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Abstracts

1st International Virtual Congress “Exercise, Aging and Health”. The INTERMAE Project. 13rd-14th May 2021

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Living in a walkable neighborhood a key to success for an active aging intervention



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Objectives: We assessed the influence of objectively assessed neighborhood walkability on the change in physical activity during the intervention program used in the ongoing PREvención con Dieta MEDiterránea (PREDIMED)-Plus trial. PREDIMED-Plus is a parallel-group, randomized trial which tested the effect of an intensive lifestyle intervention on cardiovascular disease prevention in older overweight and obese participants with the metabolic syndrome.

Methods: The present study involved 228 PREDIMED-Plus senior participants aged between 55 to 75, recruited in Palma de Mallorca (Spain). Overweight/obese older adults with metabolic syndrome were randomized to an intensive weight-loss lifestyle intervention or a control group (106 intervention and 122 control groups). A home base neighborhood environment walkability index (residential density, land use mix, intersections density) was calculated using geographic information systems (1km sausage-network buffer). Physical activity was assessed using the accelerometer for seven days, and a REGICOR validated physical activity questionnaire at baseline and 2 follow-up visits (six-months and one-year later). Generalized Additive Mixed Models (GAMMs) were fitted to estimate the association between the neighborhood walkability index and physical activity changes during follow-up.

Results: Higher neighbourhood walkability (1 z-score increment) was associated with moderate-to-vigorous accelerometer assessed physical activity duration, ($\beta = 3.44$; 95% CI = 0.52;6.36 minutes per day). When analyses were stratified by intervention arm, the association was only observed in the intervention group ($\beta = 6.357$; 95% CI = 2.07;10.64 minutes per day) (p for interaction = 0.055). There were no statistically significant associations between neighborhood walkability and self-reported physical activity nor brisk walking duration.

Conclusions: The results indicate that the neighborhood's walkability could support a physical activity intervention, helping maintain or increase older adults' objectively measured physical activity. This research may modify evidence on whether

environmental factors modify habit acquisition during physical activity intervention programs.

Keywords: Longitudinal Studies; Sedentary Behavior; Built Environment; Aged.

Influence of the supervision in exercise programs designed for the management of fatigue in women with breast cancer: a systematic review and meta- analysis.



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Objectives: The aim of this systematic review and meta-analysis was to compare the effects of supervised and non-supervised training programs on cancer related fatigue (CRF) in women diagnosed with breast cancer (BC) and determine the characteristics of the non-supervised training programs that might improve CRF in this population group.

Methods: A systematic review using the PICOS framework was conducted in PubMed, SportDiscus, Web of Science, CINAHL and PsycInfo databases using PEDro scale to assess the methodological quality of the studies.

Results: After the study selection, 42 studies met the inclusion criteria, representing 4663 subjects. Afterward, the statistical analysis indicates that the non-supervised training programs do not significantly reduce CRF levels (SMD -0.04, 95% CI -0.12 a 0.05) (Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 3.70$, $df = 27$ ($P = 1.00$); $I^2 = 0\%$) (Test for overall effect: $Z = 0.87$ ($P = 0.38$)). By contrast, supervised training programs do significantly reduce CRF in BC patients.

Conclusions: Available scientific evidence indicates that non-supervised training programs are not significantly beneficial in the management of CRF in BC patients.

Keywords: Breast cancer, fatigue, exercise, supervised, non-supervised.

Non-Supervised Exercise Interventions for Osteoporosis Prevention in Older Women. A Meta-Analysis.



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Objectives: To assess the effects of different non-supervised exercise interventions on bone mineral density (BMD) at femoral neck (FN) and lumbar spine (LS) in postmenopausal women through systematic review and meta-analysis.

Methods: A systematic review of the literature was carried out following to the PRISMA Statement. Inclusion criteria: (a) prospective randomized controlled trials, (b) with at least one exercise and one control group, (d) BMD assessments at LS and/or FN, (e) in postmenopausal women, (f) non-supervised exercise programs only. Seven electronic databases were scanned without language restrictions. A meta-analysis was undertaken with Standardized Mean Difference (SMD) as outcome measures. Random effects model was applied. Heterogeneity amongst trials was assessed. Subgroup analyses were conducted for intervention duration and type of exercise.

Results: Ten studies were included in the systematic review and meta-analysis. Exercise groups were classified into (a) Static weight bearing (SWB, n = 1), (b) Dynamic weight bearing exercise low force (DWBLF, n = 4), (c) Dynamic weight bearing exercise high force (DWBHF, n = 3), (d) Non-weight bearing exercise low force (NWBLF, n = 1), (e) Combination of more than one of the above exercise interventions (COMB, n = 1). All these types of non-supervised exercise interventions significantly improve BMD at LS and FN. Regarding intervention duration, similar effects on LS and FN BMD were found (duration ≤ 1 year SMD = 0.33, 95% CI: -0.09, 0.75 vs. duration > 1 year SMD = 0.53, 95% CI: -0.21, 1.28), with no significant differences between groups according to random-effects analysis.

Conclusions: Low-cost, home-based, non-supervised exercise interventions can be effective in preventing osteoporosis and improving BMD at FN and LS in older women.

Keywords: Osteoporosis; Bone; Exercise; Postmenopause.

Effect of a physical activity protocol and its suspension on walking, balance and posture of elderly subjects.



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Objectives: Exercise is generally recommended for elderly subjects and thus, it is fundamental to know both the effects of different programmes of adapted physical activity (APA) and the interruption of the same. The aim of this study was to evaluate the response of elderly subjects attending periods of non-continuous APA

Methods: In 15 subjects (2/13 M/F), mean age $67,8 \pm 13,8$ yrs, Body Mass Index $23,7 \pm 3,5$ Kg/m², ankle joint mobility (inclinometer), hand strength (Jamar hand grip), walking speed, step length (10 and 20 meters), aerobic capacity, endurance (6 Minute Walk Test- 6MWT), lower extremity function (SPPB: short physical performance battery), and standing posture (sagittal images) were evaluated in three consecutive periods (at the end of a 8-months APA period, after 4 months of inactivity and 4 months after restarting of a new APA period). The training programme was performed twice a week and consisted in 10 minutes of organic activation, 30 minutes of moderate physical activity, 20 minutes of exercises on the floor: breathing and stretching.

Results: After 4 months of inactivity, the subjects investigated showed a significant and widespread reduction of the gait parameters: 6MWT (446.5 ± 91.4 vs 429 ± 89.4 m; $p < 0.01$); 10 meters (step length: 0.67 ± 0.09 vs 0.63 ± 0.08 m – time: 7.6 ± 1.7 vs 8.5 ± 1.7 ”; $p < 0.01$); 20 meters (step length: 0.71 ± 0.08 vs 0.67 ± 0.06 m ($p = 0.01$) – time: 14.0 ± 2.1 vs 15.4 ± 2.0 ” ($p < 0.01$)). At the second follow-up (after 4 months of training) there was a significant improvement, even if the recovery of the parameters investigated was partial in comparison to the results achieved after the inactivity period: 6MWT (438.05 ± 92.3 m, $p < 0.01$); 10 meters (step length: 0.65 ± 0.07 m – time: 8.0 ± 1.7 ”, $p < 0.01$); 20 meters (step length: 0.68 ± 0.07 m, $p = 0.15$ – time: 14.6 ± 2.1 ”, $p < 0.01$). The walking speed evaluated in the 10 and 20 meters test was correlated with that of 4 meters (10 m: $r = 0.69$, $p < 0.01$; and 20 m: $r = 0.6$; $p < 0, 05$). The length of the step measured in the 10 and 20 meters tests was correlated with the ankle mobility (10 m: $r = 0.7$, $p < 0.01$; 20 m: $r = 0.62$, $p < 0.5$).

Conclusions: The results of this study show that in a population of elderly subjects a programme of APA, as scheduled and performed in this study, significantly improves the gait parameters. However, a short interruption of the training reduces significantly the walking speed and step length.

Keywords: Adapted physical activity; Gait speed; Balance; Exercise; Aging; Joint mobility.

Efficacy of a combined EMG and physical exercise therapy for the improvement of hemiparetic hand and foot functionalities in older patients with cerebrovascular damage.



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Objectives: Furthermore, the inclusion of physical exercise programs combined with this therapy could further improve the effectiveness of the intervention. However, the data regarding older population is scarce. Therefore, the present study was conducted to evaluate the effectiveness of a combined biofeedback-EMG and physical therapy intervention for the improvement of hand and foot functionality in post-stroke patients.

Methods: A single-blind, randomized clinical trial on post-stroke patients was designed. 40 subjects (18 men and 22 women, mean age 78 y) were randomly allocated to BIO group (n=20) or CONTROL group (n=20). Both groups received a similar intervention, only the BIO group followed a biofeedback protocol. EMG was performed on the extensor muscles of the hand that attach to the epicondyle and peroneus longus muscles. Physical exercise intervention consisted on 15 minutes session of lower limb load and balance exercises. Electromyographic activity, Fugl-Meyer score and Barthel index were determined. Statistical analyses were conducted with a repeated-measures ANCOVA, considering baseline characteristics as potential covariables

Results: There was a statistically significant increase on Barthel index and EMG activity on the BIO group compared to the CONTROL group. The score of the Fugl-Meyer test also increased, but in this case, did not reach statistical significance.

