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Featured Article

Loss of benefits after cessation of exercise interventions in nursing home residents: randomized controlled trial follow-up

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ABSTRACT

Exercise interventions improve physical fitness, cognitive and affective function, and quality of life among nursing home residents. However, little is known regarding the consequences of cessation of activity, or detraining. We analyzed physical fitness, physical activity level, cognitive function, quality of life, and loneliness during a 6-month observational follow-up after a 6-month randomized controlled trial in which nursing home residents performed either routine activities (control group) or group-based exercise (intervention group). The intervention group showed an important decline in most physical fitness and cognitive function parameters after a 6-month detraining period. These results highlight the importance of recreation as part of residents' care needs, and exercise should therefore be implemented continuously.

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Introduction

Nursing home residents are characterized by high levels of multimorbidity, deteriorated physical fitness, poor cognitive and affective functions, poor quality of life, and low physical activity level.[1] Maintaining physical fitness, cognitive and affective function, and quality of life is essential to preserve the capacity to perform routine activities of daily living.[2–4] However, nursing home residents spend most of the day engaged in sedentary activities.[5] Consequently, interventions are warranted to avoid decline in nursing home residents' health while promoting movement and overall wellness.[6]

The beneficial effects of regular physical exercise on physical fitness, cognitive and affective function, and quality of life in nursing home residents have been widely reported in the literature.[7–12] Despite these benefits, less attention has been given to the importance of maintaining exercise in older adults and the consequences of cessation of activity, known as detraining.[13,14] Some studies have described a decline in muscle function, physical fitness, cognitive and affective function, and quality of life in community-dwelling older adults after detraining,[13–16] but few studies have focused specifically on nursing home residents. Further, existing studies only analyzed short periods of detraining (4–12 weeks),[8,17] did not include a control group,[18] or only assessed the effects of detraining on physical fitness parameters but not on cognitive and affective function and quality of life.[19]

In this article, we sought to analyze whether 6 months of detraining reverses the effects obtained after a 6-month randomized controlled trial in which nursing home residents performed either routine activities or group-based exercise.[10] We hypothesized that 6 months of detraining would deteriorate nursing home residents' physical fitness, physical activity level, cognitive function, quality of life and loneliness parameters.

Methods

Study design

This was a follow-up study of a single-blind, multicenter, randomized controlled trial (ACTRN12616001044415) that took place in

Abbreviations: 1-RM, one repetition maximum; ANOVA, analysis of variance; BMI, body mass index; CG, control group; CST, 30-second chair-stand test; IG, intervention group; MoCA, Montreal Cognitive Assessment; QoL-AD, Quality of Life in Alzheimer's Disease; RAVLT, Rey Auditory-Verbal Learning Test; Rep, repetitions; SD, standard deviation; SPPB, Short Physical Performance Battery; TMT-A, Trail Making Test A; WAIS-IV, Wechsler Adult Intelligence Scale, Fourth Edition; WHR, waist-to-hip ratio

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October 2016–July 2017. All participants provided written informed consent. After baseline measurements were taken, participants were randomized through sealed opaque envelopes to either a control group (CG) or intervention group (IG) in each center. The study was approved by the Committee on Ethics in Research of the University of the Basque Country, UPV/EHU (Humans Committee Code M10/2016/105).

This study initially included residents from 10 nursing homes for a 6-month randomized clinical trial. To conduct the second part of the study, in which we assessed the effects of a 6-month observational follow-up period, four nursing homes (out of the 10 that initiated the study) agreed to conduct 6-month observational follow-up assessments. Therefore, the subsample of this study includes 31 residents from four nursing homes (out of the 112 residents from the 10 nursing homes that initiated the study).

Here, we analyzed physical fitness, physical activity level, cognitive function, quality of life, and loneliness parameters after 6 months of detraining.

