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A multicomponent exercise program improves physical function in long-term nursing home residents: A randomized controlled trial

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ABSTRACT

To investigate the impact of a multicomponent exercise program on anthropometry, physical function, and physical activity on older adults living in long-term nursing homes (LTNH), we conducted a randomized controlled trial involving 112 participants aged 84.9 ± 6.9 years. Participants were randomly assigned to an intervention (IG) or control group (CG). The IG participated in a 3-month multicomponent exercise intervention focused on strength, balance, stretching exercises, and walking recommendations. Subjects in the CG participated in routine activities. Analyses of outcome parameters were performed in the entire sample and in two subgroups, classified according to participants' physical function score at baseline. The group-by-time interaction, favoring the IG, was significant for the entire sample and for the participants in the low physical function subgroup for the following parameters: waist circumference, 30-s chair-stand, arm-curl, 8-ft timed up-and-go, SPPB score, gait speed, and Berg scale ($p < .05$). In participants with higher physical function at baseline, significant group-by-time interaction was observed in the SPPB score and Berg scale ($p < .05$). When differences were analyzed within groups, the IG maintained or improved in all assessed parameters, while participants in the CG showed a marked decline. Our study showed that a multicomponent exercise program is effective for older people living in LTNH. This is especially relevant in those with lower physical function scores. The lower efficacy of the program in participants with better function might be due to the insufficient exercise demands of our intervention for more fit residents. Future studies should analyze the effects of programs with higher intensities in older people with intermediate to high physical function.

1. Introduction

Projections worldwide predict an increase in the number of dependent older adults, which is expected to rise from 350 million in 2010 to 488 million in 2030 (Prince et al., 2013). This growth will directly influence the number of long-term nursing home (LTNH) residents as the need for older adult care grows (Pereira et al., 2017). LTNH residents typically experience a high level of multi-morbidity, functional impairment, severe cognitive deficits, depression, and very low physical activity (Bercovitz et al., 2009). Furthermore, LTNH residents have been found to spend most of the day engaged in sedentary activities (Bates-Jensen et al., 2004). Although physical inactivity is toxic for LTNH residents, falls and concerns about fall-related injuries are the main reasons for restricting physical activity in LTNHs (Schulz et al., 2017). The preservation of physical functions such as muscle strength, balance, and mobility is fundamental to maintaining the functional capacity necessary to perform routine activities of daily living (ADL) (Frändin et al., 2016). In consequence, there is a need to develop interventions that help avoid physical deterioration among LTNH residents and instead enable them to thrive (Schulz et al., 2017).

Physical exercise interventions can prevent or slow the functional decline of older adults living in LTNHs (Laffon de Mazières et al., 2017). In community-dwelling older adults, exercise has been shown to reduce all-cause mortality along with the risk of falls and fractures because of falling (Smith et al., 2017; Park et al., 2008). However, few randomized controlled trials with large sample sizes have analyzed the efficacy of multicomponent exercise programs at moderate intensity in LTNH residents (Dechamps et al., 2010; Rolland et al., 2007). In most studies performed in LTNHs, the intensity of the physical exercise programs was not stated, but interventions appeared to be carried out at a low

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intensity (Brett et al., 2016). As such, evidence supporting the need for adequate exercise programs in LTNH settings remains scarce.

Due to the heterogeneity of physical function among older adults, some studies highlight the need to focus on personal skills to achieve optimal brain–body stimulus (Frändin et al., 2016). Thus, some exercise demands may be lower for higher-functioning older adults (Pereira et al., 2017). This problem highlights a need to focus on the participant's physical function to ensure an appropriate load and intensity to resistance, balance, and walking retraining exercises to obtain sufficient benefit. To date, no research has focused on developing an optimized multicomponent exercise program for LTNH residents with varying levels of physical functioning. To fill this gap, we sought to evaluate the effects of multicomponent exercise intervention on anthropometry, physical function, and physical activity within an LTNH-based older adult population. Furthermore, we compared the effectiveness of the program among participants with low and high levels of physical function according to the participants' score at baseline.

2. Materials and methods

2.1. Trial design and participants

This study was a three-month single-blinded and multicenter randomized controlled trial. A flow diagram describing the recruitment of participants from ten long-term LTNHs (Gipuzkoa, Basque Country, Spain) is presented in Fig. 1.

Details of our methodology were published previously (Rodriguez-Larrad et al., 2017). Briefly, eligibility criteria consisted of men and women aged ≥70 years who scored ≥50 on the Barthel Index (Wade and Collin, 1988) and scored ≥20 on the MEC-35 Test (Lobo et al., 1999) [Mini-examen cognoscitivo, an adapted and validated version of the Mini Mental State Examination (MMSE) in Spanish] who were all capable of standing up and walking independently for at least 10 m. Age, gender, Barthel Index (0–100) (Wade and Collin, 1988), MEC-35 (0–35) (Lobo et al., 1999), and anthropometric data of the subjects are shown in Table 1.