Conclusions: Electrostimulation with functional biofeedback improves functional hand motor skills and gait functionality in older patients who have suffered a stroke. In our opinion, physical exercises improve the therapeutic approach compared to electrostimulation alone, since functional improvement is carried out in more than one muscle group, triggering the impulses through active movements by the patient, previously instructed by the stimulation activity.

Keywords: Sport; Physiotherapy; Stroke; Spasticity; Old age; Biofeedback

Physical condition of elderly cancer survivors determines quality of life and fatigue



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Objectives: Fortunately, longevity in cancer survivors is increasingly marked. Despite the benefits of improved physical conditioning in elderly cancer survivor's populations, there is still a gap between the recommended healthy lifestyle (such as physical activity) recommended by scientific evidence and the clinical international stage. This physical deconditioning can influence outcomes such as quality of life and fatigue.

Methods: Patients older than 60 years who have been suffer from breast or colorectal cancer was evaluated by CUIDATE group in University of Granada. Patients were stratified regarding to maximal distance able to walk during six minutes walking test (greater physical condition > 350 meters; poor physical condition < 350 meters). Quality of life and fatigue were measured with EORTCQLQ-C30 and Piper scale 22 items, respectively. T-student and U Mann-Whitney test were used.

Results: Significant differences were found ($p < .05$) in the global quality of life (75.64 ± 18.15 vs 48.33 ± 23.50), in physical function (87.69 ± 12.72 vs 74 ± 17.34), emotional function (87.82 ± 13.44 vs 57.50 ± 39.76), fatigue (18.8 ± 19.97 vs 50 ± 30.2) and pain subscales (21.8 ± 26.79 vs 50 ± 29.4) in favour to the group with greater physical condition. In addition, group with greater physical condition showed significant differences in global fatigue (1.91 ± 2.34 vs 4.26 ± 3.11) and severity fatigue subscale (1.75 ± 2.63 vs 4.48 ± 3.08) were also found ($p < .05$). No differences were found in the rest of the subscales ($p > .05$).

Conclusions: Our results indicate that patients with less physical condition measured with the 6-minute walking test reported lower quality of life and more fatigue. Therefore, care programs for older cancer survivors should be implemented to improve outcomes related-quality of life.

Keywords: Aging; Exercise; Neoplasms; Quality of life

Aging in cancer survivors: functional and health related status.



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Objectives: Although survival rates have increased substantially in cancer patients, survivorship does not mean freedom from symptoms and functional impairment. Besides, modalities used to treat and/or control cancer may accelerate aging in cancer survivors, leading to frailty and chronic dysfunctions, which negatively impact on their quality of life. Therefore, older adults are a population at risk to suffer this accelerated aging.

Methods: A cross-sectional study was carried out by CUIDATE group at the University of Granada. Survival's cancer patients over 60 years of age were selected. Outcomes measured were related to physical function (6-minute walk test (meters walked), International Fitness Scale (0-5)) and health-related outcomes such as quality of life (0-100), quality of sleep (0-21), anxiety/depression (0-21) and fatigue symptoms (0-10). T-student and U Mann-Whitney test were used.

Results: A total of 34 older cancer survivors who average aged 64.09±4.93 were recruited. Of these, 28 were women and 8 men, and the most prevalent cancer type was breast cancer (73.5%) and the rest was colorectal cancer. Older cancer survivors walked 329.61±199.6 meters in 6-minute walk test, while in International Fitness Scale reported 2.91±0.94 in general physical fitness, 2.61±0.94 in cardiorespiratory fitness, 3.04±1.02 in muscular strength, 2.78±1 in speed, and 2.57±0.95 in flexibility. Regarding health-related outcomes, scoring in global quality of life were 68.33±17.65, 85.33±11.78 for physical functioning, 85.83±12.42 for cognitive functioning, 77.5±26.65 for social functioning, and 79.17±19.02 for emotional functioning. While quality of sleep was 7±4.96, anxiety 8.08±4.73, depression 6.33±3.17; and fatigue 3.03±2.92.

Conclusions: The outcomes show adequate quality of life and functioning of the sample. However, they also suggest that breast and colorectal cancer survivors have a poor physical function, quality of sleep, mild fatigue and possibly anxiety, all of which have demonstrated in previous studies having a significant impact on health conditions and quality of life. Improvements in survivorship care, especially for older adults, are needed to reduce the accelerated aging and improve the health-related quality of life.

Keywords: Cancer Survivors; Aging; Quality of Life; Health Status

Is the Timed Up and Go Test a good predictor of mortality? The multi-center EXERNET Study.



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Objectives: The objective of this study was to determine the relationship between the Timed Up and Go Test (TUG) and risk of mortality in older adults.

Methods: Between June 2008 and November 2009, agility was measured with TUG test in 2564 Spanish non-institutionalized seniors aged 65 years or over (1942 women). All participants were members of the cohort of the multi-center EXERNET Study. Eight years later, the mortality was identified by the Spanish National Death Index (INDEF). Person-months of follow-up were calculated from the date of test until date of death or censoring on March 31, 2018, whichever came first. Kaplan-Meier curves and Cox proportional hazards models were calculated for all-cause mortality based in a cut-off point created with a decision tree algorithm that discriminates low and high levels of agility related with mortality. In all models, the time scale was the age, with left truncation on the entry age.

Results: Decision tree algorithm established 5.4 seconds or less as cut-off point of high agility. For men, this threshold was a significant protective factor as showed by the Cox PH regression model (HR= 0.51, P= 0.0026). High agility in men was associated with a significant decrease in the expected hazard with respect to low agility (more than 5.4 seconds in the TUG test). The difference in average age to death between men with low and high agility is 5.4 years. In women, no significant associations between TUG and mortality were found.

Conclusions: In men, a higher level of agility (≤ 5.4 seconds) measured with the Timed Up and Go Test seems to be a protective factor of all-cause mortality.

Keywords: Physical fitness; Mortality; Healthy Aging.

Are short-term changes in compositional daily time-use associated with changes in mental health among older people? the Seniors-ENRICA-2 study.



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Objectives: To examine the associations between change in accelerometer-measured compositional time in sleep, sedentary behavior (SB), Light Physical Activity (LPA) and Moderate-to-Vigorous Physical Activity (MVPA) and change in depression symptoms, loneliness, happiness and global mental health in older people.

Methods: 1,447 participants (71.45±4.18 years) from the Seniors-ENRICA-2 study, with assessments in 2015-2017 (wave 0) and 2018-2019 (wave 1). Time spent in sleep, SB, LPA and MVPA was assessed by wrist-worn accelerometers. Depression symptoms, loneliness, happiness, and global mental health were self-reported using validated questionnaires. Analyses were performed using a compositional data analysis (CoDA) paradigm, adjusting for potential confounders. Regression models were fitted using change in composition (expressed as a set of \ln coordinates) as explanatory variable, and change in mental health indicators as dependent variable. Bar plots were also generated to represent the changes in geometric mean across groups of change in mental health indicators (i.e., improvement, stable, or worsening).

Results: During the follow-up (2.31±0.31 years), loneliness feelings increased ($p=0.014$), while happiness level decreased ($p=0.003$); the proportion of time in sleep raised but the proportional time in LPA and MVPA dropped (all $p<0.001$). The change in the time-use distribution, as a whole, was linked to the change in happiness ($p=0.039$); the relation remained borderline for change in depression symptoms ($p=0.072$). An increase in the time spent in MVPA relative to other behaviors was associated with favorable changes in depression symptoms ($\gamma=-0.254$, $p=0.016$) and happiness ($\gamma=0.242$, $p=0.046$). For instance, compared to the whole study sample, those reducing the number of depression symptoms at least by one over follow-up increased the proportion of time in MVPA by almost 3%, while those who developed one or more depressive symptoms decreased MVPA by 5%.

Conclusions: Time spent in MVPA relative to other behaviors was beneficially associated with depression and happiness. Therefore, increasing MVPA could maintain or improve mental health in older people.

Keywords: Movement; Sedentary behavior; Sleep; Depression; Loneliness; Happiness; Mental health; Aging.

How short-term changes in time-use behaviors are associated with physical function in older women with depression? the Seniors-ENRICA-2 study.



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Objectives: To examine the prospective association between change in accelerometer-measured compositional time in sleep, sedentary behavior (SB), Light Physical Activity (LPA) and Moderate-to-Vigorous Physical Activity (MVPA) and change in physical function in older women with depression.

Methods: The analytical sample consisted of 138 women (70.95±3.80 years) from the Seniors-ENRICA-2 study with diagnosed depression, and with complete data at wave 0 (2015-2017) and wave 1 (2018-2019) evaluations. Time spent in daily behaviors (i.e., sleep, SB, LPA and MVPA) was assessed by wrist-worn accelerometers. The Short Physical Performance Battery - SPPB- (i.e., total score [0-12], balance test score [0-4], gait speed score [0-4] and chair stand test score [0-4]) and handgrip strength (i.e., dynamometry, kg) were used to estimate physical function. In order to account for the inherent intertwined of 24-h behaviors, analyses were performed using compositional data analysis (CoDA) procedures.

Results: The proportion of time invested in LPA ($p=0.002$) and MVPA ($p=0.014$) decreased between wave 0 and wave 1 (mean follow-up=2.30±0.31 years). The change in daily behaviors distribution, as a whole, was beneficially associated with the change in SPPB total score ($p=0.022$), gait speed score ($p=0.032$) and chair stand score ($p=0.046$). A raise in the time invested in LPA relative to other behaviors was related to favorable changes in these physical function indicators (all $p<0.031$). Moreover, increasing time spent in sleep relative to other behaviors was associated with detrimental changes in SPPB total score ($p=0.048$); this association remained borderline for gait speed score ($p=0.051$).