Inclusion and exclusion criteria

Eligibility criteria for the interventional study consisted of women and men aged ≥70 years old who scored ≥50 on the Barthel Index[20] and ≥20 on the MEC-35 test[21] (an adapted and validated version of the Mini Mental State Examination in Spanish) and who were able to stand up from a chair and walk 10 meters independently. Participants were not eligible for the study if they were clinically unstable according to clinical judgment of the medical professionals of the reference center or in any other condition such that participation would not be in the participants' best interests.

Control group

Participants in the CG participated in routine low-intensity activities offered by each nursing home, such as memory workshops, reading, singing, and soft gymnastics.

Intervention group

In addition to routine activities, participants allocated to the IG participated in an individualized and progressive multicomponent exercise program at moderate intensity. The exercise program consisted of one-hour of supervised group training sessions twice a week for 6 months, involving individualized strength and balance exercises and walking recommendations. All sessions began with 5 min of warm-up performing range-of-motion exercises. Strength exercises were individually tailored to each participant and focused on upper and lower extremity strength. The Brzycki equation[22] was applied to calculate 1-RM (one repetition maximum) and adapt adequate load progression of the exercises (arm-curl, knee flexion, and knee extension) for every participant at baseline and every 2 months. Sit-to-stand and hip abduction/adduction exercises were performed without external weights, and the intensity was tailored to the capabilities of each participant by adapting the number of repetitions and velocity. The intensity of strength exercises was progressively increased for each participant from 40% to 70% 1-RM through the course of the 6-month program. Balance training was also individually tailored and included exercises progressing in difficulty to challenge participants' balance as they progressed. Some exercises varied throughout the program, including weight transfer from one leg to another, proprioceptive exercises, and stepping practice. Sessions ended with 5 min of deep breathing and relaxation exercises. Walking recommendations were also individually tailored based on baseline 6 min walk test performance, starting with walking routines that lasted 5 min per day at the beginning of the intervention, with the goal of completing 20 min per day by the end of the 6-month period. Each participant's number of laps completed per day was recorded the last week of the second and fourth months by the chief nurse of each nursing home. The chief nurse of each nursing home received specific training to assess nursing home residents' adherence to the walking recommendations.

Detraining

After the 6-month exercise program, participants received no further intervention or attention from any of the research team during the 6-month observational follow-up. No specific advice about physical activity during the detraining period was given, and participants continued to receive usual care in their nursing home.

Measurements

Measurements were taken at baseline and at 6 and 12 months. All assessments were conducted by the same clinical research assistants blinded to group allocation. Clinical research assistants were researchers from the research team that included both nurses and other health professionals with special training in geriatric assessments. Measurements were assessed on-site at each participant's residence. Baseline assessment included sociodemographic variables including age, gender, body mass index (BMI), waist-to-hip ratio, systolic and diastolic blood pressure, oxygen saturation, comorbidities,[23] Short Physical Performance Battery (SPPB)[24] scores, 30-s chair-stand test[25] scores, Berg Balance Scale[26] scores, number of steps per day recorded with a triaxial accelerometer, Montreal Cognitive Assessment (MoCA)[27] scores, Rey Auditory-Verbal Learning Test (RAVLT)[28] scores, Trail Making Test-A (TMT-A)[29] scores, coding and symbol search test scores as part of the Wechsler Adult Intelligence Scale, Fourth Edition (WAIS-IV),[30] verbal fluency test[31] scores, semantic fluency test[31] scores, Quality of Life in Alzheimer's Disease rating scale (QoL-AD)[32] scores, and De Jong-Gierveld Loneliness Scale[33] scores.

Outcome measures

Physical fitness

Physical function was assessed by the SPPB, which includes tests of static balance, gait speed, and chair-stand.[24] The score for each test is given in categorical modality (0–4) based on run time intervals, and the total score ranges 0 (worst) to 12 (best). Lower body strength was measured by the 30-s chair-stand test, which requires the resident to repeatedly stand up from and sit down on a chair for 30 s (number of stands is recorded).[25] Static balance was measured by the Berg Balance Scale, which requires maintaining postural stability in 14 different functional tasks.[26]

Physical activity level

Physical activity level was recorded with a triaxial accelerometer (Actigraph GT3X model; Actigraph LLC, Pensacola, FL, USA) that participants wore on the hip with a belt for seven days. Accelerometers recorded the number of steps taken per day. An information sheet was given to nurses at each nursing home, who were instructed to help participants wear the accelerometer in the morning (if necessary) and take it off at shower- and night-times.

