



2017

The effects of exergaming interventions on cognition and physical activity of institutionalized older adults: A systematic review

Gauthier-Beaupré, Amélie and Biss, Renée K. and Talebzadeh, Arezoo and Sultana, Afroza and Chu, Charlene H.

Suggested citation:

Gauthier-Beaupré, Amélie and Biss, Renée K. and Talebzadeh, Arezoo and Sultana, Afroza and Chu, Charlene H. (2017) The effects of exergaming interventions on cognition and physical activity of institutionalized older adults: A systematic review. In: 9th Canadian Conference on Gerontology, 2-4 Nov 2017, Toronto, Canada. Available at <http://openresearch.ocadu.ca/id/eprint/2399/>

THE EFFECTS OF EXERGAMING INTERVENTIONS ON COGNITION AND PHYSICAL ACTIVITY OF INSTITUTIONALIZED OLDER ADULTS: A systematic review



Amélie Gauthier-Beaupré¹, Renée K. Biss², Arezoo Talebzadeh³, Afroza Sultana⁴ & Charlene H. Chu⁵

¹ University of Ottawa; ² Baycrest Health Sciences, Ontario Telemedicine Network, & Centre for Aging + Brain Health Innovation; ³ MDes Design for Health & Ontario Association of Architects; ⁴ School of Information Studies, McGill University; ⁵ Dept. of Occupational Science, Faculty of Medicine, University of Toronto — email: agaut039@uottawa.ca

INTRODUCTION

Older adults with mild cognitive impairments or dementia:

- ↓ physical activities in long-term care homes
- High-risk of inactivity consequences and social withdrawal

Exergaming benefits:

- Cognition
- social engagement
- well-being
- physical capabilities

RESEARCH QUESTION

What are the effects of interactive exergaming on cognition and physical activity in older adults with mild cognitive impairments (MCI) or dementia?