Conclusions: Even with a short follow-up, the increase in the proportion of time spent in LPA relative to other behaviors showed beneficial associations with changes in physical function in this specific population. Therefore, promoting LPA (e.g. a slow walk) may be a realistic and effective strategy to avoid physical function decline in older women with depression.

Keywords: Exercise; Sedentary behavior; Sleep; Physical functional performance; Gait analysis; Aging.

The effects of a 6-month multicomponent exercise program followed by a 4-month detraining period on lipid profile, inflammation and immune system in frail and pre-frail older adults.



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Objectives: To evaluate the changes on biochemical blood profile of frail and prefrail older adults after a 6-month multicomponent exercise program followed by a 4-month detraining period.

Methods: 110 frail and prefrail older adults (80.6±6.0 years) from the EXERNET-Elder 3.0 study were evaluated and divided in training (TRAIN) and control group (CON). A multicomponent training (MCT) of 6 months, 3 days a week was applied. Fasting blood were collected to measure parameters related to immune system, lipid profile and inflammation. Student's t- test was performed to evaluate differences between groups before the intervention and an ANOVA for repeated measures was used to compare differences before (PRE), after the 6 months training (POST) and after the 4 months of detraining between and within groups.

Results: No baseline differences were found for any variable. Group by time interactions were found only for Reactive Protein C (p<0.05). Changes in Reactive Protein C were observed in the TRAIN group in PRE vs. detraining and POST vs. detraining (0.66±0.05 vs 0.33±0.09mg/dL and 0.79±0.09 vs 0.33±0.09mg/dL respectively; all p<0.05), but not in CON group. TRAIN group showed changes for total cholesterol at PRE vs detraining (175.41±5.19 vs 186.32±5.51 mg/dL), for HDL cholesterol at PRE vs POST (51.46± 2.41 vs 48.27±2.5 mg/dL) and POST vs detraining (48.27±2.51 vs 53.074±2.62 mg/dL) and for LDL cholesterol at PRE vs POST (110.20±5.80 vs 112.44±5.69 mg/dL). CON group only showed changes at POST and detraining for HDL-cholesterol (48.27±2.51 vs 53.07±2.62mg/dL) and a decrease in lymphocytes within PRE and POST (2.19±0.15*10³ vs 1.92±0.14*10³μL; all, p<0.05).

Conclusion: Our MCT does not seem to have improve blood profile of older individuals as we could expected, neither for the immune system. Moreover, inflammation parameters markers seem to be reduced after the detraining. For future analysis pathologies, pharmacology and dietary intake should be taken into account.

Keywords: Aging; Health; Exercise; Frailty, Cholesterol, Blood cells.

Does nutritional status influence the effects of a Multicomponent exercise program on body composition and physical fitness? The EXERNET-Elder 3.0 study.



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Objectives: To describe differences in physical fitness between older adults at risk of malnutrition and well-nourished and to investigate whether a 6-month multicomponent exercise training (MCT) differently affects to both groups.

Methods: A total of 93 (80.4±6.0 y) scoring between 6 and 9 points inclusively in the Short Physical Performance Battery participated in this study. Mini Nutritional Assessment was used to create two groups: individuals at risk of malnutrition (n=33) and those well-nourished (n=60) and then divided in control and training group. Body composition was estimated by bioelectrical impedance and the EXERNET battery was performed to measure physical fitness (balance, arms and legs strength and flexibility, agility, endurance and walking speed). Initial differences were determined by one factor ANOVA and several model mixed effect analyses were used to investigate differences after 6 months of MCT among groups.

Results: Well-nourished participants had higher baseline arm and leg strength (13.4±3.5 vs. 14.3±3.6 reps and 9.0±3.0 vs. 11.1±3.3 reps), maximum walking speed (31.6±13.1 vs. 23.74±6.3 s), agility (11.9±5.8 vs. 8.3±2.1s), and aerobic capacity (307.7±119.1 vs. 383.9±86.4m), compared to those at risk of malnutrition (all p<0.05). During the following 6 months, only those well-nourished of the training group showed a decrease in total fat mass (-1.0±0.3kg) and body fat percentage (-1.2±0.4%). Both groups of training improved similarly in all tests, except for balance, in which only well-nourished showed improvements. No enhancements were found for aerobic capacity in any group.

Conclusions: Well-nourished older adults have a better fitness status and benefit more in terms of body composition when they undergo MCT. However, MCT seems to positively and similarly improve the fitness levels of both the well-nourished and those at risk of malnutrition older adults.

Keywords: Aging; Fat mass; Malnutrition; Muscle strength.

How does a 6-month multicomponent training followed by a 4-month detraining period affect the frailty level and functional capacity of frail and pre-frail older adults?



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Objectives: The aims of the present study were to analyse the effects of a 6-month multicomponent training program (MCT) called Elder-fit and the consequences of a 4-month detraining period on functional capacity and frailty level among frail and prefrail older adults.

Methods: A total of 110 frail or pre-frail older adults (80.3±5.8 years) were divided into a control (CON) or training group (TRAIN). The TRAIN performed a 6-month MCT, while CON continued with their usual lifestyle. Functional capacity was assessed by Short Physical Performance Battery (SPPB), while frailty was evaluated through Fried Phenotype (FP) and by the Frailty Trait Scale of 5 items (FTS-5). Student's t-test and Chi-square test were used to analyze differences between groups at baseline and linear mixed models were performed to compare differences in changes (within and between groups) through different evaluation periods. All the analyses were adjusted by baseline values, since no differences were observed in sex and frailty level between groups at baseline.

Results: TRAIN showed improvements after training in SPPB (3.03±0.29), FP (-0.53±0.13), and FTS-5 (-5.79±0.89) scores, whereas CON worsened in FTS-5 score (2.95±1.19). Differences between groups were observed in all variables for this period (all p<0.05). Meanwhile, after detraining, TRAIN worsened in SPPB (-0.91±0.34) and FTS-5 (3.61±0.93), although they improved in FP score (-0.35±0.13) (all p<0.05). With respect to CON, they improved in FP (-0.51±0.22) and FTS-5 score (-0.51±0.22) (all p<0.05). Differences between groups were reported for this second period for SPPB and FTS-5.

Conclusions: In conclusion, Elder-fit showed positive effects on the functional capacity and frailty level of frail and pre-frail older adults, whereas 4-months of detraining caused a drop of these variables, although it is important to note that they keep better status than before training. Thus, institutions should promote these ongoing physical programs, encouraging smaller break periods to avoid reversibility.

Keywords: Aging; health; Exercise; Physical functional performance; Frail elderly.

Effects of a 6-month multicomponent training followed by a 4-month detraining period on physical fitness of frail and pre-frail older people



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Objectives: To analyse the effects of the "Elder-fit" 6-month multicomponent training program (MCT) called Elder-fit and the consequences of a 4-month detraining period on physical fitness of frail and pre-frail older adults.

Methods: A total of 110 frail and pre-frail older adults (79.7 ± 5.8 y.) were divided into a control group (CON) or training group (TRAIN). The TRAIN performed a 6-month MCT, which included strength, endurance, balance, coordination and flexibility exercises, while CON continued with their usual lifestyle. Frailty status was screened by Short Physical Performance Battery, while fitness assessment was mainly based on Senior Fitness Test. Evaluations were performed at baseline, at the end of the MCT program and after a 4-month detraining period. Non-parametric tests of Friedman, Mann-Whitney U and Wilcoxon signed rank test were used to find the differences between and within groups in the different evaluation periods.

Results: No baseline differences between groups were found. After a 6-month period of MCT, TRAIN showed improvements in all fitness variables while after the detraining period they decreased balance, upper limb flexibility, strength and aerobic endurance after the detraining period (all p<0.05). Nevertheless, after detraining all fitness outcomes remained better than at baseline except for balance, flexibility of upper limb and aerobic endurance. CON did not show differences along the study, except in chair stand test in which they improved after detraining compared to baseline.

Conclusions: Elder-fit seems to be an effective strategy to improve physical fitness, which could help maintain independence and enhance quality of life in this population. The 4-month detraining period reduced the magnitude of the improvement witnessed immediately after the MCT, although this was still significantly superior to baseline values. Thus, institutions should develop preventive strategies to mitigate the adverse effects of inactivity and exercise interruptions.

Keywords: Aging; Health; Exercise; Frailty.

Iron profile role on physical performance in the elderly: a short systematic review



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Objectives: Iron plays an important role in physical performance. Some studies have spotted significant benefits for iron status in regular physical activity. However, the relationship between physical performance and iron metabolism in older adults have been scarcely investigated. Thus, the main objective of this systematic review was to find out the iron profile role on physical performance in the elderly.

Methods: A systematic review was performed to identify evidence concerning the relationship between iron profile and physical performance in older adults. The literature search was conducted from inception to January, 2021 in PubMed, Scopus, Cochrane Library and Web of Science online databases. A total of 632 records for the iron status and physical performance were detected. Journal articles were included if (i) incorporated participants ≥ 60 years old; (ii) iron blood test was performed; and (iii) there was one measure of physical performance. After selection process, 18 articles fulfilled the inclusion criteria and were included in this review.

