Effects of a giant exercising board game intervention on ambulatory physical activity among nursing home residents: a preliminary study

Alexandre Mouton, Nicolas Gillet, Flore Mouton, Dave Van Kann, Olivier Bruyère, Marc Cloes, Fanny Buckinx

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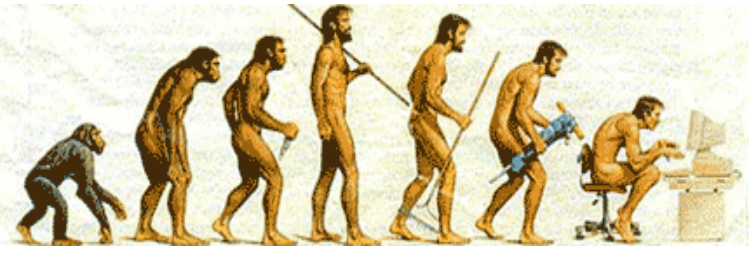
Being active…a forgotten need



Eaton & Eaton (2003)

Being active…in nursing homes?

- ✓ Majority of nursing home residents are physically inactive *(Paterson & Warburton, 2010)*
- ✓ Physical activity (PA) levels among nursing home residents are much lower than existing recommended levels (3000 steps/day) *(Tudor-Locke et al., 2011)*
- ✓ Most of their time is spent sleeping, doing nothing or watching TV in a lying or sitting position *(den Ouden et al., 2015)*
- ✓ Among the most sedentary segment of the society: increased risk of physical and neurocognitive impairments leading to frailty and increased mortality *(Sun et al., 2013; Clegg et al., 2013)*

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Benefits of physical activity in later life

- ✓ Significant health benefits among older adults who became physically active in later life *(Hamer et al., 2014)*
- ✓ Walking programs by ambulatory nursing home residents produced significant improvements in walk endurance capacity and distance *(Macrae et al., 1996)*
- ✓ Improvements in physical and muscular performances among this population could counter the development of frailty and preserve their quality of life *(Buckinx et al., 2016)*
- ✓ Moving beyond monotonous lifestyle in nursing homes:

➡ Making PA enjoyable and sociable to encourage residents to engage regularly in activities *(Chen & Li, 2014)*

➡ Growing evidence indicates that gaming approaches for PA promotion, such as board games, lead to increased enjoyment and motivation, in addition to positive cognitive and physical positive outcomes *(Bleakley et al., 2015)*

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Aim of the study

- Investigate the effects of a giant exercising board game intervention on ambulatory PA among nursing home residents

1. Primary objective: examine the effects of the intervention on the ambulatory PA of residents, by recording the number of steps/day and the energy expenditure (kcal/day)

2. Secondary objectives: assessment of the impact of the intervention on a broader array of physical and psychological outcome measurements, including measurements of physical and muscular performance, health and cognitive status, and motivation for PA.

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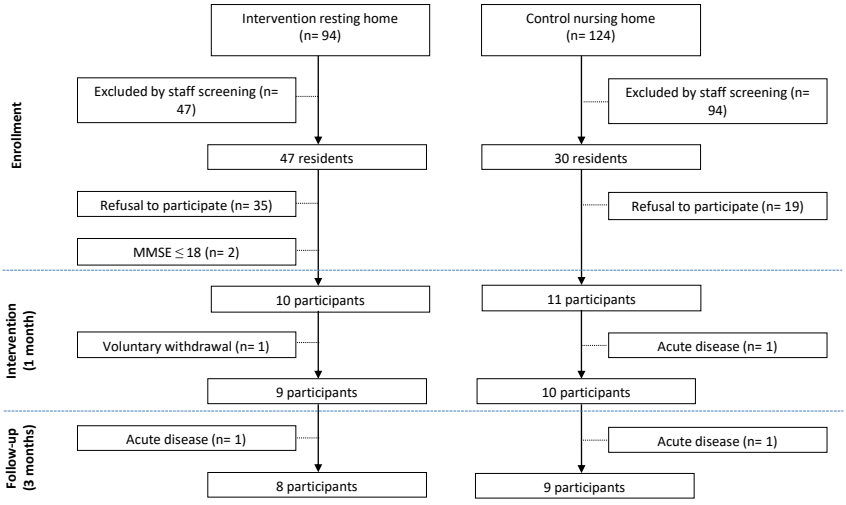
Methods

