

5-2013

# Balance and Gait Among a Community Dwelling Older Adult Population Using Nintendo Wii Bowling Game.

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## Recommended Citation

Hutchins, Carly, "Balance and Gait Among a Community Dwelling Older Adult Population Using Nintendo Wii Bowling Game." (2013). *Undergraduate Honors Theses*. Paper 68. <https://dc.etsu.edu/honors/68>

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EAST TENNESSEE STATE UNIVERSITY  
COLLEGE OF NURSING  
HONORS-IN-DISCIPLINE PROGRAM

Balance and Gait Among a Community Dwelling Older Adult Population Using Nintendo Wii  
Bowling Game

Carly Lynne Hutchins

An Honors Thesis Submitted in partial fulfillment of the requirements for the  
University Honors-In-Discipline Program  
East Tennessee State University  
May 2013

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Signature of HID Mentor                      Date

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Signature of HID Student                      Date

### **ACKNOWLEDGEMENTS**

First and foremost, I would like to thank my current mentor, Professor Kim Sell, RN, MSN, for all the time and encouragement through this research study. Professor Peggy McConnell, RN, MN, GNP-BC, my first mentor, who helped me develop ideas and goals which led to the completion of this project. Rafie Boghonian, who helped me enter data into SPSSX and gave me encouragement with my results. Lastly, I would like to thank the Johnson City Senior Center and Ms. Kamela Easlic, Program Development Supervisor, for her willingness and kindness for allowing me to conduct my research at their establishment. Everyone involved in this study is greatly appreciated, and I thank you for all you have done for me.

**ABSTRACT**

Due to the increase in the aging population older adults are looking for ways to stay fit and active in their later years. Such activities need to be fun, easy to operate, and encourage socialization. The Nintendo Wii© Bowling provides these features for the aging population. Participants in this quantitative pilot study had the opportunity to play the Nintendo Wii© Bowling Game twice a week for six weeks to see if their balance and mobility would improve when compared with the pre and post scores from the Performance Oriented Mobility Assessment (POMA). The participant's scores on the Performance Oriented Mobility Assessment showed an average increase in both gait and mobility from 24 to 27.5 on the post-test. These participants' were also asked to provide qualitative feedback on their experience in the study. One participant stated that she "gained confidence." As a whole, the participants really enjoyed playing the Nintendo Wii© Bowling. This study demonstrates that Nintendo Wii© Bowling game can be an enjoyable, easy activity to motivate elders to become more active and social while incorporating exercise into their routine. It also provides the chance for future research to be conducted on older adults to examine the benefits of exercising with the Nintendo Wii© Bowling game.

## INTRODUCTION

The purpose of this research is to examine balance and gait among community dwelling elders 65-85 years old using the Nintendo Wii® bowling game. Balance and gait is a chronic struggle among the geriatric population. At least thirty percent of persons 65 and older report difficulty walking three city blocks or climbing one flight of stairs, and that twenty percent require the use of a mobility aid to ambulate (Salzeman, 2010). Also, in a sample of non-institutionalized older adults thirty-five percent have an abnormal gait (Salzeman, 2010). When individuals experience a type of abnormal gait it can easily affect their balance. This lack of balance can lead to serious accidents. Due to the fact that balance related falls account for more than one-half of the accidental deaths in the elderly each year (CDC, 2010). Age related factors, such as neurologic changes leading to reduced vision, postural changes, slowed reaction times, and diminished sensory awareness lead to a decrease in steady gait causing a lack of balance and ultimately falls (Fuller, 2000).

Since abnormal balance and gait strike so many older adults, interventions must be put in place to improve their ADL's and overall happiness. Exercise is one great intervention that can be used. However, as the aging process takes place older adults participate less in exercise regimens. The CDC states that about 28-34 percent of adults aged 65-74 and 35-44 percent of adults 75 or older are considered inactive, meaning they engage in no leisure-time physical activity (CDC, 2001). This lack of exercise can pose great threats to older adults including osteoporosis, arthritis, and joint pain which can all lead to a decline in gait and balance (Czerniewicz and Nicholson, 2004). With the intervention of exercise, great strides can be made to improve balance and gait. Therefore, the initial focus of an exercise program for the elderly

should include exercises that are designed to improve balance, movement, speed, coordination, agility, strength, and range of motion (Czerniewicz and Nicholson, 2004). Hence, the purpose of this research is to provide exercise to community dwelling older adults by using Nintendo Wii® Bowling in hopes that balance and gait will improve over the course of the study.

## **BACKGROUND**

The background for this study is based on the amount of falls and lack of exercise that occur among community dwelling elders. The CDC states that, “one out of three adults 65 and older falls each year,” and the amount of exercise needed per week is not performed (CDC 2010). Therefore, it is best to start at the core of the problem and work to improve balance and gait in order to decrease falls and promote a better quality of life. The CDC states that many interventions can be used to prevent falls in community dwellings such as educating staff about risk factors and prevention, making sure the environment is clear and providing exercise opportunities (CDC, 2012).

