

Activating elderly in a long-term care institution by using exergames: A pilot study

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Introduction

Background: Around 30-50% of all adults over 65 who live at home will have at least one fall a year. Fall incidence increases up to 70% when living in a long-term care institution. Falls may cause older adults to decrease their activities of daily living (ADL), which in turn may have a negative impact on their wellbeing. Regular physical activity can reduce the risk of falling with 30%. However, the adherence to standard physical activity programs, which often include group exercises, is rather low, mainly because these exercises lack a motivational appeal. Therefore, alternative ways to stimulate physical activity in older adults are needed. Previous studies have already shown the potential of active video games (AVG) to increase motivation.

Objectives: To develop a program using active video games, i.e. exergames, to improve physical activity, and to evaluate its effectiveness on physical, mental and cognitive wellbeing in older people living in a long-term care institution.

Methods

Participants:

- N=29; living in a local long-term care institution (11 males, 18 females)
- Mean age = 82,59 ± 6,57 years (range= 66-94 years)
- Inclusion criteria: MMSE > 20, no epilepsy, able to walk 10 m without help
- Randomized into 3 groups: Kinect program, Standard physical activity (PA) program, Control group

Programs:

Kinect (N=8)

- Frequency:** 1 hour/session; 2 sessions/week, 8 weeks (16 sessions)
- Games:** Commercial Kinect games, played in a duo player mode. Selected to influence fall prevention risk indicators: *balance (B)*, *mobility/flexibility (M)* of arms, legs and/or trunk, *endurance (E)*, and *strength (S)* (see Table 1)

Table 1: Kinect program

Games		Fall prevention risk indicators			
		B	E	S	M
Bowling	Mini game pin rush		x	leg	arm
Soccer	Mini game super saver	x		leg	arm, trunk
	Mini game target kick	x		leg	leg
Boxing	2 rounds		x	leg, arm	arm
Skiing	2 runs	x		leg	arm, trunk
Golfing	3 holes	x			arm, trunk
Dancing	Just dance ‘Barry White’	x	x		arm, leg, trunk

Standard physical activity (N=9):

- Standard exercises that influence the same fall prevention risk indicators as the Kinect games, same frequency

Control (N=12):

- Weekly social talk (15 min)



Fig.1: Kinect program



Fig.2: Standard PA program

Outcome measures:

Physical wellbeing	Balance	Berg Balance Scale (BBS), Timed up and go (TUG)
	Strength	Handgrip force
	Mobility/flexibility	Functional Reach Test, Back Scratch Test
	Endurance	6-minute walk test (6MWT)
Emotional wellbeing	ADL	Modified Physical Performance Test (MPPT)
	Anxiety	Spielberger Stait-Trait Anxiety Inventory (STAI)
	Fear of falling	Fals Efficiency Scale International (FES-I)
	Depression	Geriatric Depression Scale (GDS)
Cognitive wellbeing	Loneliness	Loneliness Scale
	Inhibition	STROOP color-word Test
	Working memory	Digit span task
	Switching	Dual task

Results

Subjective outcome measures:

- High satisfaction** with both the Kinect and Standard PA program
 - ❖ Exercises/exergames were **fun** and **moderately intense**, **no adverse effects** were reported
 - ❖ **Boxing** and **golfing** were the most popular Kinect games, **dancing** the least popular
- Highest adherence** in the **Kinect group**
 - ❖ 75% completed all 16 sessions (compared to 44% in the Standard PA program)
 - ❖ **Social contact** during gameplay (with co-players and staff), and **growing self-confidence** were indicated as the most contributing factors of adherence
- Comparable self-reported effects** in both the Kinect program and Standard PA program (see Table 2)

Table2: Most important self-reported effects

Kinect	
Increased wellbeing	87,5%
Increased confidence	75%
Increased walking ability	75%
Less fear of falling	50%
Improved balance	50%
Standard PA	
Increased wellbeing	88,9%
Increased confidence	77,8%
Increased walking ability	55,6%
Increased happiness	66,7%
Less loneliness	44,4%
Improved balance	44,4%

Objective outcome measures:

- Kinect program and Standard PA program increased **functional reach** (mobility)
- Kinect program increased **working memory**

Table 3: Mean (M) and Standard deviations (SD) at Time 1 (T1, pre-intervention) and Time 2 (T2, post-intervention) and repeated measures analyses (RM)

	Kinect		Standard PA		Control		RM
	T1	T2	T1	T2	T1	T2	
Physical wellbeing							
BBS	44,75 (7,57)	45,88 (5,87)	44,11 (8,10)	44,33 (6,80)	45,42 (4,40)	47,67* (4,40)	T
MPPT	21,38 (7,65)	24,13 (5,25)	24,0 (7,71)	25,0 (6,78)	23,92 (5,12)	25,59 (5,60)	/
TUG	16,93 (7,28)	14,07 (3,47)	16,24 (7,50)	13,46 (4,31)	14,53 (3,09)	12,29* (2,26)	T
6MWT	231,36 (63,71)	249,40 (75,04)	222,0 (75,32)	245,32 (85,62)	231,56 (52,23)	263,24 (73,21)	/
Handgrip force	42,38 (14,93)	46,88 (17,88)	44,63 (14,70)	51,63 (20,81)	38,42 (13,81)	45,42* (14,74)	T
Functional Reach	-12,88 (7,62)	-5,63* (10,11)	-4,81 (6,43)	4,00* (7,73)	-8,88 (10,05)	-5,00 (15,23)	T
Back scratch	-14,43 (13,01)	-11,43 (11,21)	-16,86 (9,13)	-16,57 (10,36)	-14,63 (12,07)	-10,96 (11,13)	/
Emotional wellbeing							
FES-I	29,43 (15,74)	33,14 (11,91)	23,89 (8,40)	24,56 (7,81)	28,75 (10,86)	29,17 (9,37)	/
STAI	38,00 (14,58)	40,86 (11,70)	33,31 (8,87)	35,80 (6,94)	36,67 (11,68)	37,17 (8,58)	/
GDS	11,44 (7,90)	11,51 (7,82)	6,33 (3,71)	7,78 (5,02)	10,00 (7,24)	9,51 (6,43)	/
Loneliness scale	5,50 (3,89)	5,25 (2,55)	3,67 (2,24)	4,56 (3,28)	5,58 (3,29)	5,42 (2,50)	/
Cognitive wellbeing							
Inhibition	102,29 (62,7)	78,29 (38,49)	97,43 (55,38)	89,00 (32,02)	79,50 (30,41)	86,00 (40,37)	/
Working memory	9,57 (1,40)	10,71** (1,80)	10,56 (1,74)	11,00 (1,41)	10,42 (3,03)	9,42 (2,27)	T x G
Switching	22,86 (29,52)	16,27 (14,43)	22,79 (29,28)	17,43 (32,64)	13,82 (20,06)	15,04 (21,45)	/

Note: Effects of RM analyses: T=Time, T x G=Time x Group; *p<.05, **p<..01, ***p<.001

Conclusions

- Playing exergames has the potential to improve mobility and working memory in older adults living in a long-term care institution**
- Playing exergames has positive effects on social interaction and confidence**
- Confirmation of these findings in a larger study sample is recommended**

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