Results: As main results, lower iron levels above or below WHO cut-off (Hb > 13 g/dL in men; ≥ 12 g/dL in women, and ferritin ≥ 15 $\mu\text{g/L}$ in men, ≥ 10 $\mu\text{g/L}$ in women) may contribute to lower muscle strength and an impaired physical performance in elderly. The presence of even mild anaemia was an independent predictor of poorer exercise capacity. It also seems that there is an association between anaemia and greater significant decline in physical performance.

Conclusions: In conclusion, the association between iron status and physical performance in the elderly remains unclear, since it does not exist significant evidence concerning this association.

Keywords: Iron profile; Physical performance; Elderly

Effectiveness, Adherence and Safety of Home-based Strength Programs in Adults Over 60: A Systematic Review of Randomized Controlled Trials.



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Objectives: 1) Examine the effectiveness of home-based strength programs without direct supervision in persons ≥ 60 years aimed to improve physical performance, body composition, cognition, self-perceived quality of life, and physical activity. 2) Study the adherence and safety of home-based strength programs without direct supervision in persons ≥ 60 years.

Methods: Two researchers searched seven databases (Pubmed, CINAHL, PsycInfo, SPORTDiscus, Web of Science, MEDLINE, Cochrane Central Register of Controlled Trials) for all published records until April 2,020 coupled with a manual search of the existing bibliography in other previous reviews.

Results: A total of 4,925 articles were found. Finally, 18 studies met all inclusion criteria and were included in the qualitative synthesis (N = 3,487; mean age of 76 years). Home-based strength programs appeared to improve physical performance, physical activity levels and self-perceived quality of life outcomes compared to controls (usual care). Few studies evaluated cognition and body composition variables. Average adherence to home-based strength programs was medium to low (50%). The intervention group reported a considerably lower number of falls compared with the controls and no substantial differences were observed in the number of adverse events between both groups.

Conclusions: A home-based strength program may improve markers related to physical performance, physical activity and self-perceived quality of life in older adults. These training programs appear to be safe for this population. However, it is considered necessary to implement motivational strategies that could increase the adherence levels to the exercise program.

Keywords: Resistance training; Exercise; Aging; Aged; Muscle strength.

Relationship between physical performance and iron status in the elderly: The Toledo Study Healthy Ageing



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Objectives: Our aim was to evaluate the relationship between iron status and physical function in older people.

Methods: 637 women (76.2±6.5y) and 574 men (76.1±6.1y) from the Toledo Study for Healthy Aging without iron disease were included in the analysis of this cross-sectional study. Subjects underwent physical performance tests (upper and lower limbs maximal voluntary isometric strength test using standardised techniques and equipment, muscle power was calculated from the sit-to-stand test (STS) and 3 meters habitual gait speed (HGS) was also recorded). Finally, a blood sample was extracted in fasting conditions to evaluate serum iron and ferritin levels. Spearman's rank correlation coefficient was calculated. To assess the effect of poor physical function a score was created identifying the sum of weakest quartile (Q1) for the six measurements of physical function and nominal logistic regression was used to assess the relative effect of harbouring from one to six of the worst quartile of the measured physical function variables on iron status.

Results: Ferritin was correlated with physical function in women (Handgrip [r=0.14]; STS [r=0.14]; HGS [r=0.12]; p<0.05), and men (Handgrip [r=0.12]; STS [r=0.13]; HGS [r=0.14]; p<0.05), but relative STS mean power. Serum iron was correlated with STS mean power and habitual gait speed (r=0.10 and r=0.12, respectively; p<.05) in women. The model shows the relative effect of harbouring any of the worst muscle strength quartiles of the four measured sites (grip, shoulder, knee and hip), STS relative power and HGS. There was no significant association between physical fitness weakness and iron status neither in men nor women.

Conclusions: The findings indicated that the link between declining physical function and iron status may be caused by different health conditions and ageing. Lower levels of upper- and lower body strength, muscle power and HGS may not have with iron status among elderly people.

Keywords: Physical performance, Serum iron, Ferritin, Elderly.

Do our elders eat well? Inadequate hydration, low-carbohydrate and high-fat intake among Spanish older adults: The INTERMAE project.



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Objectives: The aim of this study was to determine the degree of compliance with the macronutrient intake recommendations in Spanish older adults.

Methods: A total of 83 older adults (43 males) aged 65-75 years (68.4±3.0 years) from the province of Cádiz (Spain) were included in this study (the INTERMAE project). Dietary intakes were estimated with the DIAL software (3.0.0.5 version) analysing three 24-hour recalls, including 1 weekend day, performed in January-February. Macronutrient intakes were compared with the European Food Safety Authority's dietary reference values (DRVs) established for men and women >60 years.

Results: No participants (0%) reached the daily fluid recommendations (DRV: 2.5 l/day in males; 2.0 l/day in females). A low-carbohydrate intake was observed, with only 6% of participants reaching carbohydrate DRV (45-60%), 29% reaching fibre DRV (25 mg/day), and 5% of participants under the simple sugar DRV (<10%). A high-fat diet was reported, 11% of participants met fat DRV (20-35%) being the rest above the recommendations, similarly, saturated fatty acid (<10%) and cholesterol (<100mg/1000calories/day) DRVs were met only by 16% and 10% of participants, respectively. Finally, the protein DRV (>0.83 g/kg/day) was reached by 75% of participants.

Conclusions: The older adults from the INTERMAE project presented low-liquid, low-carbohydrate and high-fat intakes. Therefore, this population should be encouraged to increase their liquid intake especially if they perform physical activity in warmer months, since dehydration is the main aspect in compromising the health of the elderly, increasing the risk of urinary infections, kidney injury or skin conditions, among others. Moreover, unbalanced diet in these older adults should be corrected by i) reducing the amount of fats and replacing them with olive oil as the main source, and ii) including cereals, whole grains, and vegetables as daily foods, thus, increasing long-chain carbohydrates and fibre and reducing simple sugars.

Keywords: Dietary Requirements; Macronutrient Intakes; Diet; Diet Survey; Elderly; Healthy Ageing.

Effects of a 6-month multicomponent training program on cognitive function in frail and prefrail older adults



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Objective: The aim of the study was to examine the effect of a 6-month multicomponent training (MCT) program on cognitive function (CF) in frail and prefrail older adults.

Methods: A total of 110 frail and prefrail older adults from the EXERNET-Elder 3.0 project participated in this study (80.7±5.8 y.). A total of 58 seniors were included in the training group (TRAIN; 39 women) and performed a MCT program for 6 months, 3 sessions/week. The other 52 participants were included in the control group (CON; 38 women), who continued with their usual routine. Both groups received healthy habits advices during the intervention period. CF was assessed in all participants pre- and post-intervention through the Mini Mental State Examination (MMSE) and Verbal Fluency test (VF). To determine the effects of the intervention a t-test and an ANOVA for repeated measures were used to assessed differences between and within groups.

Results: At baseline, there were not significant differences between groups in CF. After 6 months of MCT, the TRAIN improved registration [memory domain] (2.17±0.9 points vs. 2.38±0.8 points; $p<0.05$), writing test [language domain] (0.77±0.4 points vs. 0.89±0.3 points; $p<0.05$) and VF test (13.90±4.4 animals vs. 15.60±5.8 animals; $p<0.05$), whereas the CON only improved calculation [attention domain] (3.96±1.6 points vs. 4.55±0.8 points; $p<0.01$). According to the frailty level of the study sample, we revealed that prefrail participants improved CF measured by MMSE to a greater extent than frail individuals (25.10±5.2 points vs. 26.40±4.1 points; 26.00±2.9 points vs 26.6±3.5 points, respectively; all $p<0.05$).

Conclusions: The 6-month multicomponent training program implemented in this study elicit some improvements in cognitive function in frail and prefrail older adults. Finally, it seems that frailty level could negatively affect cognitive function development in this population, suggesting the importance of early incorporation of training to ensure prevention of cognitive decline.

Keywords: Exercise; Aging; Health; Cognition.

From therapy to doping: Illicit use of drugs to increase performance



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Objectives: The present work aimed to carry out a systematic review of the literature in order to identify, describe and analyze the substances and methods to improve the performance of an athlete, as well as, the control used to detect them. This includes the general mechanisms of action and adverse events caused by their abuse. In addition, it also aimed to clarify the legislative rules regarding doping.

Methods: For this purpose, in an initial phase, concepts necessary to understand doping and all its surroundings were described, drugs and illicit methods in the List of Prohibited Substances (2018) were characterized, as well as the existing legislative rules used by the AMA. Then, in the systematic literature review, 16 articles were identified between the years 2005 and 2017 focusing on the use of various substances, from which the use of steroids stands out.

Results: In scientific literature the greatest emphasis is placed on detection, and the harmful effects of substances are rarely discussed, a fact that should merit future attention. AAS are known for their positive effects on muscle mass and strength, such as GH. The administration of erythropoietin increases the oxygen transport capacity, increasing resistance, while the administration of β -adrenergic agonists helps in the speed of response. These substances improve selective aspects of physical performance, but are not without risks. The absence of generic samples in terms of athletes and sports made it difficult to analyze the results obtained. Different substances are used by different athletes in different sports.

Conclusions: The main results showed that the control and detection of doping continue to present a complex process, so they must always accompany scientific advances, namely in relation to new drugs.

Keywords: Doping; Performance; Prohibited use substances; Prohibited methods; Adverse events and detention.

