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| **Effects of exercise on independence and functional performance.** | | | | | | **Searches: Cochrane, Pedro, PubMed, CINAHL** |
| **Author/Year** | **Purpose** | **Design** | **Subjects** | **Intervention** | **Outcomes** | **Results** | |
| **Effects of Pilates and Tai Chi on function** | | | | | | | |
| Baker et al. 2014 | To determine whether Pilates exercises improves dynamic balance and reduce falls in community dwelling older adults.  Systematic Review w/meta-analysis; 6 studies. | Systematic Review w/meta-analysis; 6 studies. | N=278, Aged ≥60 years. | Pilates exercise type consisted of (mat, theraband, ball, reformer, trapeze, Wunda chair). Exercises were performed in standing and utilizing a small BOS with added COM movement to provide a moderate to high balance challenge.  Programs were performed at ≥2h/wk and a total of >50h over the study period. | Timed Up and Go (8-ft up and go); 5 times sit-to-stand test; POMA developed by Tinetti; and the rank value stability index (where a person maintains an upright standing position on an unstable surface. | Pilates exercises can improve balance in older adults, resulting in decreased the risk of falling. Variability among the included outcome measures did exist. | |
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| Huang & Liu. 2012 | To evaluate the effect of TCC on the balance control and flexibility of the older adults.  . | Systematic Review w/meta-analysis; 7 RCTs | N= 1088. Aged ≥60 years. | Tai Chi Chuan (TCC) | Balance control ability and flexibility of the older adults: Single-leg balance test, GUG, Berg (balance) | The completion time of the Get-up and Go test of the older adults in the experiment group was significantly shortened compared with the control group. The time of single-leg stand of older adults in experiment group was significantly prolonged compared with control group. The pooled estimated Berg (balance) test indicated that the balance control ability of older adults in experiment group was significantly increased compared with the control group. | |
| Qin et al. 2005. | To determine the effects Tai Chi Chun (TCC) exercises have on bone mineral density (BMD) and neuromuscular function in postmenopausal women. | Cross-sectional study | N=99 healthy postmenopausal women mean age of 55.9+/-3.1 years and within 10 years after the menopause, and N = 48 women who had been regularly practicing TCC exercise | TCC group: exercises performed 3hours/week | BMD using dual-energy X-ray absorptiometry (DXA) measured: lumbar spine and proximal femur of the non-dominant leg (femoral neck, greater trochanter, and Ward's triangle). Neuromuscular function evaluating: magnitude of trunk bend-and-reach, quadriceps muscle strength, and single-stance time on the non-dominant leg. | The study demonstrated an overall higher BMD at spine and hip and better neuromuscular function, in postmenopausal women who had been practicing regular TCC exercise for more than 3 years (average, 5 years) as compared with control group not participating in TCC. Regular participation in TCC exercise shows beneficial effects on BMD of the weight-bearing skeleton and on body functions including: muscle strength, balance, and flexibility in early post-menopausal women. | |
| **Effects of mixed exercise interventions on function** | | | | | | | |
| Cadore et al 2013 | To examine and recommend training strategies for improved functional capacity, muscle strength, balance, gait ability, and reduced falls risk community dwelling and physically frail older adults. | Systematic review; 20 RCTs. | N=684. Aged ≥70 years. | Resistance training programs performed 2-3 times a week, with 3 sets of 8-12 repetitions and an intensity starting at 20%–30% and progressing to 80% of 1RM, by utilizing body weight as the resistance source and simulating daily activities.  Endurance training includes walking with changes in pace and direction, treadmill walking, step-ups, stair climbing, and stationary cycling. Training begins at 5–10 min and progress to 15–30 min. RPE of 12–14 on the Borg scale appears to be well tolerated.  Balance training includes, tandem foot standing, multi-directional weight lifts, heel–toe walking, line walking, stepping practice, standing on one leg, weight transfers (from one leg to the other), and modified Tai Chi exercises.  