Cognitive function

Cognitive function was assessed using MoCA, which includes visuospatial/executive function, naming, attention, language, abstraction, delayed recall, orientation, and global measures of cognitive functioning.[27] Verbal memory and capacity to recall and accumulate words through learning trials was evaluated by the total learning measure of the Spanish validated version of RAVLT.[28] Executive function was measured by TMT-A.[29] Processing speed was evaluated by

Table 1
Characteristics of participants at baseline (0 months).

	Control group (n = 15)		Intervention group (n = 16)		
	Mean ± SD	N	Mean ± SD	N	*p*
Age (years)	83.7 ± 6.5	15	84.7 ± 7.0	16	0.953
Sex, n (%)					
Female	11 (73.3)		9 (56.3)		0.320
Male	4 (26.7)		7 (43.8)		
BMI (kg/m^2)	29.0 ± 5.1	15	27.0 ± 4.6	16	0.275
WHR	0.97 ± 0.07	15	0.98 ± 0.08	16	0.834
Systolic blood pressure (mmHg)	149.7 ± 20.5	15	140.9 ± 14.4	16	0.176
Diastolic blood pressure (mmHg)	78.9 ± 8.5	15	75.2 ± 8.8	16	0.246
Oxygen saturation (%)	93.7 ± 3.8	15	95.1 ± 2.8	16	0.299
Comorbidities, n (%)[a]					
1	5 (33.3)		4 (25.0)		0.609
2	4 (26.7)		4 (25.0)		0.916
≥3	4 (26.7)		6 (37.5)		0.519
Physical fitness					
SPPB (score 0–12)	5.9 ± 2.5	15	6.6 ± 2.5	16	0.449
4 m gait speed (m/s)	0.62 ± 0.22	15	0.75 ± 0.19	16	0.086
CST (n of stands)	7.7 ± 5.0	15	8.5 ± 3.4	16	0.587
Berg Balance Scale (score 0–56)	45.1 ± 5.8	15	46.4 ± 7.2	16	0.584
Physical activity level					
Steps (n of steps/day)	825 ± 521	12	1299 ± 845	15	0.075
Cognitive function[b]					
MoCA (score 0–30)	14.7 ± 3.2	13	14.4 ± 4.4	14	0.861
RAVLT (score 0–75)	20.9 ± 7.6	15	20.8 ± 9.9	16	0.970
TMT-A (s)	115 ± 50.1	10	120 ± 41.1	11	0.654
Coding (WAIS-IV) (score 0–135)	14.0 ± 9.2	11	13.3 ± 8.0	14	0.978
Symbol search (WAIS-IV) (score 0–60)	10.1 ± 4.7	11	8.9 ± 6.0	15	0.579
Verbal fluency test (n of words)	7.2 ± 3.1	15	6.6 ± 3.2	16	0.616
Semantic fluency test (n of words)	8.7 ± 2.7	15	8.4 ± 2.7	16	0.713
Quality of Life[c]					
Quality of Life in Alzheimer's Disease (score 13–52)	33.1 ± 4.5	15	33.8 ± 5.8	16	0.599
Loneliness[d]					
De Jong-Gierveld Loneliness Scale (score 0–11)	5.8 ± 2.7	15	6.6 ± 3.1	16	0.430

BMI, body mass index; SD, standard deviation; WHR, waist-to-hip ratio; SPPB, Short Physical Performance Battery; CST, 30-s chair-stand test; MoCA, Montreal Cognitive Assessment; RAVLT, Rey Auditory-Verbal Learning Test; rep, repetitions; TMT-A, Trail Making Test A; WAIS-IV, Wechsler Adult Intelligence Scale, Fourth Edition; QoL-AD, Quality of Life in Alzheimer's Disease.