1 Recruitment



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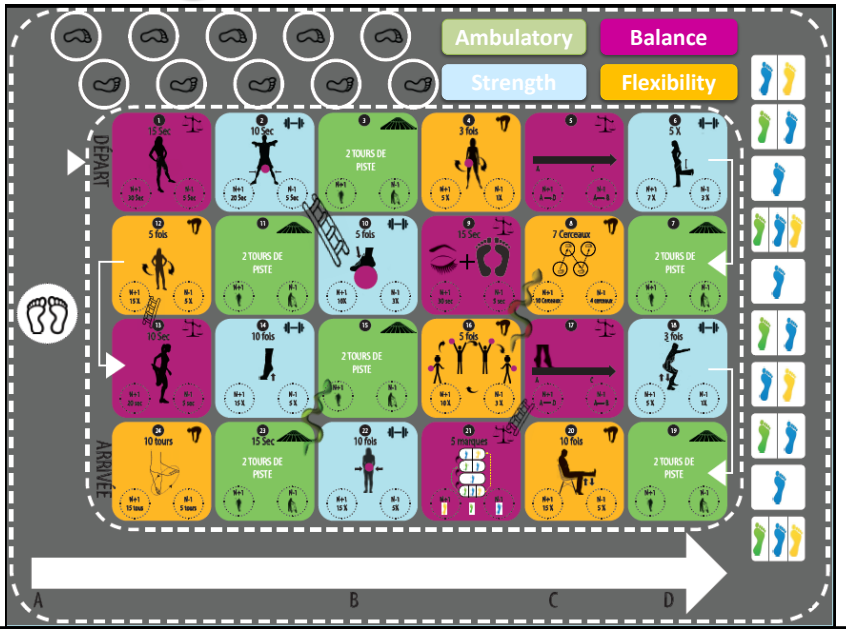
2 Intervention design



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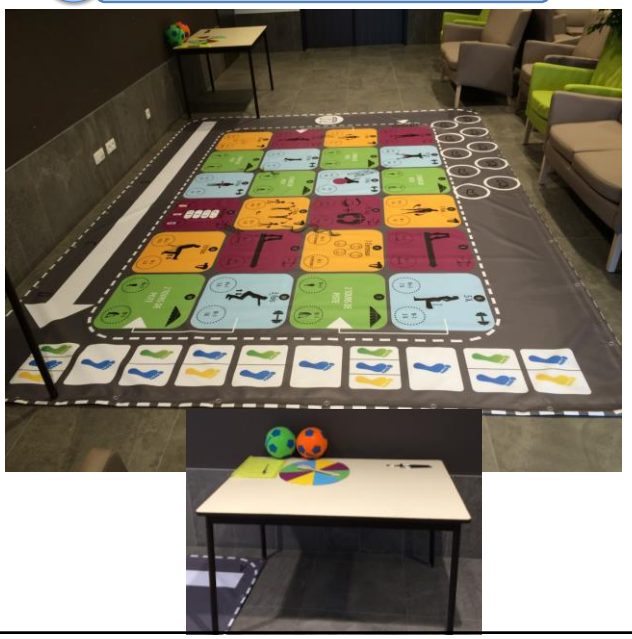
2 Intervention design



2 Intervention design

✓ Decreased assistance by a PA coach:

- ❖ 1st week: 4 sessions
- ❖ 2nd week: 3 sessions
- ❖ 3rd week: 2 sessions
- ❖ 4th week: 1 session

✓ Autonomy-oriented approach based on the self-determination theory (SDT):

- ❖ Promoting social interactions (relatedness)
- ❖ Providing adapted physical exercises (competence)
- ❖ Encouraging regular voluntary participation in the game (autonomy)

✓ Registration of participation in the game on a logbook after each session

3 Outcome measurement

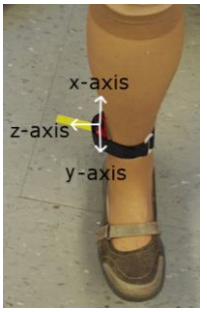
Baseline (T0) → **Post-intervention (T1)** → **Follow-up (T2)**

Intervention (1 month) | Follow-up (3 months)

Tests & interviews | Tests & interviews | Tests & interviews

✓ Pa level: 3 days of recording with ActiGraph GT3X ©

❖ Steps per day
❖ Energy expenditure (kcal/d)



*References for the tests are mentioned in the bibliography

3 Other assessment tools

Cognitive status	Mini-Mental State Examination (MMSE)
Quality of life	EuroQol 5-dimensions (EQ-5D)
Motivation for physical activity	Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2)
Body balance, physical, and muscular performance	
Body balance , gait	Tinetti test
Body balance , gait, chair stand	Physical Performance Battery (SPPB)
Functional mobility	Timed Up and Go test
Muscular isometric strength *- knee extensors and flexors* *- hip abductors and extensors* *- ankle flexors and extensors*	MicroFET2 hand-held dynamometer 

