

THE EFFECT OF VIRTUAL REALITY TRAINING ON BALANCE, GAIT AND MOBILITY IN PERSONS WITH PARKINSON'S DISEASE: A SYSTEMATIC REVIEW



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OVERVIEW

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- Introduction
- Databases
- Search Terms
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- Results
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INTRODUCTION

- Parkinson's Disease(PD) is a progressive neurodegenerative disease affecting motor, sensory and cognitive function
 - Motor functions: postural stability and functional mobility
- These deficits profoundly impact one's independence and greatly increases risk of falls
- The combined direct and indirect cost of PD is estimated to be \$25 billion per year in the United States¹
- Average medication costs for an individual with PD is \$2,500 per year¹
- Current treatment includes medication, surgery and lifestyle changes

VIRTUAL REALITY AND FORCE PLATES

Commercially Available

- Wii Fit
 - Includes balance board that senses weight distribution
- Microsoft Kinect
 - Senses body position and depth in space to determine body motion



Non-Commercially Available

- Force Plates
 - Measures weight distribution

PURPOSE

- The purpose of this systematic review was to determine the effect of virtual reality (VR) on improving balance, gait and mobility in adults with Parkinson's Disease (PD).

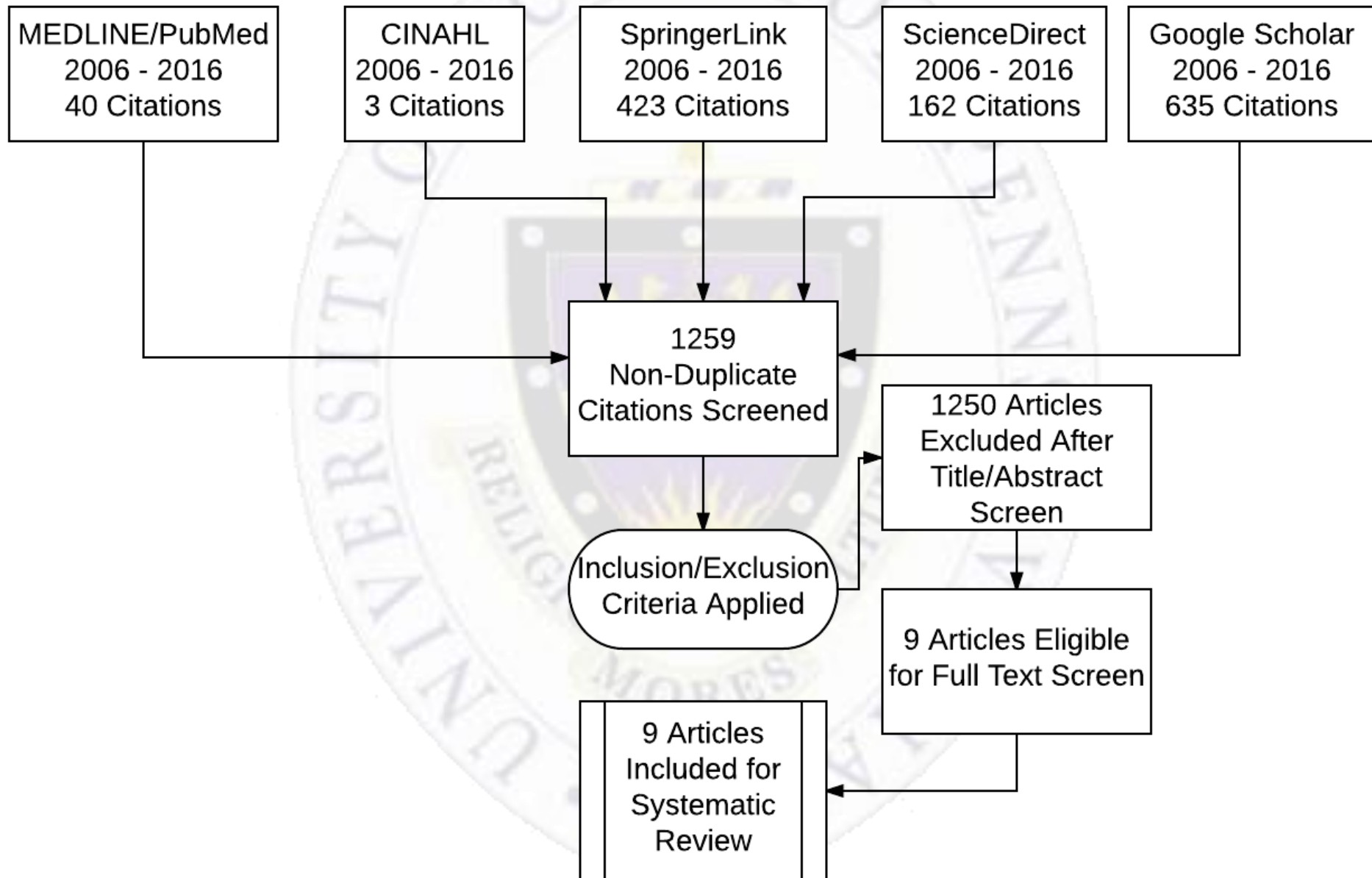
METHODS

- Databases: Science Direct, SpringerLink, Google Scholar, CINAHL, Medline/PubMed
- (Parkinson's Disease OR Parkinson's OR PD) AND (virtual reality OR visual augmented feedback OR VR) AND (balance OR gait OR mobility)
- Search limits: English, humans, and peer-reviewed

SELECTION CRITERIA

- Sample Population: adults ≥ 18 y/o, confirmed diagnosis of PD
- Interventions: virtual reality (immersive or non-immersive)
- Outcome: balance, gait, and mobility
- Study Designs: Randomized Controlled Trials

PRISMA Chart



RESULTS

- A total of 1,112 articles were screened for eligibility. Following detailed appraisals, 9 RCTs met the selection criteria.
- Sample sizes ranged from 20-44 participants (256 total; avg. age 66.5 y/o) with mild-moderate PD (H&Y Stages I-III)

RESULTS

- Treatment parameters varied at 2-5 sessions/wk (30-60 min) with 6.5 wks average duration (range 4-12 wks)
- Seven studies used VR systems with a force plate (FP) and external display [5 of 7 fixed (2 Wii Fit), 2 dynamic], one used a handheld controller with no force plate (Wii), and one study used a body position sensor (Kinect)

