Twelve months of resistance training can improve the cognitive functioning of older women living in the community

Synopsis


**Question**: Does resistance training improve cognitive function in older women living in the community? **Design**: Randomised controlled trial with concealed allocation and blinded outcome assessment. **Setting**: A local fitness centre and research centre in Canada. **Participants**: Women aged 65 to 75 years living independently in the community and with a Mini-Mental State examination score of at least 24 were included. Having a medical condition for which exercise was contraindicated, participating in resistance training in the last 6 months, and having depression were exclusion criteria. Randomisation of 155 participants allocated 52 to once-weekly resistance training (1RT), 54 to twice-weekly resistance training (2RT), and 49 to twice-weekly balance and tone exercises (BAT). **Interventions**: All groups received 60-minute exercise classes for 52 weeks supervised by fitness instructors. The 1RT and 2RT groups participated in a progressive high intensity protocol using a weights machine and free weights for resistance and with a training regimen of 2 sets of 6 to 8 repetitions for arm and leg exercises. The BAT group’s program consisted of exercises for stretching, range of motion, pelvic floor and balance, and relaxation techniques. **Outcome measures**: The primary outcome was change in the executive cognitive function of selective attention and conflict resolution as measured by the Stroop test at 6 and 12 months. The Stroop test assesses the time taken to name words of colours typed in incongruent ink colours. Secondary outcome measures were cognitive functions of set shifting and working memory, whole-brain volume, and functional measures of gait speed and muscular performance. **Results**: 135 participants (87%) completed the study and were included in the analysis. At 6 months there was no between-group difference but at 12 months, task performance in the Stroop test had improved by ~2.9 s in the 2RT group compared to BAT (95% CI −12.2 to −0.8) and −4.3 s in the 1RT compared to BAT (95% CI −13.8 to −2.5) representing improvement of 11% and 13% in 2RT and 1RT groups, respectively, and deterioration of 0.5% in the BAT group. Peak quadriceps muscle power increased by 13% in the 2RT group, but decreased by 8% in 1RT and 16% in the BAT group. There was a small but significant reduction in whole brain volume in 1RT and 2RT compared with BAT. The groups did not differ significantly on the remaining secondary outcomes. **Conclusion**: Twelve months of once or twice-weekly resistance training can improve the cognitive functioning of older women living in the community.

Commentary

This randomised controlled trial (RCT) contributes to the growing body of literature showing that physical activity can improve cognitive function in cognitively healthy older adults (Angevaren et al 2008). Liu-Ambrose and colleagues demonstrated that only one 60-minute session of supervised progressive resistance training per week for 12 months improved participants’ selective attention and conflict resolution in comparison to a twice-weekly balance and tone training control group. This improvement was greater in the once weekly resistance training group than in the twice weekly group. However, the authors did not offer any explanations for this dose effect. The authors conclude that the positive cognitive effect may be selective for executive functions since other secondary cognitive outcomes did not improve, however the battery of cognitive tests used was small. Furthermore the authors reported that the improvement in executive functions was significantly associated with increased gait speed. This important finding adds further weight to the relevance of gait speed for cognitive function and survival (Soumaré et al 2009, Hardy et al 2007). A puzzling result is that brain volume was reduced in both resistance training groups in comparison to the control group – opposite to what one would have expected. Similar controversial brain volume findings have been reported previously and one hypothesis is that it might have to do with the intervention helping to dissolve specific cerebral pathology (eg, amyloid plaques). If β-amyloid were measured it could have helped to explore this hypothesis further. This RCT encourages us not only to recommend physical activity for the ageing brain, but also to investigate further what type, frequency, and intensity of physical activity might be optimal.

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References

Additional physiotherapy during acute care reduces falls in the first 12 months after hip fracture

**Synopsis**


**Question:** Do additional physiotherapy and high dose vitamin D₃ therapy reduce the rate of falls and hospital admissions in patients with hip fracture? **Design:** Randomised, controlled trial with blinded outcome assessment. **Setting:** One large hospital centre in Switzerland. **Participants:** 173 patients with acute hip fracture. All participants had to have a mini-mental examination score of at least 15, have had no prior hip fracture at the newly fractured hip, have undergone surgical repair, have creatinine clearance of more than 15 mL/min and to have been able to walk 3 m before their hip fracture. Key exclusion criteria included metastatic cancer or chemotherapy, kidney stones, hyperparathyroidism, sarcoidosis, or severe vision or hearing impairment. Randomisation of 173 participants allocated 42 to standard physiotherapy and high dose vitamin D₃ therapy, 44 to additional physiotherapy and high dose vitamin D₃ therapy, 44 to standard physiotherapy and standard vitamin D₃ therapy, and 43 to additional physiotherapy and standard vitamin D₃ therapy. **Interventions:** Both groups received 30 min per day of physiotherapy and 800 IU per day vitamin D₃ therapy. In addition, the additional physiotherapy groups received an extra 30 minutes of home program instruction each day during acute care and an instructional leaflet at discharge. The high dose Vitamin D therapy groups also received an additional 1200 IU per day vitamin D₃ therapy. **Outcome measures:** The primary outcomes were rate of falls and the rate of hospital readmission at 12 months, assessed by monthly telephone calls and a patient diary. All analyses were based on intention to treat and included 173 patients. **Results:** 128 participants completed the study. At 12 months, the falls rate in the patients who had received additional physiotherapy was 25% less (95% CI –44% to –1%). High dose vitamin D₃ therapy did not reduce the rate of falls. At 12 months, the rate of hospital readmission was 39% less in patients who received the high dose vitamin D₃ therapy (95% CI –62% to –1%). Additional physiotherapy did not reduce the rate of hospital admission. **Conclusion:** Additional physiotherapy and supplementation with high dose vitamin D₃ therapy of 2000 IU per day had different benefits after hip fracture. Additional physiotherapy reduced the rate of falls and supplementation with high dose vitamin D₃ therapy reduced the rate of hospital readmission. These two interventions may be useful together as they address two distinct but important complications after hip fracture.