[a] Comorbidities include hypertension, diabetes mellitus, dyslipidemia, chronic obstructive pulmonary disease, coronary heart disease, peripheral vascular disease, cancer, and depression.[23]

[b] For MoCA, RAVLT, verbal fluency, semantic fluency, and WAIS-IV, a higher score indicates better performance. For TMT-A, a higher score represents a worse performance.

[c] For QoL-AD, a higher score represents better quality of life.

[d] For the De Jong-Gierveld Loneliness Scale, a higher score represents a higher perception of loneliness.

the coding and symbol search test part of the WAIS-IV.[30] Verbal fluency and semantic fluency were measured by the number of words listed beginning with a given letter in 60 s and by the number of words produced in the restricted animal category in 60 s.[31] For MoCA, RAVLT, verbal fluency, semantic fluency, and WAIS-IV, a higher score represents better performance. For TMT-A, a higher score represents worse performance.

Quality of life and loneliness

The QoL-AD rating scale was used to assess the quality of life of residents, where total score ranges from 13 (worst) to 52 (best).[32] Since many participants showed different cognitive impairment levels or were at-risk to develop dementia during the study period, we chose the QoL-AD rating scale as the best tool for assessing the quality of life of participants.[32] The De Jong-Gierveld Loneliness Scale was performed to assess the perception of loneliness of residents, where high scores indicate a higher perception of loneliness.[33]

Statistical analyses

Normal data distribution was checked using the Shapiro-Wilk test, and non-normally distributed variables were square root-transformed. Continuous variables were presented as mean and standard deviation and categorical variables as frequencies and percentages. Between-group differences were assessed using mixed design repeated measures analysis of variance (ANOVA; three time points × two groups) with three levels (measurements at 0, 6, and 12 months). η^2 was calculated for the estimation of effect size. η^2 values ≤0.02, ≤0.13, and ≥0.26 were considered *small, medium*, and *large*, respectively.[34] A post-hoc Bonferroni test determined 2 × 2 differences within each group. Significance was set at $p < 0.05$. Analysis was performed using IBM SPSS Statistics 24 statistical software package (SPSS, Inc., Chicago, IL, USA).

Results

Baseline characteristics were not significantly different between the CG and IG. Mean age was 84.2 years (range: 72–102 years), and participants were predominantly women (64.5%) (Table 1).

Adherence to the exercise program

Attendance rates at exercise sessions were 90.8%, and completion of walking recommendations was 79.0%.

Physical fitness

The group-by-time interaction in mixed design ANOVA over the 12-month period was significant for the SPPB ($p < 0.001$; ES^2 = *large*), gait speed ($p < 0.05$; ES^2 = *medium*), and Berg Balance Scale

($p < 0.001$; ES^2 = *large*). Although after the 6-month exercise program the IG significantly improved performance on the SPPB ($p < 0.05$), 30-s chair-stand test ($p < 0.05$), and Berg Balance Scale ($p < 0.05$), during the 6-month observational follow-up period the results on the SPPB ($p < 0.05$), gait speed ($p < 0.05$), 30-s chair-stand test ($p < 0.05$), and Berg Balance Scale ($p < 0.05$) significantly declined. The CG showed a progressive, though not significant, decline in physical fitness measures throughout both the first six-month period ($p > 0.05$) and the next six-month observational follow-up period ($p > 0.05$), except for gait speed, which was maintained ($p > 0.05$) (Table 2).

Physical activity level

The number of steps per day did not significantly change throughout both the first six-month period ($p > 0.05$) and the next six-month observational follow-up period in either group ($p > 0.05$) (Table 2).

