

Feasibility of an in-home remote exercise intervention for older adults with mild cognitive impairment during the COVID-19 pandemic: a pilot study

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Purpose

- The older adult population is growing rapidly, along with cases of dementia and Alzheimer's disease
- Currently, 50 million cases of dementia are reported worldwide (World Health Organization, 2020)
- Previous studies show that aerobic exercise is associated with improved cognition (specifically executive function) in older adults with mild cognitive impairment (MCI) (Anderson-Hanley et al., 2012, 2018; Ludyga, 2016)
- More recent studies demonstrate a combined/synergistic effect of integrative physical and cognitive exercise leading to greater cognitive benefits (Anderson-Hanley et al., 2012, 2018; Wall et al., 2018)
- However, only a small proportion of older adults get recommended amounts of physical exercise
- Telemedicine is a rapidly growing field with techniques that could provide older adults with access to a highly engaging neuro-exergame that can motivate exercise (Wall et al., 2018), with continual efforts made to increase accessibility to technology and ease of use
- In response to the COVID-19 pandemic, we conducted a pilot study to test the feasibility of a home-based, remote exercise intervention for older adults
- All communications via email and Zoom
- Shipped apparatus (iPad, pedaler, watch, etc.) to participants' homes

Methods

- Through a collaboration with Pacific Brain Health Center (PBHC), three older adult volunteers with MCI (and their partners) were recruited from Los Angeles county, CA
- Participants used under-desk pedalers and iPad Air 2 to play the Memory Lane neuro-exergame 3-5 times a week for three months
- Participants pedaled along a virtual bike path, steering at forks in the road to complete assigned errands, and then retrace path
- Participants instructed to track exercise progress in a written logbook and on a monthly basis, answer questions about self-perceived effort
- The Montreal Cognitive Assessment (MoCA) was completed by participants on the iPad and was administered by a researcher over Zoom
- Memory lane (iPACES v2.0) utilized in this study was created through a collaboration with software company 1st Playable Productions in Troy, NY to improve playability and to create an iOS app on an iPad (Wall et al., 2018).
- 1st Playable Productions allowed us to create a new tourist version of the game in which errands became tourist destinations in various regions (NY, CA, Europe, etc.)



References

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Results

Set-up process:

- Cadence meter issues with one participant; fixed once research team sent new cadence meter (hard to instruct cadence setup remotely)
- Equipment was not adaptable

Exercise apparatus/Ergonomics:

- Difficult to elevate heart rate
- Uncomfortable to sit up straight while pedaling; reclining/leaning back slightly was more comfortable
- Pedaler slid forward away from chair, hard to mount in place

iPad/Zoom:

- Zoom: easy to use on iPad
- Long iPad charging time (one participant: 1.5 days to charge)
- Dizziness due to pedaling movement while watching moving figures on-screen

Bluetooth devices:

- Faulty/weak watch connection
- Difficult to set up connection; would have liked to have pre-established Bluetooth connection

Memory Lane:

- Game was entertaining and challenging at first, but eventually the errands became repetitive and increased familiarity made the game too easy for some, toggling on coin rewards enhanced challenge
- Enjoyed the challenge of increasing length of errand list with each new round

Cognitive tests:

- Some were easy, others challenging (overall adequate difficulty level)

Conclusions

- First remote neuro-exergaming trial in our lab: shipped our apparatus setup directly to participants' homes, used Zoom as primary communication tool to provide instructions and administer neuropsychological testing
- Participants found neuro-exergame interesting, but had several setup and technical difficulties
- Advantages: simple user interface, game adaptability added new challenge for participants, Testflight allowed for easy upload of new versions (enticed participants to stay interested, fix software bugs/errors)
- Limitations: difficulties with Bluetooth connection between watch, iPad, and cadence meter, difficult pedaler apparatus setup, uncomfortable seating, expensive shipping costs
- Future research must look for new user-friendly ways to allow for easier/more efficient apparatus setup, more comfortable/efficient ergonomic setup, and less convoluted Bluetooth system (ex. Cubii Pro pedaler with built-in cadence meter)
- Future work should incorporate new tourist version of iPACES Memory Lane to more effectively engage and motivate participants
- Clinical implications: eventually use neuro-exergaming interventions as prescriptive treatments to ameliorate the cognitive decline associated with Alzheimer's disease and other dementias