Inflammaging and immunosenescence in HIV-infected patients

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Objectives: HIV infection contributes to inflammaging and immunosenescence even when viral replication is controlled by antiretroviral treatments.

The objectives of this work were the analysis of the differences in inflammatory (IL6, sCD163) and antiinflammatory (IL10) biomarkers, regulatory miRNAs 7, 21 and 210, and immunosenescence parameters (ratio CD4/CD8, CD4+CD28-CD57+ and CD4+PD1+ T lymphocytes) between HIV-infected patients and healthy controls (HC). The influence of detectable HIV load was evaluated.

Methods: Serum inflammatory and anti-inflammatory molecules concentrations were measured by ELISA. miRNAs levels were determined by qRT-PCR. Immunosenescence parameters were quantified by flow cytometry.

Results: Our results showed an increase of IL6, IL10 and sCD163 in HIV-infected patients compared to HC. Particular analysis of HIV-infected patients demonstrated that the increase in these pro- and anti-inflammatory molecules were attributable to HIV-infected patients with detectable HIV load, with similar serum concentrations in patients with undetectable HIV load and HC.

Whereas no significant differences were detected in miRNA-7 expression between HC and HIV-infected patients, miRNA-21 and miRNA-210 expressions were significantly increased in HIV-infected patients with detectable HIV load compared to HC.

A CD4/CD8 ratio decrease was observed in all patients, especially in those with detectable HIV load. Senescent CD4+ T cells were increased in all patients compared with HC, with no differences when HIV-infected patients with detectable or undetectable load were compared. CD4+ PD1+ T cells were also increased in both groups of patients, with or without detectable HIV load.

Conclusions: Our results demonstrate that inflammaging and immunosenescence are elevated in HIV infection, increasing the risk of age related diseases. The influence of HIV replication control (undetectable viral load) to decrease inflammaging implies the need to direct our efforts to ensure that all HIV-infected patients are diagnosed and treated.

Keywords: HIV; Inflammaging; Immunosenescence; Antiretroviral treatment; Cytokines; miRNAs; Lymphocytes.

Inflammaging in chronic HIV-infected patients. A comparison in function of the age.

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Objectives: Infection caused by the human immunodeficiency virus (HIV) has become a chronic disease thanks to the effectiveness of antiretroviral treatment (ART). However, this therapy does not prevent HIV-infected patients from presenting a persistent inflammatory and immune activation, which has been implicated in the progressive decrease of CD4+ T cell count, higher incidence of cardiovascular disease, neoplasms, metabolic syndrome, type 2 diabetes mellitus and obesity, among other conditions. The influence of intestinal bacterial translocation in this inflammatory and immune activation has been demonstrated. The objective of this study was the analysis of intestinal permeability, inflammatory and immune activation of HIV-infected patients in function of the age.

Methods: A prospective, observational study with 24 healthy controls (HC), 19 chronic HIV-infected patients <50 years (CHIV<50) and 27 chronic HIV-infected patients >50 years (CHIV>50) was made. Intestinal barrier integrity marker I-FABP, proinflammatory cytokine interleukin IL-6, both measured by ELISA, and lymphocyte activation (CD4+CD38+HLADR+ and CD8+CD38+HLADR+) measured by flow cytometry, were analyzed.

Results: Serum levels of I-FABP and IL-6 were similar in both groups of HIV-infected patients. Both CD4+ and CD8+ lymphocyte activation markers were increased in CHIV > 50 group compared to CHIV <50 (p=0.02).

Conclusions: Our results demonstrated a discrepancy between inflammatory and immune activation in function of the age in infected patients: while the intestinal permeability and inflammatory markers did not show significant differences in function of the age, those patients with more than 50 years showed an increase in the lymphocyte activation than those with lower age, supporting the previously demonstrated decrease of CD4+ T cell in those patients with more age as a consequence of continued immune activation.

Keywords: HIV; Inflammaging; Immune activation; Intestinal permeability.

Is manual dynamometry reliable to assess muscle strength in older people?



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Objectives: A widely used way to assess muscle strength in older people is by using manual dynamometry (handgrip) because it is an easy, fast and inexpensive method. Muscle strength is an important predictor of all-cause mortality in this population, and it is directly related with general health, therefore it is important to measure it in older adults. However, it seems that it is not always possible to increase handgrip strength through resistance exercises in this population. Thus, the purpose of this intervention was to check if the handgrip strength improves after a multicomponent physical exercise program in institutionalized older people compared to the maximum strength of the lower limbs.

Methods: 33 participants of 85.00±4.50 years were divided into a control group (n=16) and an experimental group (n=18) who followed a multicomponent physical exercise program for 12 weeks with a frequency of 3 bouts per week. We measured handgrip strength in both hands and maximum strength (F₀) in both groups before and after the intervention period (F₀ was evaluated following an incremental test in leg press).

Results: There were no significant differences in handgrip strength between the control and experimental groups, but we found an increase in F₀ in both groups, and this increase was greater in the experimental group (Table 1).

Table 1. Muscle strength for both groups before (pre) and after (post) the intervention period.

	Experimental group			Control group		
	Pre	Post	p-value	Pre	Post	p-value
Handgrip left	15.2±4.4	14.8±4.3	.805	13.8±4.8	14.8±6.1	.634
Handgrip right	17.1±4.5	16.1±4.5	.557	15.2±5.6	15.4±6.0	.921
F ₀	514.2±150.0	543.9±159.4	.719	562.4±212.2	553.8±443.9	.579

Conclusions: A multicomponent physical exercise program seems to improve maximum strength, even though this improvement may not be reflected when measuring handgrip strength using manual dynamometry.

Keywords: Muscle Strength; Hand Strength; Exercise; Frail Elderly

Effects of bodyweight training for 24 weeks on the functionality of postmenopausal women: a pilot study.



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Objectives: To analyze the effects of 24 weeks of bodyweight training on the functionality of postmenopausal women.

Methods: Thirty postmenopausal women underwent 24 weeks of training, three times per week with 45 minutes each session. The sample was distributed into 1-Bodyweight Training Group (n=10;65.1±4.86 years;28.76±4.26kg/m²), that performed bodyweight exercises, 2-Combined Training Group (n=10;64.43±3.1 years;29.56±4.80kg/m²), that performed strength and aerobic exercises using gym equipment, and 3-Control Group (n=10;62.83±4.87 years;32.92±6.23 kg/m²), who did stretching exercises. Functionality was assessed at pretest (P0), after 12 weeks (P12), and after 24 weeks (P24) using the Gallon-Jug Shelf Transfer Test (GJST), Dressing on and Taking off a T-Shirt (DTOT), Five Times Sit-to-Stand (5XSTS), 10-meter Walk Test (10WT), and Stand Up and Walk Around the House (SWAH). We performed a principal component analysis (PCA) to cluster the variables and a generalized linear model with bootstrapping. Significance was assumed at p<0.05.

Results: Clustering the variables resulted in a Kaiser-Meyer-Olkin of 0.754 and a significant Bartel index. PCA analysis showed the following commonalities: 5XSTS:0.811; SWAH:0.806; GJST:0.756; 10WT:0.743, and DTOT:0.584. We noted significant main effects for time (p<0.001) and group (p<0.001), however, no time*group interaction was detected (p=0.301). In experimental groups, P24 was different from P0, and Control Group had no differences in the time course.

Conclusions: Twenty and four weeks of bodyweight and combined training improved functionality in postmenopausal women.

Keywords: Aging; Resistance training; Postmenopause.

Exercise-Drugs Interactions: A Perspective on This Dynamic Duo

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Objectives: It has been described since late 1980s how exercise modulates drug pharmacokinetics, and how its specific characteristics (e.g. type or intensity) are directly related to drug disposition and, consequently, alters pharmacodynamics. Up till now, plasma analysis has been the gold standard for investigating drugs' pharmacokinetic profile by collecting blood samples and performing liquid/gas chromatography coupled with mass spectrometry. However, the invasive nature of venipuncture, the high costs and long turnaround times, the difficulty for estimating free-drug concentration and the inability to tracking drug behavior continuously and longitudinally make this method inappropriate to assess real-time exercise-drug interactions. The latest technological advancements in drug monitoring are on the way to solve this problem. This perspective intends to highlight the crucial significance of monitoring drug pharmacokinetics in real time during exercise using non-invasive wearable (and portable) on-body devices.

Methods: A brief perspective on exercise-drug interactions was performed, emphasizing the most avant-garde technology to analyze this interplay. The search for studies of potential interest was carried out in different databases (PubMed, Web of Science, Scopus, EMBASE, ScienceDirect and SPORTDiscus).

Results: In recent times several biosensors are being developed to analyze drug metabolism through external biofluids (e.g. interstitial fluid, saliva, tears, and sweat). A novel device integrated by a microfluidic interface, a wireless electronic module, a sensor and a battery in the form of a wrist-worn smartwatch and based on sweat reading has proven its reliability in monitoring drug pharmacokinetics. A groundbreaking research proved how an electrochemical sensor sweat band placed on subjects' wrist was able to track the pharmacokinetic behavior of levodopa in a continuous and prolonged way, finally determining the averaged time of peak levodopa concentration for the three participants across the exercise bouts in a cycle-ergometer.

Conclusions: We are firmly convinced that expanding comprehension of how exercise interacts with drug pharmacokinetics would open a new window in clinical practice, allowing clinicians to design tailored programs and boosting exercise-drug synergies.