Cognitive function

The IG had significantly improved MoCA test scores at completion of the 6-month exercise program ($p < 0.05$), but 6 months after completion of the program this group showed a non-significant decrease in scores ($p > 0.05$). The IG showed a non-significant improvement in RAVLT, TMT-A, and symbol search test scores, maintained scores on the verbal fluency test, and showed a non-significant decline in coding and semantic fluency test scores during the 6-month intervention ($p > 0.05$). During the 6-month observational follow-up, the IG showed a non-significant decline in RAVLT and TMT-A scores, maintained performance on symbol search test scores, and showed a non-significant improvement in coding, verbal fluency, and semantic fluency test scores($p > 0.05$). The CG experienced a non-significant decline in MoCA, TMT-A, coding, symbol search, verbal fluency and semantic fluency test scores and maintained scores on the RAVLT test throughout the first 6-month period ($p > 0.05$). During the 6-month observational follow-up, the CG experienced a non-significant decline in MoCA, RAVLT, and coding test scores and a non-significant improvement on TMT-A, symbol search, verbal fluency, and semantic fluency test scores ($p > 0.05$). Group-by-time interaction in mixed design ANOVA for MoCA was at the limit of significance ($p = 0.054$; ES^2 = *medium*) (Table 2).

Quality of life and loneliness

The IG showed a significant decrease in loneliness perception after the 6-month exercise intervention ($p < 0.05$) and the 6-month observational follow-up ($p < 0.05$). The CG showed a non-significant decrease in loneliness perception during the first 6-month period ($p > 0.05$) and a non-significant increase during the next 6-month observational follow-up period ($p > 0.05$). On the other hand, the IG showed a non-significant improvement in QoL-AD during the 6-month exercise intervention ($p > 0.05$), but this measure returned to baseline after the 6-month follow-up ($p > 0.05$). The CG showed a non-significant improvement in QoL-AD during the first six-month period ($p > 0.05$) and a non-significant decrease during the next six-month observational follow-up period ($p > 0.05$). The group-by-time interaction was not significant for either quality of life or loneliness ($p > 0.05$) (Table 2).

Discussion

We observed an important decline in most physical fitness and cognitive function parameters after a 6-month detraining period in nursing home residents. Therefore, exercise cessation reversed the improvements seen with a 6-month exercise intervention. Several studies show that exercise prevents decline in physical fitness, cognitive and affective function, and quality of life in community-dwelling older adults[35,36] and nursing home residents[12,37], but less attention is paid to the consequences of exercise cessation.

Telenius et al.[17] performed a 3-month exercise program in nursing home residents and observed that in a subsequent 3-month follow-up period, residents deteriorated according to the Berg Balance Scale (-1.5 points), 30-s chair-stand test (-0.4 raises in average), and gait speed (-0.02 m/s) assessment. Cadore et al.[18] showed that nursing home residents who completed an 8-week exercise intervention followed by a 6-month detraining period deteriorated in performance on the 30-s chair-stand test (-0.9 raises in average) and gait speed (-0.17 m/s). Our results corroborate these findings of significantly poorer results after a detraining period and showed that residents who completed a 6-month exercise program deteriorated on the Berg Balance Scale (-3.6 points), 30-s chair-stand test (-1.8 raises in average), and gait speed (-0.12 m/s) during a 6-month observational follow-up period. In addition, we observed that after the 6-month exercise program, there was more than a two-point improvement on the SPPB among the IG, while during the 6-month observational follow-up period, the values of SPPB decreased by two points and returned practically to baseline scores. A one-point change in total SPPB score is of clinical relevance to identify changes in the ability to walk one block, climb one flight of stairs, or any self-perceived change in mobility.[38] The decline in physical fitness observed among IG participants after the follow-up period is concerning because gait speed, strength, and dynamic balance performance are indicators of adverse outcomes such as activities of daily living difficulty, falls, disability, and mortality.[39,40] Therefore, exercise could be an especially important preventive intervention to avoid adverse events.

