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School of Public Health and Health Professions
Department of Exercise and Nutrition Sciences

Exergaming Intervention for Sedentary Community Members

Courtney E. Miller, Dmitriy V. Belous, Daniel M. Rosney and Peter J. Horvath
Department of Exercise and Nutrition Sciences, School of Public Health and Health Professions

Abstract

Physical activity is known as one of the best ways to improve the quality of life, decrease stress, prevent disease, and inhibit chronic depression in older sedentary adults. While the Nintendo Wii® video
game platform has been utilized in rehabilitative settings, research is limited as to its efficacy when used as an in-home exercise modality. The Wii® uses upper and lower body movements similar to those movements in traditional exercise while raising heart rate by doing various amounts of activity.
Purpose: To evaluate the effect of Wii Fit® exergaming on functional fitness.
Methods: Middle-aged men and women exercised using Wii Fit® for three, twenty-minute bouts each week for eight weeks. Functional fitness was assessed using the YMCA Step Test (YMCA), Sit-to-Stand test (SST), and Single-Leg-Stand Test (SLS) prior to and after the eight weeks of exergaming.
Results: In 10 participants (2 male, 8 female), after eight weeks of exergaming intervention there was a 19% improvement in sit to stand reps (before 13.8±0.6, after 17.0±1.2, $p<0.01$). There were no improvements in the balance or step test.
Conclusion: Lower body endurance was improved after eight weeks of exergaming intervention. Quality of life and functional fitness may improve utilizing Wii Fit® exergaming as an exercise modality.

Background

Regular participation in physical activity is one of the most effective ways to prevent obesity, cardiovascular disease and other morbidities[1] as well as improve quality of life, increase functional independence and reduce chronic depression in older adults with and without disabilities[2]. In order to implement this behavior change, alternative, innovative, long-term, economically feasible interventions and therapeutic approaches are needed. The Nintendo Wii® has been utilized in rehabilitative settings. However, research is limited in the possibility of using the Wii® as a within-the-home exercise instrument for those who do not have a gym membership, or who otherwise cannot regularly make it to their local fitness center. The purpose of this pilot study is to determine the feasibility, compliance level, and safety of using the Nintendo Wii® to compare stress, functional fitness, and overall health in relation to cortisol levels, exercise tests, and self-reported questionnaires in older adults who participate in regular "exergaming". Theoretically, if the exercise intensity reached while playing the Wii® is moderate, such participation has the potential of meeting the physical activity guidelines established by the American College of Sports Medicine[1].

1. Garber, C. E., Blissmer, B., Deschenes, M. R., Franklin, B. A., Lamonte, M. J., Lee, I. M., . . . Amer Coll Sports, M. (2011). Quantity and Quality of Exercise for Developing and Maintaining Cardiorespiratory, Musculoskeletal, and Neuromotor Fitness in Apparently Healthy Adults: Guidance for Prescribing Exercise. Medicine and Science in Sports and Exercise, 43(7). doi: 10.1249/MSS.0b013e318213fefb
2. GSA. (2011). The Gerontological Society of America 64th Annual Scientific Meeting November 18-22, 2011 Boston, MA ABSTRACTS. Gerontologist, 51.
3. O'Donovan, C., & Hussey, J. (2012). Active video games as a form of exercise and the effect of gaming experience: a preliminary study in healthy young adults. Physiotherapy, 98(3). doi: 10.1016/j.physio.2012.05.001

Objectives

1. To examine the effects of eight weeks of Nintendo Wii® game play on salivary and hair cortisol.
2. To compare at baseline and at week eight changes in quality of life and emotional well-being using Nintendo Wii® with respect to self-reported questionnaires.
3. To evaluate functional fitness before and after using Nintendo Wii® for eight weeks.

Funding

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Methods

- Sedentary, middle-aged men and women exercised using the Wii Fit® for 20 minutes a day, three days a week for eight weeks.
- There were 10 completed participants (eight females, two males).
- Participants were allowed to choose which activities they participated in each visit, which included aerobics, balance, yoga, strength, and training plus during each visit.
- Participants were passively observed during each exercise visit to ensure safety and compliance. Heart rate and RPE were recorded during each exercise visit.
- Functional fitness was assessed using the YMCA, SST, and SLS prior to and after the eight weeks of exergaming. The SST measures lower body strength and endurance by counting how many times participants can stand and then sit back down in 30 seconds. The SLS measures balance and stability by timing how long participants are able to stand unassisted on one leg with their eyes closed. The YMCA determines aerobic fitness by measuring heart rate during and after three minutes of stepping up onto a platform in cadence with a metronome.
- Salivary and hair cortisol samples were collected before and after eight weeks of exergaming.
- The Bod Pod® was used to measure body composition; weight, fat mass and fat free mass (kg and %) were recorded before and after exercise intervention.
- Participants took a Subjective Exercise Experience Survey and a Self Efficacy Questionnaire to measure confidence in continuing exercising using the Wii Fit® after the completion of the study.
- To measure the change in functional fitness before and after exercise intervention paired t-tests were performed; using SigmaPlot® (V13).

Results

Table 1: Subject Demographics

Exergaming Intervention (n=10)	
Subject Characteristics	**Mean ± SD**
Age (years) 2 Males, 8 Females	56.3 ± 3.77
Height (cm)	164.08 ± 10.43
Weight (kg) - Before	80.9 ± 20.59
Weight (kg.) - After	80.9 ± 20.68
Fat Mass (kg) - Before	31.27 ± 11
Fat Mass (kg) - After	31.77 ± 11.72
Fat Mass % - Before	38.3 ± 6.9
Fat Mass % - After	38.6 ± 7.8
Ethnicity -Caucasian -African American -Asian	 N=8 N=1 N=1

Table 1: There was no change in body composition before and after the exergaming intervention.