METHOD

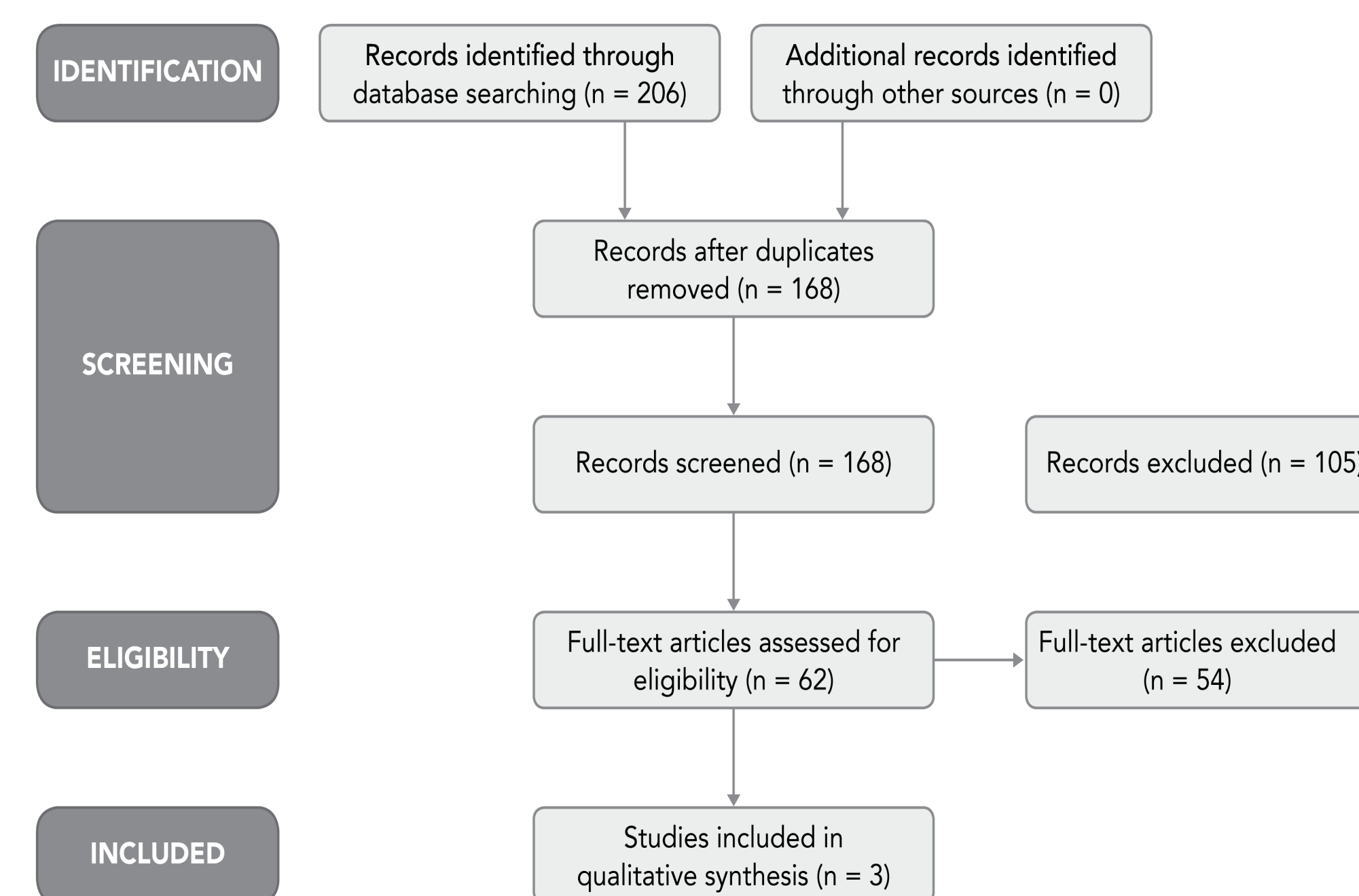
LITERATURE SEARCH

- Databases: MEDLINE, CINAHL, PsycINFO, and Compendex
- Keywords: older adults with mild cognitive impairment or dementia, technology-based games, physical activity and long-term care facilities
- Limits: English and years >2007

INCLUSION/EXCLUSION CRITERIA

	INCLUDE	EXCLUDE
STUDY TYPE	Quantitative studies (original research studies, reviews, pilot studies, etc.)	Non-scholarly articles, dissertations, qualitative studies
PARTICIPANTS	Older adults (mean age of 65 or older) MCI or dementia	People younger than 65 No MCI or dementia
SETTING	Nursing home, long-term care facility, care home	Own home in the community, complex continuing care unit, retirement home, assisted living
INTERVENTION	Exergaming, interactive games, motion based games	Physical inactive activities (e.g., inactive virtual reality)
COMPARATOR/CONTROL GROUP	Any (pre/post design, randomized control trial, etc.)	
OUTCOME	Motivation, cognition, emotion, social, physical	

PRISMA Diagram (Moher et al., 2009)