## **RESEARCH QUESTION**

Does the use of Nintendo Wii® bowling twice a week for one hour for a six week period improve balance and gait among community dwelling adults 65-85 years old?

## **LITERATURE REVIEW**

Two studies have been completed on community dwelling adults sixty five and older addressing mobility and balance. One study in particular performed once a week Nintendo Wii® bowling for eight weeks using pre and post scores on the Timed Up and Go Test, while using a

questionnaire at the end. This researcher had five women and four men who ranged from 60 to 70 years old. Results of the study provide evidence that there was a significant difference in the pre and post participation times and participating seniors reported the game made their bodies feel better and move better (Kidd, 2010).

Another study was conducted to see if the Nintendo Wii© was efficient in a falls prevention training program. This study also used the Time Up and Go Test along with functional reach, TURN-180, and flexibility scores to focus on a total body analysis of balance and mobility by using the Nintendo Wii Balance Board©. There were sixty-five participants who were randomly divided into a Wii© group and a non-Wii group. The researchers stated that the difference in the pre and post scores for the Wii© group showed significantly greater improvement in flexibility scores, Timed Up and Go Test scores, and functional reach than those in the non-Wii group (Griffin 2012). This study suggests that the Wii Balance Board© is a positive intervention to improve balance and gait.

When it comes to using a proper instrument for evaluating balance and mobility the most commonly used is the Time Up and Go Test. This assessment instrument has been effective according to Kidd who states that her findings using the Timed Up and Go when comparing the paired t-test scores to pre and post times showed significance ( $t=-3.91$ ,  $df=8$ ,  $p=.004$ ) (Kidd, 2010). No particular studies were found researching Wii© bowling that use POMA alone to assess mobility and balance. However, one study was conducted to assess the clinimetric properties and accuracy of the POMA. The researchers used residents in either a self-care or nursing care residence that were 78% female and had a mean age of 84.9 (Faber, Bosscher, and Weirnigen, 2006). The study concluded that “the POMA-T and its subscale POMA-B have adequate reliability and validity for assessing mobility in older adults, and that the POMA-T is

useful for demonstrating intervention effects at the group level (Faber, Bosscher, and Weirnigen, 2006). The POMA has also been deemed useful for assessing balance and gait among a group of 60 community dwelling older persons with a concurrent validity of 0.64-0.70 and an interrater reliability of 0.75 to 0.90 reported (Lin, Hwang, Hu, Wu, Wang, and Huang, 2004).

## **METHOD**

### **Participants**

Participants were recruited from a local senior center in East Tennessee through newspaper ads, flyers, and public announcements coordinated by the researcher. The researcher also attended various events to set up a booth to explain the purpose, reason, and details of the study. Flyers were distributed to participants at this time to encourage participation. The older adults were informed of the start date and time and were given a chance to sign up via a contact information sheet in which they provided their name and phone number. A total of ten individuals signed to be contacted as possible participants. Participants that were listed on the contact sheet were notified a week prior to the start date. They were informed on the time and location to meet. The inclusion criteria for participants included: community dwelling adults ages 65-85 years old, ability to safely ambulate, rise from a chair, and be seated, and the ability to cognitively operate Wii Bowling© controller. Those participants with assistive devices such as canes and walkers were not excluded from the study. The exclusion factors were those with recent falls or hospitalizations within the past three months and non-English speaking individuals.

At the first meeting seven older adults attended. Participants were then screened using a screening form to ensure that inclusion/exclusion criteria were met. The researcher then



explained the informed consent, provided the opportunity to ask questions, and then participants signed.

### **Demographics**

Among the seven participants who were originally assessed, the mean age was 72 years old. The ages ranged from 66 to 77 years old. Six participants were white, non-Hispanic with one participant being black, non-Hispanic. All the participants were female, except for one male participant. Several participants attended college and graduate school. One completed six years of graduate school, while another completed three years of graduate school, and two participants completed Master's degrees. Two of the participants completed two years of college while one participant lacked collegiate experience but graduated high school.

### **Measurement Tool**

The POMA (Performance Oriented Mobility Assessment) also known as the Tinetti was used to assess mobility and balance in the older adults. This instrument was easily administered using task-oriented commands that measure an older adult's gait and balance abilities. The researcher was instructed by a licensed physical therapist from an outpatient facility on how to correctly administer the instrument. The physical therapist instructed the researcher how to assess stance, sway, and walking patterns. The instrument took approximately five minutes to complete per participant and scores for balance and gait were graded separately. For the balance portion, participants were assessed sitting, rising, turning, and immediate standing balance. They were scored with a 0, 1, or 2 for each segment for a total possible score of 16 for balance. Similar to the balance portion, gait was assessed by observing step symmetry, step continuity, step height and length, walking stance, and trunk swing. For gait participants were scored with 0, 1, or 2 for

a total possible score of 12 for gait. Interpretation of the scores is as follows: 25-28= low fall risk, 19-24= medium fall risk, < 19= high fall risk.