RESULTS

- Training was administered by a PT during the “on” phase of medication for all participants
- Primary outcomes included:
 - standing balance (SOT, rhythmic weight shifts, BBS, FRT, SLS)
 - gait (DGI, TUG, 10MWT, tandem gait, obstacle crossing)
 - mobility/ADLs (MBI, STS, PDQ-39, UPDRS2)

RESULTS

- Statistically significant improvements were found between the experimental groups vs. the control groups for balance in 4 studies (Wii Fit, dynamic FP, Wii, Kinect), gait in 2 (Wii Fit, dynamic FP) and mobility in 2 (Wii Fit, Wii)
- Statistically significant improvements were found within both groups for balance in 3 studies (fixed FP, dynamic FP, Wii), gait in 1 (fixed FP), and mobility in 2 (Dynamic FP/Biodex, Wii)

CONCLUSION

- Findings are mixed as to whether VR is superior to traditional PT
- However, there is moderate evidence that VR combined with exercise and/or treadmill training improves balance, gait and/or mobility in persons with mild-moderate PD

CLINICAL RELEVANCE

- Commercially available VR systems (i.e., Wii, Wii Fit, and Microsoft Kinect) were equally as effective as other dynamic and fixed FP systems to enhance balance, gait and mobility in patients with mild-moderate PD
- Effective protocols included VR combined with exercise and/or treadmill training for 20-30 mins, 2-3X/wk for 6-12 weeks duration
- Based on the evidence, clinicians should consider the use of VR as a safe, feasible adjunct to the treatment of patients with PD in clinical and home settings

LIMITATIONS

- Widely variable treatment parameters and outcomes, small sample sizes and complex equipment used in some studies
- Our research was limited to the databases we searched

FUTURE RESEARCH

- Future research is needed to define VR treatment parameters to optimize balance, gait and mobility outcomes in this population

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CASE STUDY

- 62 y/o male
- Diagnosed with PD 3 years ago; started medications 1 year ago
- H & Y stage 2
- Deficits include:
 - Narrow BOS, decreased step length, festinating gait pattern, stooped posture, difficulty transitioning surfaces and navigating narrow spaces, abnormal balance strategies, poor recovery for LOB
- Outcome Measures:
 - TUG: 16 seconds
 - BBS: 38/56
- Intervention: VR (Wii, Kinect) in combination with treadmill training: 2x a week for 30-60 minutes for 6 weeks