Our results are in line with other studies involving an exercise program in nursing home residents that did not observe significant changes in physical activity level.[41] Despite evidence for the benefits of exercise interventions, people living in nursing homes spend most of their time in sedentary activities[37] and, unfortunately, the intervention did not reverse the sedentary behavior of nursing home residents. Frequently, the environment and organization of nursing homes do not facilitate physical activity among residents.[42] The setting and schedule of nursing homes should be designed so that residents are encouraged to increase the time that they are physically active, making them more likely to maintain the physical, cognitive, and affective improvements gained by physical exercise. These results are very relevant for gerontological nurses, as nurses could be those professionals that encourage residents to engage in an active lifestyle.[43] Such prompts can be used to motivate, guide, and provide information to support residents to improve physical activity levels and thus improve both the quality of care and the quality of life of nursing home residents. Further, we did not observe significant changes in physical activity level among the CG over the 12-month period. Although Lobo et al.[44] showed a negative association between time of institutionalization and physical activity level in nursing home residents, the duration of our study may have been too short to observe changes in physical activity level among CG participants.

Few studies have analyzed the effects of detraining on cognitive function among older adults. Ansai et al.[45] reported no significant changes in MoCA scores during a 6-week detraining period after a 16-week exercise program in community-dwelling older adults. Blasco-Lafarga et al.[16] performed an intervention in community-dwelling older adults that was divided into two training periods of 8 months each followed by two periods of detraining of 3.5 months each. They surprisingly observed a significant improvement in cognition after the second detraining period.[16] In our study, we observed that the IG showed a two-point decline on the MoCA during the 6-month detraining period, which is considered clinically relevant.[46]

However, our study showed that the 6-month physical exercise program was effective in reducing the perception of loneliness for

Table 2
Effects of exercise intervention and follow-up cessation on physical fitness, physical activity level, cognitive function, quality of life, and loneliness in nursing home residents.

	Control group (n=15)				Intervention group (n=16)					
	Baseline, mean ± SD	6 months, mean ± SD	12 months, mean ± SD	N	Baseline, mean ± SD	6 months, mean ± SD	12 months, mean ± SD	N	p [c]	Partial η^2
Physical fitness										
SPPB (score 0–12)	5.8 ± 2.5	5.7 ± 2.2	5.6 ± 2.5	14	6.6 ± 2.5	8.9 ± 2.4[a]	6.9 ± 2.9[b]	16	<0.001	0.550
4 m gait speed (m/s)	0.62 ± 0.22	0.61 ± 0.13	0.64 ± 0.19	15	0.75 ± 0.19	0.84 ± 0.19	0.72 ± 0.20[b]	16	0.015	0.258
CST (n of stands)	7.2 ± 4.8	6.8 ± 4.5	5.9 ± 5.1	14	8.5 ± 3.4	10.4 ± 3.5[a]	8.6 ± 3.9[b]	16	0.240	0.100
Berg Balance Scale (score 0–56)	44.6 ± 5.7	42.8 ± 5.3	42.5 ± 7.8	14	46.4 ± 7.2	49.7 ± 4.4[a]	46.1 ± 7.7[b]	16	0.001	0.406
Physical activity level										
Steps (n of steps/day)	845 ± 541	765 ± 512	871 ± 510	11	1324 ± 840	1594 ± 1156	1372 ± 1198	14	0.180	0.138
Cognitive function[d]										
MoCA (score 0–30)	14.8 ± 3.3	14.4 ± 4.8	14.1 ± 3.8	12	14.4 ± 4.4	17.1 ± 5.4[a]	15.1 ± 6.0	14	0.054	0.224
RAVLT (score 0–75)	20.9 ± 8.1	20.9 ± 7.3	19.4 ± 8.4	13	20.8 ± 9.9	23.9 ± 13.7	20.4 ± 11.6	16	0.620	0.036
TMT-A (s)	87.0 ± 23.3	92.3 ± 23.7	90.1 ± 34.3	7	104.2 ± 21.9	94.0 ± 33.5	92.5 ± 32.6	6	0.418	0.160
Coding (WAIS-IV) (score 0–135)	15.0 ± 10.0	14.0 ± 9.7	12.8 ± 9.3	9	13.3 ± 8.0	12.6 ± 8.2	13.4 ± 9.2	14	0.593	0.051
Symbol Search (WAIS-IV) (score 0–60)	10.3 ± 4.9	8.5 ± 5.5	8.9 ± 5.8	10	9.2 ± 6.1	9.7 ± 7.1	9.8 ± 6.7	14	0.280	0.114
Verbal Fluency Test (n of words)	7.3 ± 3.2	6.4 ± 2.5	7.2 ± 3.4	14	6.6 ± 3.2	6.5 ± 4.3	7.1 ± 4.3	16	0.801	0.016
Semantic Fluency Test (n of words)	8.7 ± 2.7	7.1 ± 3.6	9.2 ± 3.4	15	8.4 ± 2.7	7.0 ± 3.2	8.9 ± 3.4	16	0.970	0.002
Quality of life[d]										
Quality of Life in Alzheimer's Disease (score 13–52)	32.9 ± 4.6	33.3 ± 4.4	31.8 ± 5.2	14	33.8 ± 5.8	36.2 ± 4.5	33.8 ± 5.5	16	0.598	0.037
Loneliness[f]										
De Jong-Gierveld Loneliness Scale (score 0–11)	6.0 ± 2.6	4.6 ± 4.1	5.1 ± 3.5	14	6.6 ± 3.1	3.4 ± 2.6[a]	4.6 ± 2.9[a]	16	0.375	0.070