Multi-component training programs include gradual increases in the volume, intensity, and complexity of the exercises, along with the simultaneous performance of resistance, endurance, and balance exercises. | Gait ability was assessed by the 6-meter walk and the Timed Up and Go. Balance performance was assessed by the tandem and semi-tandem tests, Berg balance scale, one leg stand test, and clinical test of sensory interaction and balance. Strength measurements used the one repetition maximum test (1RM) and isokinetic and isometric dynamometry. Data on incidence of falls were assessed using validated questionnaires. | A multi-component exercise program incorporating strength, endurance, and balance training is the best strategy for improving gait, balance, strength, and reducing rate of falls in community dwelling older adults and maintaining functional capacity/independent during aging. | |
| Kang et al. 2015 | Investigate the effects of a 4-week multicomponent exercise program comprised of balance, strengthening, and stretching exercises, and visual feedback-based balance exercise, on the physical fitness of community-dwelling elderly women.  . | RCT. | N=22 women ≥ 65 years, able to walk 10 m without walking aids. | Experimental group: 4-week multicomponent exercise program, 60-minute sessions, 3x/week, comprising 5 minute warm-up and cool-down, 20 minute balance and strengthening exercises and 5 minute stretching.  Control group instructed to maintain their level of activity without participating in any specific physical fitness exercises during the 4 weeks. | Lower body strength was evaluated using 30-second chair stand test  Lower body flexibility was evaluated using the chair sit-and-reach test  Upper body strength was assessed using the 30-second arm curl test.  Upper body flexibility: back scratch test with two hands.  Dynamic balance/agility: 8-foot up-and-go test.  Aerobic endurance assessed using 2-minute step test  Body composition: (BMI) | Experimental group significantly increased lower and upper body strength 52.8% (p < 0.01) and 22.5% (p < 0.05), respectively following 4 weeks of training, but no changes were observed in the control group. Lower and upper body flexibility improved 232.4% (p < 0.01) and 25.9% (p < 0.01), respectively. Dynamic balance/agility also improved 15.3% (p < 0.05). No significant changes in aerobic endurance and body composition. Subjects in the control group showed a significant change (14.8% improvement) only in upper body flexibility (p < 0.05) over 4 weeks. | |
| **Effects of physical exercise interventions on function** | | | | | | | |
| de Vries et al 2012. | To determine the effect of physical exercise on mobility, physical functioning, physical activity and quality of life in older adults with mobility problems, physical disability and/or multi-morbidity. | Systematic Review w/meta-analysis; 18 original studies | Aged ≥60 years. | \*Home exercise (n = 50): progressive resistance training lower extremity. 10 weeks, 3 times a week  \*\*Home based strength training (n = 107) using elastic bands + cognitive and behavioral strategies to enhance attitude related to exercise and to maximize adherence. 6 months, 3 times a week, 35 min. Total: 45,5 h | \*Mobility: mobility skill, WS, 6MWT. Quality of life: SF-36 10 weeks  \*\*Mobility: TUG. Physical function: SIP, physical disability score, overall disability score. 3 months | \*10 weeks Mobility: mobility skills WS significant improvement  \*\*3 months Physical function: Physical disability score (−0.86: −1.14, −0.58) 6 months  Physical function: Physical disability score (−2.66: −3.03, −2.29) Overall disability score (−2.79: −3.17, −2.41) | |
| Bean JF et al. 2004  . | Goal was to determinate the effects of physical training with a weighted vest in community-dwelling older adult women. | Single-blind RCT.  10 women randomized to InVEST training group and 11 women randomized to a control group. | N=21. Aged (≥70years) Subjects were woman with a score between 4-10 on Short Physical Performance Battery (SPPB). | 12 weeks, 3x/week, 5-10 minute warm-up and cool-down, total program lasting 30 minutes.  InVEST subjects performed dynamic progressive resistance exercises: chair stands, toe raises, pelvic raises, step ups, seated triceps dips, and chest press. Volume consisted of 3 sets, 10 reps, 1-2 minutes rest between sets.  Control program consisted of chair-based exercises chair stands, plantar flexion, unilateral knee flexion, shoulder press. Volume consisted of 3 sets, 10 repetitions, with minimal rest between sets. | SPPB, 5x-chair stand, gait speed | InVEST group demonstrated significant improvements (P ≤ .05) in leg power across measurements obtained at 75% to 90% of the one-repetition maximum. Both groups demonstrated significant improvements in chair stand and SPPB score from baseline, and the InVEST group showed significant improvements in gait speed and chair stand from baseline (P ≤ .05). InVEST produced significantly greater changes in chair stand time than control (P≤.05). | |