Keywords: Precisión medicine; Drug monitoring; Pharmacokinetics; exercise.

Cost-effectiveness of physical exercise interventions in people over 60 years old: A systematic review.

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Objective: This systematic review was conducted to examine the cost-effectiveness of physical exercise interventions in people over 60 years old without an acute specific pathology and non-institutionalized.

Methods: A systematic search was carried out in PubMed, Web of Science, and Cochrane Library, covering the period from the respective start date of each database to January 2021, published in English or Spanish. Two investigators evaluated 847 studies against the inclusion criteria (randomized controlled trials studies, that analyzed the cost-effectiveness of physical exercise interventions, in humans aged ≥60 years old, without an acute specific pathology and non-institutionalized). Methodological quality was assessed with the Physiotherapy Evidence Database scale and quality of economic evaluation with the Quality of Health Economic Studies.

Results: Fifteen studies including 13325 participants met the inclusion criteria. Eleven out of fifteen studies on exercise programs for older people reported cost-effective results. These physical exercise interventions were most cost-effective than many existing medical interventions. Specifically, the most cost-effective training to older people appears to be a multicomponent physical exercise program including cardiovascular exercise, muscle-strengthening of lower extremities, balance and stretching training. Also, the training methodology should be a progressive moderate intensity performed at least twice per week with each session lasting 60 minutes for ≥ 6 months. Finally, it would be delivered as a group-based intervention doing an extra physical exercise at home with home-based follow up, which appears to be cost-effective to decrease health and social care costs.

Conclusions: These findings suggest that physical exercise interventions in older adults without an acute specific pathology and non-institutionalized are a cost-effective tool. Gender, age, cognitive status, frailty, training frequency and duration could modify the cost-effectiveness of physical activity interventions. Health policy decision-makers may use these results to design useful policies and strategies to promote exercise for healthy ageing and to decrease healthcare costs in older adults.

Keywords: Exercise; Aging; Health; Cost-effectiveness.

Relationship between behavioral change and physical fitness and anthropometric variables in Spanish frail older adults: EXERNET-Elder3.0 project



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Objectives: The current rate of population ageing and the lack of physical activity among other factors, may lead to a state of vulnerability leading to frailty syndrome in older adults, which will be a challenge for health systems in the coming years. The use of behavioural change theories such as the Transtheoretical Model (TTM) and more specifically the Stages of Change (SoC) will help us to understand and promote physical activity behavioral in the population. The aim of this study was to identify the relationship between physical fitness and anthropometric variables as a function of stages of change (SoC) in a sample of frail older adults.

Methods: A total of 103 frail and pre-frail Spanish older adults (72 females) participated in this cross-sectional study, on the framework of the EXERNET-Elder3.0 project (Zaragoza). Age ranged from 68-94 years (mean=80.4±5.9 years). Stages of change (SoC), anthropometric data (BMI, %Body-fat, waist and hip circumference) and physical fitness (Senior Fitness Test) were measured. ANOVA and Scheffé post-hoc test were used for statistical analysis.

Results: Significant differences were found in BMI, Hip Circumference, Speed 6m, Speed 30m, Legs strength, Agility test and Resistance test ($p < 0,05$) as a function of SoC. According to the post-hoc test, those in advanced SoC (Action-Maintenance Stage), had healthier outcomes (anthropometric and physical fitness) compared to those in lower SoC (Precontemplation-contemplation, Preparation stages).

Conclusions: Subjects in early SoC are less motivated and therefore less willing to change physical activity practice. In this study, participants in Precontemplation-contemplation, Preparation stages reported worse fitness and body composition scores compared to advanced stages of change. The use of The SoC in older adults can help in the identification and the design of physical activity programs that aim to improve and promote regular physical activity practice in frail older adults.

Keywords: Aging; Frailty; Physical Fitness; Biobehavioral Sciences.

Physical activity and associated factors in the Spanish population ≥65 years



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Objectives: This study aims to analyze the physical activity (PA) levels and associated factors in the Spanish population ≥65 years.

Methods: A descriptive cross-sectional study was performed including people ≥65 years from the Spanish National Health Survey 2017. Groups of PA were set using the International Physical Activity Questionnaire as low (LPA), moderate (MPA) and vigorous (VPA). A total of 1,711 subjects were studied. The prevalence of each PA level was estimated, along with the 95% confidence intervals (CI). A logistic regression model was fitted, with PA level as the dependent variable and the following independent variables: sociodemographic factors (age, gender, marital status and studies level), health factors (degree of limitation and pain, self-perceived health status, mental health, illness diagnosis, drug consumption, hospital admissions and emergencies visits) and lifestyle (tobacco and alcohol consumption, body mass index and health eating index).

Results: A 5.6% of the sample performed LPA, 15% MPA and 3.8% VPA. Taking LPA as a reference, people with greater self-perceived health status were more likely to perform MPA (OR=0.938;CI95%=0.842-1.045) and VPA (OR=1.144;CI95%=0.432-0.862). Also, people with a lower degree of limitation were more likely to perform MPA (OR=0.502;CI95%=0.402-0.626) and VPA (OR=0.277;CI95%=0.191-0.402). Having bad mental health was a risk factor for MPA (OR=1.639;CI95%=1.160-2.317) and VPA (OR=2.166;CI95%=1.172-4.005), as well as not taking painkiller specifically for VPA (OR=1.869;CI95%=1.270-2.751).

Conclusions: Better self-perceived health status, good mental health and not taking painkillers were associated with higher levels of PA. PA programs are needed to improve the overall health of people ≥65 years.

Keywords: Physical activity; Health status; Elderly

Movement-based mHealth interventions to improve walking performance, balance, and physical activity self-management in older patients with neurological diseases



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Objectives: Due to the aging of the population, the chronicity and morbidity of diseases have increased in recent years, influencing the demand for healthcare resources. The availability of smartphones and the capabilities of their apps could be a solution to this new situation. Specifically, mHealth could provide the monitoring of patients in outdoor settings, home-based physical activity (PA) programs, and self-management. Therefore, this review aims to analyze the scientific evidence of movement-based mHealth interventions on walking performance, balance, and PA self-management in patients with neurological diseases.

Methods: A systematic review of randomized controlled trials (RCT) was conducted following the PRISMA guideline and performed in four databases: PubMed, Web of Science, Scopus and Physiotherapy Evidence Database (PEDro). The studies were selected using the following prescribed inclusion criteria: (I) Adults suffering neurological disease; (II) Interventions based on mHealth, using smartphone or tablet; (III) Comparison with treatment as usual or no intervention; (IV) Primary outcomes concerning walking performance, balance and PA self-management. The PEDro scale was used to evaluate the methodological quality of the studies.

Results: The initial search returned 269 articles. After the full selection process, a total of eight RCT were included in the present review, involving 282 participants. The results showed improvements in walking performance, balance and PA self-management in patients with several neurological diseases performing mHealth intervention. The overall PEDro score was 5.5, considering a moderate quality.

Conclusions: mHealth interventions seem to be a promoting alternative in the recovery of walking and balance in patients with neurological conditions, as well as in the enhancement of PA performance and self-management. However, it is needed for further studies to build evidence on the recommendation and use of mHealth in neurorehabilitation.

Keywords: m-Health; Locomotion; Posture; Physical exercise; Neurological diseases; Elderly.

Emerging insights into metabolome changes related to age and sex using advanced nuclear magnetic resonance profile.



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Objectives: Aging is a single greatest risk factor associated with diseases such as cancer or cardiometabolic diseases. Age and gender are physiologic factors that have a strong influence on metabolism including small molecules and lipoproteins. Gender differences in metabolites and lipoprotein levels are further affected by age. The aim of this study was to characterize an advanced metabolomics profiling including lipoproteins, glycoproteins and low molecular weight metabolites based on Nuclear Magnetic Resonance (NMR) in general Spanish population.

Methods: The cohort included 2626 women and 1964 men (age 50±17). The Liposcale Test was used to quantify the lipid content, particle number and size of lipoprotein subclasses. The Glycoscale test was used to obtain the glycoprotein profile and low molecular weight metabolites were also determined. We performed statistical univariate (mean ± std) and multivariate analyses to investigate the extent to which sex and age influence metabolome.

Results: Men showed a more pro-atherogenic profile than women, with higher LDL-C and LDL-P levels than women below age 50, and also present higher amount of small LDL particles which are associated with a pro-atherogenic profile. Furthermore, men present lower levels of HDL-C with higher proportion of HDL-TG which indicates that men presents a more dysfunctional HDL particles. In both sexes age was associated with an increase in the small LDL subclass. Glucose, lactate, alanine, glutamate, tyrosine, acetone and creatinine levels present an increasing tendency with age, but men have higher concentrations of them. GlycA and GlycB associated with inflammation also present an increasing tendency with age having higher concentrations in men population.

Conclusions: Advanced metabolomics profile including amino acids, lipoproteins and energy metabolism may serve as hallmarks of aging.

Keywords: Metabolomics; Aging; Sex; NMR; Liposcale

Resistance training in frail institutionalized centenarians



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Objectives: The oldest-old are at high risk of intrinsic capacity deterioration with subsequent loss of functional independence, which translates into increased health care costs. Growing evidence supports the multisystemic benefits of exercise programs, also in frail, institutionalized or hospitalized older adults. Exercise interventions have been described even in nonagenarians, but never at the limits of human lifespan. The purpose of this study was to examine the effects of resistance training in frail institutionalized centenarians.