**Commentary**

Hip fractures are predicted to increase in incidence by 36% by 2051 in Australia (Sanders et al 1999). Studies aiming to improve outcomes in this group with effective and relatively low cost interventions have potentially substantial impact for the individual, their family, and costs to the health system. This study is a valuable addition to the limited evidence regarding effective interventions in reducing falls or improving associated outcomes in this high risk group.

Importantly, this study adds to the substantial evidence available that exercise programs can reduce falls in at-risk older people, although few of these studies have investigated high risk clinical groups such as patients with hip fracture or stroke. The 25% reduction in falls, and a non-significant although substantial reduction in hospitalisations, and hip fracture-related hospitalisations are impressive outcomes.

One critical element for physiotherapists is the content of the exercise program (Hill and Williams 2009), particularly given the findings of a recent meta-analysis that a critical element of successful fall prevention exercise programs is that they incorporate challenges to the balance system (Sherrington et al 2008). In the brief description of the exercise program in this paper, there appears to be limited focus on balance (‘standing on both legs then standing on one leg while holding a handrail’). Other successful falls prevention exercise programs such as the Otago program (Robertson et al 2002) have incorporated a stronger focus on specific balance activities. Given that falls in most cases caused the hip fracture in these patients, and balance impairment is strongly implicated in falls, it will be worth investigating if stronger focus on balance performance can achieve even better outcomes.

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**References**

Ankle exercises in combination with intermittent ice and compression following an ankle sprain improves function in the short term

Synopsis


Question: What is the effect of an accelerated intervention incorporating early therapeutic exercise as compared to a standard intervention of protection, rest, ice, compression, and elevation after acute ankle sprain? Design: Randomised, controlled trial with blinded outcome assessment and intention-to-treat analysis. Setting: An emergency department and sports injury clinic in Northern Ireland. Participants: Men and women 16–65 years, with acute (< 7 days) grade 1 or 2 ankle sprain. Key exclusion criteria were complete (grade 3) rupture, bony ankle injury, and multiple injuries. Randomisation allocated 101 participants to an accelerated intervention incorporating early therapeutic exercises (exercise group) or a standard protection, rest, ice, compression, and elevation intervention (standard group).

Interventions: During the first week after baseline both groups received written advice on using ice and compression. The exercise group also undertook 20 minutes of exercises three times a day focused on increasing ankle range of movement, activation and strengthening of ankle musculature, and restoring sensorimotor control. In the following four weeks a standardised treatment consisting of ankle rehabilitation exercises was provided to both groups.

Outcome measures: The primary outcome was subjective ankle function assessed by the lower extremity functional scale (0–80) at weeks 1 to 4. Secondary outcomes assessed were: pain at rest and pain with activity with 10-cm visual analogue scales, swelling by a modified version of the figure of eight method, and physical activity by a physical activity logger. Ankle function by the Karlsson score and rate of reinjury were also assessed at 16 week follow-up.

Results: 15 of the 101 patients dropped out during the trial, 11 in the exercise group and 4 in the standard group. An effect was found in favour of the exercise group with the lower extremity functional scale (0–80) at week 1 (MD 5.3, 95% CI 0.3 to 10.3) and week 2 (MD 4.9, 95% CI 0.3 to 9.6). In addition, the exercise group was more active in the first week as measured by time spent walking (0.4 hours per day, 95% CI 0.2 to 0.6). No between-group differences were observed for pain at rest, pain with activity, or swelling. At 16 weeks there were no significant differences between the groups in the Karlsson score or reinjury rate (2 in each group). Conclusion: An accelerated exercise protocol during the first week after ankle sprain improved ankle function and early return to weight bearing activity.

[Between-group difference in time spent walking per day calculated by CAP editors]

Commentary

This study is the first to describe the effect of early mobilisation in combination with the standard PRICE (Protection, Rest, Ice, Compression, Elevation) treatment after an acute ankle sprain using a randomised controlled trial where, instead of rest, the intervention group performed therapeutic exercises aimed at increasing ankle movement, as well as static strengthening and stretching exercises (Knight 1995). The main finding was a significant improvement in short-term ankle function for those completing the exercise protocol during the first week following an ankle sprain. It is worth noting that the size of the effect (expressed as change in the lower extremity functional score from baseline to week 1) was smaller than the change of 9 points nominated as the clinically important change. However, as the adherence rate to the prescribed treatment was higher in the standard group compared to the exercise group (77.9% versus 67.8%), the effect for those adhering to the exercise protocol might have been higher than confirmed by the published results. The authors did not describe in detail how often the exercises should be performed during the first week (’20 min, 3 times a day’). However, based on the study protocol previously published (Bleakley et al 2007) we assume that the exercises were prescribed daily during the first week. For general practitioners, as well as sports physicians and physiotherapists, seeing patients with acute ankle sprains in the clinic, these findings emphasise the importance of prescribing exercises in combination with the PRICE protocol in the first week after injury to optimise rehabilitation. However, the optimal dosage of treatment, including PRICE, choice of exercises, intensity and frequency of the exercise protocol, requires further investigation.

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References