| Valenzuela et al. 2012. | To identify the available literature regarding the effect of progressive resistance training in institutionalized older adults. | Systematic review; 13 RCTs. | Aged 80-89. | Intervention group: seated exercises, equipment consisted of ankle and wrist weight, resistance machines, therabans, weighted belts; training duration: 2-12 months; training sessions lasted 30-60 minutes; prescribed 3x/week; Volume ranged 3 sets, 5-20 repetitions; intensity ranged 50%-80% 1RM. | Strength outcomes using 1RM, 1x and 5x chair stand, 6MWD, Berg balance scale (BBS), Physical | Progressive resistance training can have significant improvements in muscle strength and functional performance in community-dwelling older adults. | |
| Orr et al. 2008. | Review the literature to determine if PRT is an effective single intervention to sufficiently improve balance performance in older adults. | Systematic review; 29 RCTs, n= 2174. | Men or women mean age ≥ 60years, including healthy, community dwelling cohorts, nursing home residents, frail, mobility-or-functionally limited with pathologies. | PRT group: avg. 27 weeks, 58 minutes sessions, frequency 2-3 days/week, 2-3 sets per session, using resistance machines, free weights, weighted vest.  Control group: varied from no exercise to alternative exercises including – slow velocity chair based, functional, breathing classes, education. | Static eyes open/closed: Single-leg stance, Parallel stance, double-leg stance, Classic Romberg, Semi-tandem stance, Tandem stance, Sharpened Romberg, FICSIT, Postural sway on compliant surface, Balance ability on tilt board,  Dynamic eyes open/closed: Tandem walk-forward/backward, Functional reach, Balance beam walk  Functional: Berg balance test, CS-PFP-balance and coordination domain, ADAP-balance and coordination domain | PRT alone as an isolated intervention has not been shown to significantly improve balance performance in older adults. | |
| Latham et al. 2003. | To determine the effects PRT has on older adults with physical disabilities, functional limitations and impairments. | Systematic review; 66 RCTs, n= 3783 | Men or women mean age ≥ 60years | PRT interventions included: elastic bands or tubing, cuff weights, free weights, isokinetic machines or other weight machines, individual or group exercise programs, and in a home-based or gymnasium/clinic setting. | Primary outcome was physical disability: Barthel Index, HRQOL, SF-36.  Secondary outcomes: muscle strength (e.g. 1 repetition maximum test, isokinetic and isometric dynamometry), aerobic capacity (e.g. 6 minute walk test, VO2 max), balance (e.g. Berg Balance Scale, Functional Reach Test), gait speed, timed walk, timed 'up-and-go' test, chair rise (sit to stand) | No significant differences were found between the different types of training. Aerobic training produced larger gains in measures of aerobic capacity while PRT tended to produced larger gains in strength. There is no statistically significant evidence to show that PRT independently used as an intervention has an effect on physical disability. | |
| Gillespie et al. 2012 | To assess the influence and outcomes single and multi-component interventions have on function and the incidence of falls in community-dwelling older adults. | Systematic review; 159 RCTs, n= 79,193 | Community-dwelling older adults age ≥ 60 years | Single interventions, multifactorial programs, multi-component group exercise, Tai Chi, | Primary outcomes: rate of falls, number of fallers  Secondary outcomes: number of participants sustaining fall-related fractures, adverse effects of interventions, economic outcomes | Multicomponent intervention programs and exercises are most effective at reducing rate of falls and improving functional performance. Multifactorial programs do not show statistically significant evidence for reducing risk of falls. Programs that include group and home-based exercises and home safety interventions demonstrate reducing rate of falls and risk of falling in community-dwelling older adults. Tai Chi is demonstrated as an effective program for reducing risk of falls. | |