Methods: Twelve frail [Fried: 3.7±0.8; Frailty trait scale-short form (FTS-5): 36.2±3.8] institutionalized centenarians (101.3±2.1 years) were randomly allocated to an intervention or a control group. The intervention group performed resistance training during 12 weeks (2 times/week, 1-2 sets of 8-10 repetitions as fast as possible, at 50-70% of the one-repetition maximum; 8 exercises). Functional capacity [Physical Performance Mobility Examination (PPME)], physical fitness and health-related quality of life [EuroQol-5D index (EQ-5D)] were evaluated in both groups before and after the intervention.

Results: Repeated measures ANOVA revealed a significant group by time interaction ($p < 0.05$) in FTS-5 ($\eta^2: 0.399$), PPME ($\eta^2: 0.875$), isometric knee extension strength (IKE) ($\eta^2: 0.515$), 6-meter walk test ($\eta^2: 0.642$), 30-second Sit-to-stand ($\eta^2: 0.866$) and EQ-5D ($\eta^2: 0.076$). More specifically, the intervention group significantly improved their PPME (3.8±2.6 points vs. 6.5±3.3 points), IKE (9.7±4.3 kg vs. 12.5±3.9 kg), 30-second Sit-to-stand (8.3±1.5 repetitions vs. 12.0±2.0 repetitions) and EQ-5D (0.112±0.118 vs. 0.233±0.090) (all $p < 0.05$) from baseline to the end of the 12-week training period. Additionally, no major adverse effects were noted over the intervention period despite the frailty of the centenarians.

Conclusions: To our knowledge this is the first time that the effects of resistance training have been described in centenarians. The results suggest that no one is too old to benefit from resistance training, being a safe strategy to delay the age-related loss of functionality, and therefore improving their quality of life.

Keywords: Centenarian; Frailty; Resistance Training; Physical fitness; Health-Related Quality of Life

Aging in Chilean population: diabetes associated to frailty



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Objectives: The objective was to evaluate the association between diabetes mellitus and frailty elderly general population from Maule region in Chile.

Methods: We performed a cross-sectional analysis in 618 adults ≥60 years old, from a cohort population-based study in Maule region in Chile, from 2015 to 2017.

Diabetes was based on reported medical diagnoses, or use of anti-diabetes drugs, or fasting plasma glucose ≥126 mg/dl. Frailty was based on Fried's criteria: weight loss, exhaustion (both self-reports), weakness (grip-strength), slowness (4-meters walking speed), and low physical activity (7-days accelerometer). Frail was any participant with at least 3 and pre-frail 1-2, indicators.

We ran multinomial regressions model with diabetes as a predictor and frailty state as outcome, adjusted for age, sex, and education.

Results: The participants were 58% women, 44% obese, and mean age 66.0±4.5 years. Among participants, 6% were frail, 49% pre-frail and 46% robust. The prevalence of diabetes was 22%, higher in women than men (26% vs 19%, $p = 0.015$), and increased with frailty state (18% robust, 24% pre-frail and 49% frail, $p < 0.001$). Diabetes was associated with frailty (OR: 3.7; 95% CI 1.8-7.8), and pre-frail (OR: 1.4; 95% CI 0.9-2.1) compared with robust. Frail participants spent the last time doing light and moderate activity, and the least walking per day than robust and pre-frail participants ($p < 0.001$).

Conclusions: The increased of the prevalence of chronic diseases as diabetes are important to understanding that the frailty state could increase rapidly. There is a need to assess the impact treatments to delay and reverse frailty in older people <80 years old. These interventions would favor the healthy aging in Latin-American country such as Chile.

Keywords: Frailty; Diabetes mellitus; Aging; Physical activity.

Fitter bodies in fitter brains? The association between physical fitness and cognitive performance in older adults.



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Objectives: To examine the associations of a set of physical fitness components with cognitive performance in older adults.

Methods: A total of 91 participants (42 females) between 65 and 75 years were included from the INTERMAE project (funded by Consejería de Salud y Familias, and FEDER, PI-0002-2017, clinical trial NCT03923712). Physical fitness was assessed by i) 6-minute walking test (cardiorespiratory fitness), ii) handgrip strength and 30 seconds-chair stand tests (upper and lower-limb muscular strength, respectively), and iii) 8-foot up and go test (coordination-agility). Cognitive performance was assessed by mini-mental state examination (screening for dementia), clock drawing test (screening for dementia), Rey auditory verbal learning test (memory), trail making test (cognitive flexibility), and stroop (inhibition). Linear regression analyses were performed adjusting for age, sex, and educational level.

Results: Higher cardiorespiratory fitness was associated with better inhibition (standardized $\beta = 0.390$, $p < 0.001$). Higher upper-limb muscular strength was associated with better cognitive flexibility and inhibition ($\beta \geq 0.320$, $p < 0.05$) whilst greater lower-limb muscular strength was only associated with inhibition ($\beta = 0.378$, $p < 0.05$). Higher coordination-agility was associated with greater cognitive flexibility and inhibition ($\beta \geq 0.296$, $p < 0.05$).

Conclusions: Cardiorespiratory fitness, muscular strength, and coordination-agility fitness were related with cognitive flexibility and inhibition but not with screening for dementia or memory in older adults. Further studies are needed to corroborate our findings.

Keywords: Aerobic capacity; Resistance; Cognitive function; Elderly.

Determinants of cardiorespiratory fitness and its association with cognitive performance, brain structure and prefrontal cortex oxygenation in older adults.



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Objectives: To identify the determinants of cardiorespiratory fitness (CRF) and to analyse its association with cognitive performance, brain structure and prefrontal cortex oxygenation in older adults.

Methods: The sample comprised of 92 participants (41 females) ranged 65 and 75 years from the INTERMAE project (funded by Consejería de Salud y Familias and FEDER (PI-0002-2017, Clinical Trial: NCT03923712). Participants completed 5 measurements sessions including: i) laboratory measurements of body composition, resting cardiovascular, metabolic and spirometry parameters, and CRF by the modified Bruce incremental test; ii) Senior Fitness Test Battery and handgrip test; iii) magnetic resonance imaging session; iv) self-reported questionnaires; and v) a battery of neuropsychological tests.

Results: The body composition parameters, resting cardiovascular and metabolic parameters, spirometry values, smoking and physical fitness performance were identified as relevant and independent determinants of CRF (all $p < 0.01$). Then, three new equations have been identified with the high prediction values for CRF with different complexity levels (r^2 ranged from 0.77 to 0.87, all $p < 0.001$). Finally, higher CRF, both objectively-measured and estimated, were associated with better cognitive performance (language, fluency and cognitive flexibility) (all $p < 0.05$) and brain structure (grey matter, white matter, entorhinal cortex and hippocampus volumes) (all $p < 0.05$).

Conclusions: Three new predictive equations for CRF that would be of help for screening cognitive performance with low cost and high feasibility tools have been developed. CRF level may be a protective factor against the deterioration of cognitive performance and brain structure in older adults.

Keywords: Aging; Physical Fitness; Mental Health; Brain; Dementia.

Are physical fitness levels different by Apo E genotype in older adults?



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Objectives: To examine the differences in physical fitness by Apolipoprotein E (Apo E) genotype status in older adults.

Methods: Physical fitness components (cardiorespiratory fitness, muscular strength, flexibility, coordination, and agility) and Apo E genotype (E2, E3, E4) were measured in 44 older adults (43% females) ranged 65 to 75 years from the INTERMAE project (funded by Consejería de Salud y Familias and FEDER, PI-0002-2017, Clinical Trial: NCT03923712). Cardiorespiratory fitness was assessed as VO₂peak relative (by modified Bruce incremental test) and 6-minute walking test. Muscular strength was assessed using handgrip, arm curl and 30 seconds-chair stand tests, flexibility by back scratch, chair sit and reach tests and coordination and agility was measured by 8-foot up and go test. DNA was extracted for genotyping the specific polymorphisms of Apo E (Thermo Fisher).

Results: We found 66% of APOE3/3 carriers, 23% of APOE3/4 and 11% of APOE2/3. Genotypes 2/3 and 3/3 were grouped as “no associated risk” to compare with the genotype 3/4 “higher risk of Alzheimer”. There were no differences for physical fitness levels by the two genotypes groups except for flexibility. Females who carried the allele 2 and 3 showed higher flexibility than the APOE3/4 carriers (p<0.05).

Conclusions: In general, there are no differences in physical fitness by Apo E genotype group in older adults. Older females’ carriers of alleles 2 and 3 presented better flexibility than APOE3/4 female’s carriers. These findings showed that genetic risk for Alzheimer do not necessary affect physical fitness levels suggesting that habitual physical activity and/or exercise could help to compensate its negative influence. However, further studies are still needed to corroborate our findings.

Keywords: Aged; Aerobic capacity; Muscle strength; Fitness; Genotype.

Are physical fitness components associated with sleep quality?



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Objectives: To examine the association of physical fitness components with sleep quality in older adults, and to analyse the role of sex.