The present study was approved by the Committee on Ethics in Research of the University of the Basque Country (Humans Committee Code M10/2016/105). Written informed consent was obtained from all study participants. The protocol was registered under the Australian and New Zealand Clinical Trials Registry (ANZCTR) with the identifier: ACTRN12616001044415.

Table 1
Descriptive characteristics of study participants (mean ± SD).

	Control group (n = 55)	Intervention group (n = 57)	p-Value
Age (years)	84.7 ± 6.1	85.1 ± 7.6	.81
Female n (%)	37 (67.3)	42 (73.7)	.46
Body mass (kg)	66.6 ± 15.1	66.0 ± 13.8	.81
Body height (cm)	153.5 ± 9.6	152.7 ± 8.9	.65
BMI (kg/m^2)	28.2 ± 5.3	28.2 ± 5.1	.99
Waist circumference (cm)	97.6 ± 12.6	98.9 ± 13.6	.61
Hip circumference (cm)	100.1 ± 9.7	100.7 ± 9.8	.75
WHR	0.97 ± 0.08	0.98 ± 0.07	.70
MEC, 0–35	28.0 ± 3.5	27.0 ± 4.0	.16
Barthel, 0–100	82.8 ± 13.1	79.2 ± 12.9	.15

BMI = body mass index; WHR = waist-to-hip ratio; MEC = mini-examen cognoscitivo.

2.2. Randomization

The participants were randomly assigned (in a 1:1 ratio) through sealed opaque envelopes to either the control (CG) or the intervention group (IG) by coin-tossing sequence generation. Subjects, rather than LTNHs, were randomized to intervention to avoid confounding effects of the setting area. All the volunteers received detailed study information in their reference sites through the research team: objectives, measurement variables, and other details about the interventions were explained orally and in writing to both potential participants and their families.

2.3. Control group activities

Subjects in the CG participated in the routine activities that the LTNHs typically offered to the attendees: memory workshops, reading, singing, etc. Activities were low intensity in all cases.

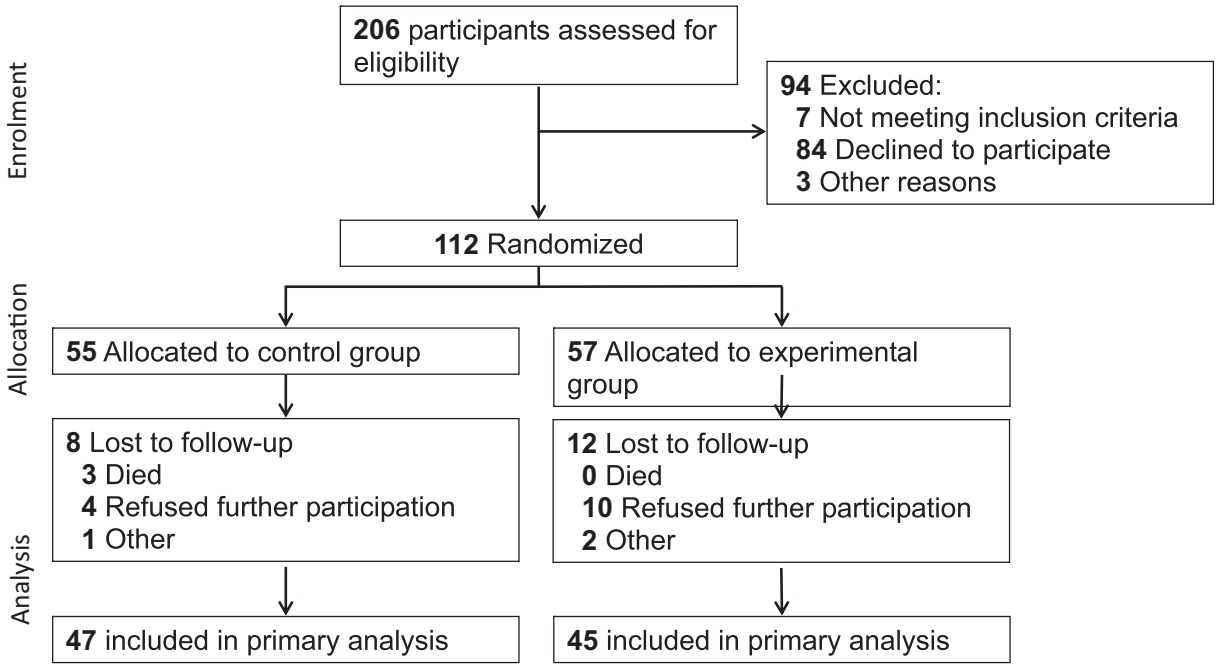

Fig. 1. Flow diagram.