. The third game will explore how we can apply motion-based video games to help build healthy relationships between older adults and caregivers by releasing stress through the engagement in play, contributing to the quality of life of both caregivers and patients.

#### **4. STAGE OF STUDY AND RESEARCH**

I have completed all formal requirements of my PhD program (coursework, comprehensive exam, research proposal) other than giving an overview of my research to the department, and the preparation and defense of my thesis. I have completed the first two studies of my research (comparing sedentary and motion-based game controls for older adults [3], and full-body motion-based game interaction for institutionalized older adults [4]). I am currently working on games one and two (wheelchair-based game interaction, long-term player motivation; see list above). I plan to submit this work to the ASSETS 2013 conference and the Entertainment Computing journal. I hope to complete game three in summer 2014 and submit it to CHI 2015.

#### **5. EXPECTED CONTRIBUTIONS**

My research will make two main contributions in the fields of interaction design and game design for older adults. First, it will provide a systematic examination of motion-based game interaction for older adults, which is a crucial step towards designing motion-based video games that are accessible for this audience. Based on the results of the first two studies, I developed design guidelines for the creation of accessible motion-based game interaction. These considerations extend beyond the application to game design; results of my work generalize to interaction design for older adults and can help inform the work of designers in many fields, e.g., in ambient-assisted living. Second, the last two studies of my dissertation research aim to explore motion-based game design for older adults with a focus on game accessibility and player engagement. Based on the results, it will be possible to evaluate the overall feasibility of motion-based video games in a nursing home context.

On a general level, my work will provide answers to the question of whether motion-based video games can be designed in a way that is accessible and engaging for institutionalized older adults. On that basis, it will be possible to determine whether motion-based video games are a suitable means of fighting sedentary

lifestyles among this audience, thereby using games to increase the quality of life of nursing home residents.

#### **6. HOPES FOR THE DC**

The ASSETS 2013 doctoral consortium would provide me with a range of opportunities that would allow me to grow as a researcher, and would be beneficial at my current stage of study.

Most importantly, I would have the chance of presenting my work to the ASSETS community. Because I have primarily published at venues with a focus on interaction design in the past, I would greatly appreciate feedback from researchers with a background in accessibility. Also, I always enjoy sharing and discussing my work with other researchers and students; I believe that feedback from persons at various stages of their career can be of great help in terms of providing new perspectives and creative ideas. Additionally, attending ASSETS would also give me the opportunity of networking and exploring future career paths. At the current stage, I expect to finish my PhD by the end of 2014, and being part of the ASSETS doctoral consortium would allow me to connect with potential supervisors for post-doctoral positions in North America. Finally, I enjoy learning about other students' research; I hope that I would be able to share some of the experiences that I made throughout my PhD studies, and that I would be able to provide helpful feedback to other participants of the doctoral consortium.

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