Methods: A total of 95 older adults (42 females) aged 68.3±2.9 years were included from the INTERMAE project (funded by Consejería de Salud y Familias and FEDER, PI-0002-2017, Clinical Trial: NCT03923712). Cardiorespiratory fitness was measured by 6-minute walking and modified Bruce incremental tests; muscular strength was measured by handgrip, arm curl (repetitions in 30 s), leg extension isometric strength and 30 seconds-chair stand tests; gait speed was evaluated by SPPB-4 meters test; and coordination/agility was measured by 8-foot up and go test. Sleep quality, sleep duration and sleep efficiency were assessed using the Pittsburgh Sleep Quality Index (PSQI) questionnaire. Student’s t-test, correlation and multiple linear regression analyses unadjusted (model 1) and adjusted for potential confounders (model 2, age and sex) were applied for the overall sample.

Results: There were significant differences in total PSQI score between sex (p=0.03), but not in sleep duration and sleep efficiency. There were significant correlations of 6-minute walking test (r= -0.295; p=0.004), handgrip test (r= -0.238; p=0.02), leg extension strength (r= -0.247; p=0.02), gait speed (r= -0.316; p=0.003) with PSQI score. While, only leg extension strength was correlated with sleep duration (r= 0.2361; p=0.03). Linear regression analyses showed associations of 6-minute walking test (p=0.009), handgrip test (p=0.02) and gait speed (p=0.002) with PSQI in model 1, and between arm curl test and sleep efficiency in model 2 (p=0.03).

Conclusions: A better cardiorespiratory fitness, muscular strength, and gait speed were associated with better sleep quality in older adults. Further studies are needed to corroborate our findings.

Keywords: Aged; Aerobic capacity; Muscle Strength; Gait Speed; Sleep

Is the risk of dementia increasing the odds for fall risk in older adults?

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^aMOVE-IT Research Group, Department of Physical Education, Faculty of Education Sciences, University of Cádiz, Puerto Real, Spain.^bInstituto de Investigación e Innovación Biomédica de Cádiz (INiBICA). Cádiz, España.**Objectives:** To examine the association between cognitive status and fall risk in older adults.**Methods:** A total of 81 older adults (aged 65 to 75 years; 38 women) with valid data for cognitive status, fall risk and confounders variables from The INTERMAE project (funded by Consejería de Salud y Familias and FEDER, PI-0002-2017, Clinical Trial: NCT03923712) were included in the current analysis. Cognitive status was determined by the Clinical Dementia Rating (CDR) questionnaire, being classified as at risk of dementia (score ≥ 1) or with no dementia (score < 1). Fall risk was assessed by the Efficacy Scale International (FES-I). The FES-I total score ranged from 16 to 64 points and the cutoff of ≥ 23 points was considered to categorize as low or high fall risk. Logistic regression models were applied to calculate odds ratios and 95% confidence intervals for the association between cognitive status and fall risk after adjusting for potential confounders (i.e. age, sex, body mass index and educational years).**Results:** Older adults being at risk of dementia had an odds ratio of 6.3 (95% confidence interval 1.411-11.982) of having high fall risk compared with those without dementia.**Conclusions:** Prodromal stages of dementia, or being at risk for, increase more than 6 folds the fall risk in older adults. Preventive intervention strategies (ie. exercise) aimed to decrease falls should be emphasized in those population with cognitive concerns or at risk of dementia.**Keywords:** Risk of Dementia; Clinical Dementia Rating; Risk of Falls; Falls Efficacy Scale International; Elderly.**Are body composition and physical fitness associated with total antioxidant capacity?**J. Corral-Pérez^{a,b}^aMOVE-IT Research Group, Department of Physical Education, Faculty of Education Sciences, University of Cádiz, Puerto Real, Spain.^bInstituto de Investigación e Innovación Biomédica de Cádiz (INiBICA). Cádiz, España.**Objectives:** To determine the associations of body composition and physical fitness with total antioxidant capacity (TAC) in older adults.**Methods:** A total of 46 older adults (20 females) of 68.52 ± 3.08 years were included from the wave 1 of INTERMAE project (funded by Consejería de Salud y Familias and FEDER, PI-0002-2017, clinical trial NCT03923712). Body composition was measured using a multifrequency bioimpedance. Physical fitness was divided into three domains: i) cardiorespiratory fitness, measured by peak oxygen consumption (VO₂peak) by the modified Bruce incremental test and 6-minute walking test; ii) muscle strength, assessed by handgrip, 30 seconds-chair stand and arm curl tests; and iii) coordination-agility, assessed by 8-foot up and go test and 6-meter gait speed at normal and fast pace. Plasma TAC levels were measured by using a modified ferric reducing antioxidant power. Simple linear regression analyses were performed to calculate the associations of TAC with body composition and fitness tests.**Results:** No associations were found for body composition and TAC except for fat and fat free mass (both absolute and percentage) which showed a negative and positive association with TAC, respectively ($p < 0.04$). VO₂peak was associated with TAC (absolute, $\beta = 0.29$, $p < 0.05$), however, no association was found for 6-minutes walking test. Regarding muscle strength, significant associations were found for handgrip ($\beta = 0.41$) and chair stand tests ($\beta = 0.31$) but not for arm curl test with TAC. Finally, coordination-agility, 8-foot up and go test and 6-meter gait speed tests were associated ($\beta = -0.51, 0.39, 0.45$, respectively) with TAC.**Conclusions:** Body weight does not seem to be associated with TAC but a relevant role of fat mass and fat free mass on TAC was reported. Moreover, almost all physical fitness tests were associated with TAC which could suggest a potential mechanism by which fitness prevent frailty. However, further analysis including accelerometer-measured physical activity and diet remained to be performed to complement these findings.**Keywords:** Aged; Antioxidants; Exercise; Fitness; Body Composition.

Is physical fitness a relevant determinant of depressive symptoms in aging?



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Objectives: To examine the associations of a set of physical fitness components with depressive symptoms in older adults considering the role of sexes.

Methods: A total of 92 older adults (42 females) of 68.9±2.9 years were included from The INTERMAE project (funded by Consejería de Salud y Familias and FEDER, PI-0002-2017, Clinical Trial: NCT03923712). Flexibility was measured by sit and reach and back scratch tests; cardiorespiratory fitness was measured by the 6-minute walking test and modified Bruce incremental test to determine VO₂peak; muscular strength was determined by handgrip, arm curl, SPPB-5 repetitions chair stand and 30 seconds-chair stand tests; and gait speed, balance and coordination were evaluated by time in SPPB-4 meters gait and time in 6 meters gait at normal and fast speed, tandem test and 8-foot up and go test, respectively. Depressive symptoms were assessed by using the short version of Geriatric Depression Scale (GDS). Multiple linear regression analyses unadjusted (model 1) and adjusted by confounders (model 2, age and sex; model 3, adding antidepressant medication and self-reported health) were applied.

Results: All physical fitness tests and VO₂peak (absolute and relative) were associated with depressive symptoms ($P<0.05$) in overall sample after adjusting by models 1 to 3. When analyses were performed by sex, better performance in 6 meters gait at normal speed, SPPB-4 meters gait time in males and also back scratch test in females were associated with lower depressive symptoms in model 1. The 6 meters gait at normal speed and SPPB-4 meters gait time were associated with depressive symptoms in males and females, respectively, after adjusting by confounders (model 2). All physical fitness tests and VO₂peak were associated with depressive symptoms in both sexes after adjusting by model 3, except for 8-foot up and go, handgrip, arm curl and chair stand tests and VO₂peak in females.

Conclusions: Higher levels of physical fitness components were associated with fewer depressive symptoms in older adults. Moreover, these associations were maintained in both sexes, although with stronger impact in males. Our findings suggest a need for improving or maintaining physical fitness due to its beneficial relationship with depressive symptoms.

Keywords: Aged; Physical Fitness; Depression; Mental Health.

Effect of a 5-months multicomponent exercise program on telomere length, telomerase and S-klotho protein in older adults



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Objectives: To examine the effect of a 5-months multicomponent physical exercise intervention on telomere length, telomerase concentration and activity, and S-klotho protein in older adults.

Methods: A total of 60 older adults, aged 65-75 years, were included from the INTERMAE project (funded by Consejería de Salud y Familias and FEDER PI-0002-2017, Clinical trial: NCT03923712). Telomere length was measured in peripheral blood mononuclear cells (PBMCs) by real time- quantitative Polymerase Chain Reaction (RT-qPCR). Telomerase concentration was analyzed in plasma by Human TERT (Telomerase Reverse Transcriptase) ELISA Kit and telomerase activity by TeloTAGGG telomerase PCR ELISA kit (Roche) in PBMCs. S-Klotho plasma levels were measured by a soluble α -Klotho ELISA assay kit (Demeditec, Kiel, Germany). Repeated measures ANOVA and linear regression analyses were applied.

Results: A multicomponent exercise intervention enlarges telomeres length (TL) ($p<0.05$) and increases telomerase (medium effect size: 0.52) and plasma S-klotho concentrations ($p<0.001$) after adjusting for age, sex, TL at baseline and wave. However, significant changes on telomerase activity were not found. Sensitivity analyses by wave and TL at baseline (short vs long) reported a significant effect of exercise intervention in those older adults with shorter TL at baseline.

After 3 months of detraining, only telomere length remained higher ($p<0.001$), while increases in S-klotho protein or telomerase concentrations trend to return to baseline.

Conclusions: In older adults, a multicomponent exercise program promotes larger telomere length and higher telomerase and S-klotho protein concentrations compared with controls, although no positive effect is found on telomerase activity. After 3 months of detraining, the improvements in telomere length remained, while telomerase and S-klotho protein concentrations disappear.

Keywords: multicomponent exercise, klotho protein, telomere, telomerase and aging

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