LETTER TO THE EDITOR

IMPLEMENTING HOME-BASED EXERCISE TECHNOLOGY IN A NURSING HOME: DOES MCI STATUS MATTER?

Dear Editor,

The scientific literature highlights the necessity of implementing appropriate exercise programs in nursing homes to overcome the barriers to physical activity, and avoid prolonged periods of sedentary (e.g. sitting) and autonomy decline among residents. Growing evidence indicates that exergaming approaches for physical activity promotion, such as interactive video games, lead to increased enjoyment and motivation in addition to positive cognitive and physical outcomes, while being cost effective (1). The Jintronix Rehabilitation System®(JRS), a new home-based exercise technology, that has a unique ability to adapt to individuals' limitations (i.e. range of motion, speed, intensity, etc.), and increasing difficulty of games as well as automated reminders and feedback can provide users with an increased sense of control and self-efficacy, which is something that other systems lack (2). Previous studies have demonstrated that the JRS is feasible, acceptable and safe in various population such as community-living older adults who sustained a minor injury (3) or pre-disabled older adults without dementia or cognitive impairment (4). Given its potential, we explored the feasibility, acceptability and efficacy of the JRS on physical performance in nursing home residents both with and without MCI.

To address this objective, we conducted a pilot study in one nursing home (i.e. Ross Home) located in Dunedin, New Zealand. Participants enrolled in the study were classified into 2 groups according to cognitive status: mild cognitive impairment (MCI) and non-mild cognitive impairment (NMCI) groups. Four-weeks of individualized and supervised intervention (1 session/week; 20-25min/session) were conducted. Adapted exercise programs (i.e. standing, standing/sitting or sitting) targeting balance and strength were created using JRS. More specifically, each session consisted of a warm-up (i.e. walking on the spot), cool down (i.e. heel raises and/or hip abduction) and a core program (i.e. nine exercises) targeting movements to improve balance and strength. The core program consisted of: 1 strengthening exercise, 2 balance exercises and 6 combined exercises delivered as a exergames (e.g. kicking a soccer goal, whack a mole, catching word balloons). The level of difficulty was individualized throughout the intervention, according to participant performance, based on "Jintronix quality of movement". A score ≤ 50% resulted in a decreased in difficulty level for that exercise while a score ≥ 80% lead to an increase of the difficulty level.

Socio-demographic characteristics were collected at baseline (i.e. age, sex, ethnicity, first language, level of education, comorbidities, history of mood/depression, falls history, duration living at Ross Home, walking aid use, current physical activity levels). Feasibility (i.e. adherence, quality of movement (QOM) and level of autonomy) and acceptability (i.e. self-perceived enjoyment (PLE) and 2) self-perceived difficulty (PLD)) were obtained through the JRS software and a face-to-face interview. Physical performance (i.e. Timed up and Go test (TUG) and five sit-to-stand test (5STS)) was assessed pre- and post-intervention. Paired t-tests were performed to compare functional outcome data before and after the intervention. Per protocol analysis were performed in all sample and according to the cognitive status (i.e. MCI or NMCI). All statistical analyses were performed using SPSS 25.0 (Chicago, IL, USA). P-value ≤ 0.05 was considered statistically significant.

From the fourteen recruited participants, nine (82.7±6.7 years; female: 56%; MCI (n=4) and NMCI (n=5)) completed the intervention. A larger proportion of participants with MCI had attained higher tertiary education than NMCI participants (75 vs. 60%, respectively). History of physical activity (childhood) was also higher in MCI (100%) compared with NMCI group (60%). Both groups were comparable for all the

Table 1
Feasibility and acceptability of the Jintronix Rehailitation System (JRS)

Variables	Total sample (n=9)	NMCI (n=5)	MCI (n=4)
Feasibility			
Adherence (%)	89.3	85	100
QOM (%)	94.9	95.5	94.1
Exercises self- initiated (%)	73.7	93.7	53.3
Additional instructions required (%)	33.5	22.4	44.2
Acceptability			
PEL (%)	84.5	91.7	83.3
PLD (%)	95.8	100	95.8

NMCI: Non Mild Cognitive Impairment; MCI: Mild Cognitive Impairment; QOM: Quality of Movement; PEL: Perceived Enjoyment Level; PLD: Perceived Level of Difficulty

other measured characteristics.

Six (3 NMCI; 3 MCI) participants (66.7%) followed the standing program and attended 89.3% of the sessions (MCI: 100% vs. NMCI: 85%). The average quality of movements (QOM) in the core program was 84.6% (MCI: 82% vs. NMCI: 86%). One NMCI participant following the limited standing program, attended 100% of the session and reached 89% on QOM. Two participants (1 MCI; 1 NMCI) followed the seated program, attending 87.5% of the sessions and had a QOM of 79%. Participants reported also high acceptability (PEL enjoyment and PDL difficulty perceived >80% in both groups) (Table 1).

Finally, our results highlights that TUG significantly improved during the intervention period in the NMCI group (PRE: 22.8±8.79 sec vs. POST: 20.1±7.02sec; p=0.03) but not the MCI group (p=0.09). A significant improvement in walking speed was also observed in the NMCI group (PRE:0.31±0.06 m/s vs. POST: 0.34±0.07 m/s; p=0.03). This improvement in gait speed is above the minimal detectable change of 0.03 and therefore considered clinically relevant (5).

In conclusion, this 4-week pilot intervention observed that using JRS in older adults with or without MCI and living in nursing home is feasible, acceptable, safe. Clinically meaningful changes in physical function were achieved with this low dose of exercise in people without MCI. Additional studies are needed to determine if a longer duration would improve physical function in older adults with MCI residing in nursing homes.

Conflict of interest: The authors have no conflicts of interest to declare.

F. Buckinx[1,2], D.L. Waters[3], M. Aubertin-Leheudre[1,2]

1. Département des Sciences de l'activité physique, Groupe de Recherche en Activité Physique Adaptée (GRAPA), Université du Québec à Montréal, Montréal, Canada; 2. Centre de Recherche de l'Institut Universitaire de Gériatrie de Montréal (CRIUGM), Montréal, Canada; 3. Department of Medicine and School of Physiotherapy, University of Otago, Dunedin, New-Zealand

Corresponding Author: Aubertin-Leheudre Mylene, Département des Sciences de l'activité physique, Faculté des Sciences, UQAM, Pavillon Sciences Biologiques, SB-4615, 141, Avenue du Président Kennedy, Montréal, Québec, Canada, H2X 1Y4. Email: aubertin-leheudre.mylene@uqam.ca

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