Results

Figure 1: Single-Leg-Stand Test

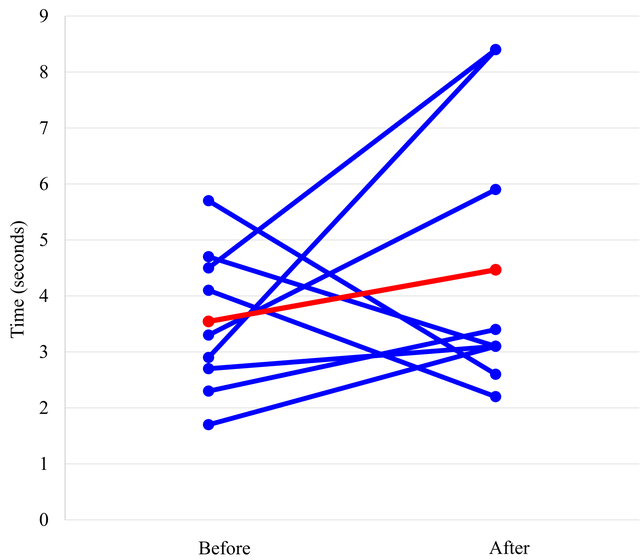

Figure 1: Colored in blue are individual times for the single leg stand test measured before and after exercise intervention. The mean time is colored in red. $p = 0.355$. (n=9)

Figure 2: Sit-To-Stand Test

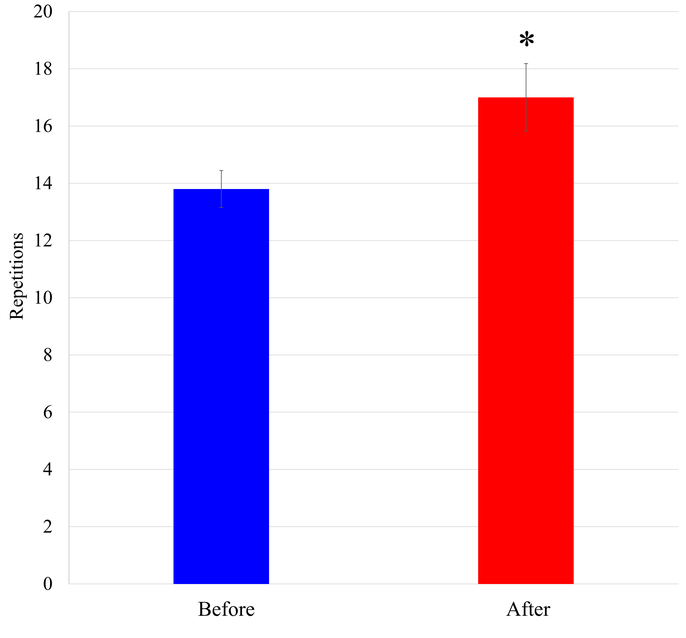

Figure 2: Mean ± SEM repetitions during a sit to stand test measured before and after exercise intervention. * $p < 0.01$. (n=10)

Figure 3: Three Minute Step Test

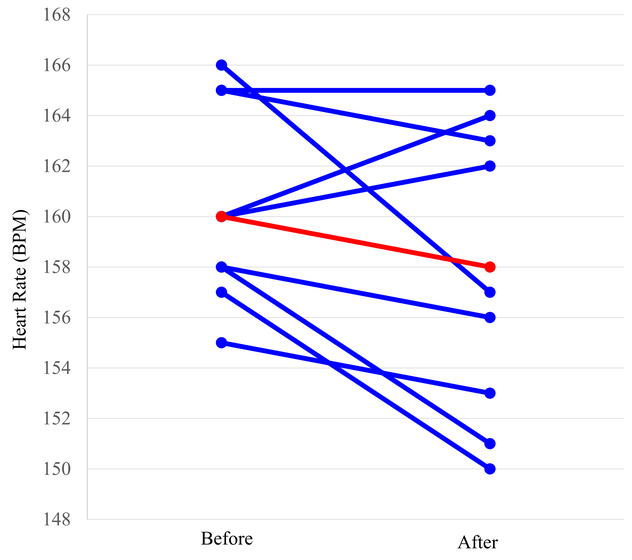

Figure 3: Colored in blue are the individual max heart rates during the 3 minute step test measured before and after exercise intervention. The mean max heart rate is colored in red. $p = 0.117$. (n=9)

Discussion

The study is currently in progress with 11 participants completed with an additional 11 yet to begin. A 19% increase in 30-second sit-to-stand repetitions was seen after the eight week exercise training. No other tests significantly improved. We expect that trending improvements in other functional fitness tests will become significant once the remaining participants have completed the exercise training.

According to the Self Efficacy Survey and Subjective Exercise Experience Scale all participants reported that they felt great after playing the Wii®. Ten out of eleven participants reported they were at least 70% confident that if they had a Wii® in their home they would exercise for 20 minutes a day three days a week for the next month. Eight out of eleven participants reported with at least 70% confidence that if they had a Wii® in their home they would exercise for 20 minutes a day three days a week for the next three months. Participants highly agreed with the efficacy of using the Wii Fit® as an exercise modality.

Conclusion

These findings suggest that eight weeks of Nintendo Wii® exergaming can improve functional fitness. Improving functional fitness can lead to improved quality of life and emotional well-being in older, sedentary men and women. According to the surveys participants are more likely than not to continue to use the Wii Fit® after completion of the study.

The Wii Fit® can be further studied as an in-home exercise modality for sedentary people.

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