Questionnaires: structured face-to-face interview

*References for the tests are mentioned in the bibliography

Results

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1 Baseline characteristics

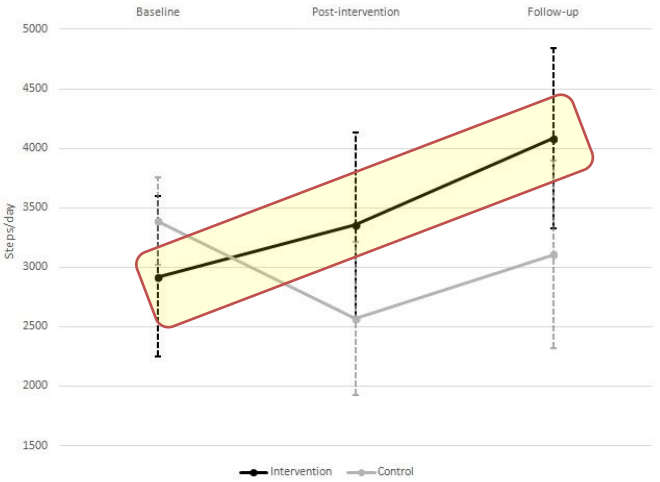
✓ No significant differences at baseline

Characteristics	Intervention group (n=10)	Control group, (n=11)	P-value
Sex			
Women	6 (60)	8 (72.7)	0.54
Age (years)	82.5 (79–89)	89.9 (87–91)	0.08
Height (cm)	162.9 (158–170)	159.2 (146–169)	0.53
Weight (kg)	67.7±19.2	64.1±15.8	0.85
Body mass index (kg/m²)	25.3 (20.5–28.6)	25.4 (22.1–24.7)	0.97
Energy expenditure (kcal/d)	1,753.3 (1,639–1,877)	1,658.2 (1,569–1,794)	0.33
Steps per day (number)	2,920.9±1,351.5	3,386.8±730.7	0.19
MMSE score (/30)	26.6±2.2	25.6±2.5	0.56
EQ-5D score (%)	64.2 (58.7–76.4)	60.3 (50.4–76.4)	0.56
Relative autonomy index (BREQ-2)	30.5±14.5	31.6±16.9	0.82
Tinetti score (/28)	23.6±3.2	23.5±2.5	0.92
SPPB score (/12)	7.9±2.7	6.6±2.3	0.28
Time up and go test (sec)	16.2 (10.4–19.8)	22.7 (13.9–23.6)	0.22
Strength of the knee			
Extensors (Ne)	113.2±56.4	110.7±38.6	0.76
Flexors (Ne)	108.9±43.8	117.8±28.6	0.56
Strength of the hip			
Extensors (Ne)	93.9±55.4	88.2±36.9	0.71
Flexors (Ne)	74.2±44.8	60.2±16.5	0.92
Strength of the ankle			
Extensors (Ne)	93.9±48.8	89.9±29.9	0.81
Flexors (Ne)	65.3±35.2	82.4±20.5	0.31

2 Steps/day

- 2921 steps/day at baseline
- 3358 steps/day post-intervention (+14.9%, $p = 0.04$)
- 4083 steps/day after 3 months follow-up (+39.8%, $p = 0.03$)

Intervention group



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3 Other outcomes

- Significant increase of energy expenditure/day
  - after the intervention (+112 kcal/day, +6.3%, $p = 0.01$)
  - after three months (+213 kcal/day, +12.3%, $p = 0.02$)

Intervention group

- Significant improvement of perceived quality of life after three months ($p = 0.04$)

Characteristics	Post-intervention (T1)	P-value[a]	Follow-up (T2)	P-value[b]
Energy expenditure (kcal/day)				
Intervention group	+112.00 (−56.3 to +221.7)	0.01	+205.29 (+47.7 to +353.7)	0.02
Control group	−88.00 (−236.2 to +89.8)	0.03	−212.89 (−429.2 to −121.2)	<0.01
P-value[c]	<0.01		<0.01	
EQ-5D score (%)				
Intervention group	+6 (+2.9 to +14.5)	0.11	+0.1 (−6.9 to +17.1)	0.04
Control group	+0.1 (−5.5 to +12.2)	0.21	−1.0 (−16.1 to +12.2)	0.43
P-value[c]	0.83		0.94	
Relative autonomy index (BREQ-2)				
Intervention group	−7.75±24.05	0.24	−3.00±30.69	0.67
Control group	−8.20±14.99	0.11	−13.00±13.26	0.02
P-value[c]	0.86		0.35	

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3 Body balance, physical and muscular performance

- Tinetti scores increased significantly after the follow-up period (+9.1%)