RESULTS

REFERENCE	STUDY DESIGN	N PARTICIPANTS	PARTICIPANT DESCRIPTION	SETTING	EXERGAMING TECH	INTERVENTION	COMPARISON/CONTROL GROUP	RELEVANT OUTCOMES MEASURED	SUMMARY OF PHYSICAL OUTCOMES	SUMMARY OF COGNITIVE OUTCOMES
Delbroek et al. (2017)	Randomized control trial	N = 20 (Intervention group n = 10; Control group n = 10)	Older adults who were able to walk 10 meters repeatedly with walking aid, lived for at least 3 months at the residential care center and suffered from mild cognitive impairment (MoCa < 26)	Residential care center in Belgium	BioRescue training (RM Ingenierie, France)	Played the BioRescue program which was offered by a physical therapist and consisting of 3 minute exercises used to train balance, weight bearing, memory, attention and dual tasking. The degree of difficulty of each exercise was adapted to participant abilities.	Usual care	MoCA, Cognitive-motor dual tasking (instrumented timed up and go test + visual matching task). Observed Emotion Rating Scale (OERS), Intrinsic Motivation Inventory (IMI)	The total time of the iTUG improved significantly after 6 weeks training in the intervention group (17.2 sec versus 15.8 sec, p=0.02). The turn-to-sit transition improved in the intervention group by almost a second (p=0.02), whereas the sit-to-stand transition or turn duration did not improve. However, the step-time before the turn decreased significantly in the intervention group (0.7 sec versus 0.5 sec, p=0.02)	No changes on the MoCA in either group. Dual task was too challenging for participants although supplementary analyses suggested intervention group improved. Sadness, anger and anxiety were almost never experienced during the BioRescue during gameplay, while alertness and pleasure were often observed. On the IMI, participants reported the program to be interesting and pleasant.
Liou et al. (2015)	Quasi-experimental	N = 32 (Intervention group n = 23; Control group n = 9)	institutionalized older adults with mild cognitive impairments	"Institutionalized" but no other detail is given about the setting	Xbox-360 Kinect	Xbox-360 Kinect (games: Kinectimals, Body and Brain Exercises, Kinect Sport 1&2 and Fruit Ninja) for 20 min twice/week for 8 weeks	No additional training	Ruler Drop Reaction Time Test (RDRTT) for simple reaction progress, Mini-Mental State Examination (MMSE) and Clinical Dementia Rating (CDR) to understand cognitive states	Reaction time significantly decreased for the Kinect group. No change in the control group. Difference between groups not tested.	N/A (unless we consider reaction a cognitive outcome rather than physical outcome)
Colombo et al. (2012)	Case study	N = 10	Persons with dementia (no mean age identified)	Long Term Special Care Units	Eye Toy: play for PlayStation 2	Exercise of upper limbs by blowing up blue bubbles from a screen where the image of the person was captured in. Sessions were held twice weekly in quiet rooms. Exergames were shown stepping through increasing difficulty levels (i.e.: different colors, speed of movement, bi manual dexterity required).	Changes in outcomes from initial state to after study	Mini Mental Status Examination (MMSE13) for cognitive states, Balance: Tinetti gait; MOSES for social interactions and withdrawal	Balance and gait didn't change at the end of the trial. Motor performances improved especially in subjects interested in the game since the beginning.	Significant increase in MMSE from 16.4/30 (4.6) before virtual environment engaging to 18/30 (4.6) after it (p<.05). Good level of involvement by persons with dementia, who looked interested towards the game and technology.

Cognition: Improvement in alertness, concentration and memory capabilities. In one of the three studies though, there were no increase in memory capabilities.

Physical: Two of the three studies reported a significant pre/post-test improvement to motor function but gait did not improve.

CONCLUSIONS

- Insufficient evidence on benefits of exergames on cognition and motor capabilities of institutionalized older adults with mild cognitive impairment or dementia.
- More robust research looking at the effects of exergames on cognition and motor function is needed. Additional development of exergames tailored to the needs and interests of this population is also required.

REFERENCES

Colombo, M., Marelli, E., Vaccaro, R., Valle, E., Colombani, S., Polesel, E., ... Guaita, A. (2012). Virtual reality for persons with dementia: an exergaming experience. *Gerontechnology*, 11(2), 402–405.

Delbroek, T., Vermeylen, W., & Spildooren, J. (2017). The Effect of Cognitive-Motor Dual Task Training with the Biorescue. *The Journal of Physical Therapy Science*, 29, 1137–1143.

Liou, M., Chen, S.-T., Fu, H.-C., & Chiang, I.-T. (2015). Effects of Somatosensory Video Games on Simple Reactions of Institutional-Dwelling Older Adults with Mild-Cognitive Impairments (pp. 428–429). IEEE. <https://doi.org/10.1109/ICALT.2015.27>

Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. doi:10.1371/journal.pmed1000097