### **Materials and Procedure**

The Nintendo Wii Bowling© game system was provided by a local senior center along with an available room, chairs, and Wii controllers. The only supplies that were needed to assess the participants via the Performance Oriented Mobility Assessment were an armless chair and a clear 15 foot walkway. The participants were assessed at the first session upon completion of the informed consent document which explained the details of the Performance Oriented Mobility Assessment and the Wii Bowling© game.

The participants played the Wii Bowling© for one hour each session. Participants were instructed by demonstration on how to use the Wii© controllers and gaming system. The participants remained sitting or standing for the entire session until it was their turn to bowl. Participants would then rise from the armless chair and walk two feet to complete their turn. They would then take the controller and perform two bowls per turn and then be seated or remain standing.

At the end of the study, participants were asked to complete a qualitative survey. Responses to the survey helped the researcher gain a better understanding of what it was like for them to participate in a physical activity, such as Nintendo Wii© bowling. The surveys were provided and explained to each participant. Participants were given a sufficient amount of time to complete the survey and write any responses they deemed important. The survey asked three separate questions and provided a numbered scale 0-10, with 0 being the worst and 10 being the best, for participants to circle. Space was also left below each question for comments. The questions on the survey were:

- 1) How much did you enjoy participating in the activity?
- 2) How much do you feel you gained by participating in the activity?
- 3) What would you change about the activity?

## **RESULTS**

The Performance Oriented Mobility Assessment scores improved for all participants who completed the study. The average pre-test score for balance and gait was a 24, medium fall risk, compared to a post-test score of a 27.5 which indicates a low fall risk. The paired t-test indicated that the results between the pre-test and post-test were not statistically significant ( $p=0.5$ ). However, the post-test Performance Oriented Mobility Assessment did increase by 3.5 at the end of the five week period.

The results from the survey were very positive. The two participants who completed the entire five week program stated they enjoyed participating in the activity very much, and both stated they gained a lot during the activity. One participant stated, "Doing this really helps me with my confidence because I have had a knee replacement and it has been hard for me to get around." She also stated, "I have noticed it has been easier for me to go upstairs than before." When asked by survey what the participants would change about the study the two participants circled, "nothing at all." The participants also stated the activity was very fun. One couple that attended several sessions stated, "We loved bowling when we were younger, but the ball is just too heavy now and we are scared we might fall." Therefore, this activity provided a safe, fun, and interactive environment for elders.

## **DISCUSSION**

There have been several studies conducted similar to this one that had promising and positive results. For instance, in Kidd's study (2011) looking at community dwelling elders via the Timed Up and Go Test it was statistically significant ( $t=-3.91$ ,  $df=8$ ,  $p=.004$ ) that those who participated in Wii Bowling© for more than four weeks compared to those who did not had an improved time on the Timed Up and Go Test (Kidd, 2011). Kidd's findings are similar to this study in that the participants showed improvement in scores related to gait over a short period of time among community dwelling elders. However, the current study used the Performance Oriented Mobility Assessment which focused on both balance and gait. Although this study was not found to be statistically significant it could be due to the low number of participants attending the final session. However, improvement was still noted among the two final participants with one increasing from 27 to 28 and the other increasing from 24 to 27 putting both participants in the low fall risk category.

This study also showed how using the Wii Bowling© can create a fun, safe, active, and social environment for community dwelling elders. The participants continually mentioned how much they were going to miss coming to the sessions and how much fun they had. After keeping in contact with staff members at the site location, the researcher has been informed that Wii Bowling© remains on the schedule so past participants can recruit other individuals to join in the activity. Therefore, this study sets the basis for further research since community dwelling gained confidence, socializations skills, and improvement on the Performance Oriented Mobility Assessment.

### **LIMITATIONS**

Originally, participants were asked to attend one hour Wii Bowling© sessions twice a week for six weeks. Due to scheduling issues the study only lasted five weeks and met only once

per week for one hour. At the start of the study seven participants attended the first session, but the next week only four participants attended. As a whole, four participants attended anywhere from 3-5 sessions constantly. Due to poor weather conditions only two participants attended the final session. Therefore, only two post-test Performance Oriented Mobility Assessment and surveys were obtained. The lack of a larger sample size greatly affected the significance of this study, but weather conditions were not ideal for the final sessions and participants could not attend.

### **CONCLUSION**

The results of this pilot study suggest that the Nintendo Wii Bowling© may offer some improvement in gait and balance. It also showed that older adults enjoy and respond to this activity in a positive manner. However, further studies need to be conducted with much larger sample sizes over longer periods of time to find statistically significant data. The possibility of other gaming systems and programs could be used to collect more data. Also, a variety of settings could be utilized to find more results such as nursing homes and assisted living facilities.

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