Intervention group

Characteristics	Post-intervention (T1)	*P*-value[a]	Follow-up (T2)	*P*-value[b]
Tinetti score (/28)				
Intervention group	+1.00±2.12	0.14	+1.80±2.12	0.02
Control group	−0.80±0.55	0.48	+0.55±2.19	0.37
P-value[c]	0.20		0.34	
SPPB score (/12)				
Intervention group	−0.77±1.79	0.24	−0.50±1.60	0.47
Control group	−0.10±2.92	0.45	−0.55±2.01	0.41
P-value[c]	0.82		0.37	
Time up and go test (sec)				
Intervention group	+1.88 (−3.7 to +4.1)	0.07	−0.99 (−4.9 to −0.4)	0.19
Control group	+0.46 (−8.7 to +2.9)	0.68	+0.55 (−7.3 to +3.4)	0.88
P-value[c]	0.43		0.11	

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Introduction > Methods > Results > Conclusions

3 Body balance, physical, and muscular performance

Intervention group

- Strength of ankle extensors (+37.6%) and flexors (+32.1%) increased significantly

Characteristics	Post-intervention (T1)	*P*-value[a]	Follow-up (T2)	*P*-value[b]
Strength of the knee				
Extensors (Ne)				
Intervention group	+37.65±62.89	0.15	+44.59±77.99	0.11
Control group	+10.27±20.05	0.17	+13.62±25.06	0.23
P-value[c]	0.28		0.37	
Flexors (Ne)				
Intervention group	+24.73±30.04	0.05	+30.47±50.52	0.09
Control group	+4.83±22.78	0.37	−0.81±20.72	0.95
P-value[c]	0.89		0.69	
Strength of the hip				
Extensors (Ne)				
Intervention group	+10.35±52.05	0.59	+23.07±54.72	0.41
Control group	+6.26±22.73	0.37	−4.91±27.14	0.57
P-value[c]	0.91		0.02	
Flexors (Ne)				
Intervention group	+2.32±39.09	0.59	+18.05±40.92	0.32
Control group	+17.57±8.9	<0.01	+13.63±13.94	0.41
P-value[c]	0.83		0.12	
Strength of the ankle				
Extensors (Ne)				
Intervention group	+26.30±45.42	0.04	+45.74±45.09	0.02
Control group	+11.56±27.72	0.21	+10.98±22.32	0.48
P-value[c]	0.21		0.08	
Flexors (Ne)				
Intervention group	+31.78±38.66	0.03	+23.69±33.37	0.03
Control group	+12.4±17.05	0.04	−13.23±16.67	<0.01

Discussion

✓ First study to implement a PA intervention driven by the SDT among nursing home residents

+ Social support experienced during the game

+ Pedagogical approach oriented towards progressive autonomy

+ Adapted activities

➡ Contribution to the significant outcomes observed in the intervention group
(Schutzer & Graves, 2004)

⚠ Participants in the study were those with the best level of autonomy

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- ✓ Participation in the giant exercising board game:

➡ Improvements in, or at least maintenance of physical states (QOL) that prevent further frailty and diseases among nursing home residents

- ✓ Improvements of the strength of the ankle in the intervention group : Strength and flexibility of the musculature is needed to ensure extension (dorsiflexion) and flexion (plantar flexion) of the ankle during walking

➡ Likely to be associated with gait and balance training *(Sherrington et al., 2012)*

➡ Could prevent falls and frailty *(Schultz et al., 2015)*

Exercising is not supervised: not control of an optimal intensity level
Results based on a limited number of participants from 2 nursing homes

Efforts were made to recruit 2 similar nursing homes (population, number of beds, services and geographical situation)

Clinical Interventions in Aging

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ORIGINAL RESEARCH

Effects of a giant exercising board game intervention on ambulatory physical activity among nursing home residents: a preliminary study

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Purpose: This study examined the effects of a giant (4×3 m) exercising board game intervention on ambulatory physical activity (PA) and a broader array of physical and psychological outcomes among nursing home residents.

Materials and methods: A quasi-experimental longitudinal study was carried out in two comparable nursing homes. Ten participants (aged 82.5±6.3 and comprising 6 women) meeting the inclusion criteria took part in the 1-month intervention in one nursing home, whereas 11 participants (aged 89.9±3.1 with 8 women) were assigned to the control group in the other nursing home. The giant exercising board game required participants to perform strength, flexibility, balance and endurance activities. The assistance provided by an exercising specialist decreased gradually during the intervention in an autonomy-oriented approach based on the self-determination theory. The following were assessed at baseline, after the intervention and after a follow-up period of 3 months: PA (steps/day and energy

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