SD, standard deviation; SPPB, Short Physical Performance Battery; CST, 30-second chair-stand test; MoCA, Montreal Cognitive Assessment; RAVLT, Rey Auditory-Verbal Learning Test; rep, repetitions; TMT-A, Trail Making Test A; WAIS-IV, Wechsler Adult Intelligence Scale, Fourth Edition; QoL-AD, Quality of Life in Alzheimer's Disease.

[a] $p < 0.05$, significantly different from baseline.

[b] $p < 0.05$, significantly different from 6 months after baseline.

[c] p-value for the group-by-time interaction

[d] For MoCA, RAVLT, verbal fluency, semantic fluency, and WAIS-IV, a higher score represents better performance. For TMT-A, a higher score represents a worse performance.

[e] For QoL-AD, a higher score represents a better quality of life.

[f] For the De Jong-Gierveld Loneliness Scale, a higher score represents a higher perception of loneliness.

one year among nursing home residents. These results support the findings of a study carried out in nursing home residents with chronic pain,[47] which concluded that exercise interventions, particularly those conducted in small groups, promote friendly and reliable relationships among participants based on common interests and similar needs.[48,49] Loneliness may also be relevant as it can be related to poorer health outcomes, such as functional decline, morbidity, and mortality.[50] However, numerous factors can influence the perception of loneliness, and we cannot ensure that these benefits were obtained due to exercise. Like other studies involving a detraining period after an exercise program in nursing home residents,[17,51] we did not observe significant changes in quality of life between the CG and IG. However, our study reported a non-significant decline across the 6-month observational follow-up (-2.4 points) in the IG.

The main strength of our study is that it includes a well-defined sample of nursing home residents. This is the first study analyzing detraining effects on cognitive function, quality of life, and loneliness in nursing home residents. However, our findings cannot be directly applied to all nursing home residents because we do not know whether these results apply to individuals with lower physical and cognitive functions than the participants in our study. In addition, we included a small sample size, which may be underpowered for some variables in our results.

Conclusions

We measured an important decline in most physical fitness and cognitive function parameters following a 6-month detraining period in nursing home residents. These results highlight residents' care needs for recreation and exercise that should be implemented continuously. These results are very relevant for gerontological nurses, as nurses are those responsible for promoting physical activity and an active lifestyle in most of the nursing homes included in this study. Nurses could play an important role in increasing the physical activity level of residents and thus improve both the quality of care and quality of life of nursing home residents. Nursing home staff, along with health institutions and funding providers, should be aware of these results when implementing physical exercise programs.

Declaration of Competing Interest

None.

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