Proprioceptive training reduces the risk of ankle sprain recurrence in athletes

Synopsis


Question: Does a home-based proprioceptive exercise program reduce the one-year incidence of recurrent lateral ankle sprain in athletes? Design: Randomised controlled trial. Setting: Participants were recruited through primary care clinics as well as through advertisements in magazines, on the internet, and at sports tournaments in The Netherlands. Participants: 522 athletes aged 12–70 years with a lateral ankle sprain in the preceding 2 months were allocated to one of two groups, using concealed allocation. The groups were comparable at baseline with respect to age, sex, hours of sports exposure, and history of ankle sprains. Interventions: Athletes in both groups were free to seek and use any treatment they chose for their original ankle sprain. When any such interventions were complete and the athlete had returned to sport, only the intervention group additionally received an 8-week, unsupervised home-based proprioceptive training program, designed by physiotherapists. The program consisted of 3 sessions per week of up to 30 minutes each. An instructional DVD, exercise sheets, balance board, and web-based resources were provided to the intervention group. Exercises were gradually increased in difficulty and training load during the 8-week program. Outcomes: The primary outcome was incidence of ankle sprain in the 1-year follow-up period, reported monthly on a web-based questionnaire. Reported ankle injury data were rated by a blinded assessor as acute ankle sprains or other ankle injuries. Participants who reported an ankle injury also completed a cost diary to record costs of healthcare and lost productivity until recovery. Results: 86% of participants were followed up at 12 months. 33% of athletes in the control group reported an ankle sprain during follow-up, compared with 22% in the intervention group, which is an absolute risk reduction of 12% (95% CI 4 to 19) and number needed to treat of 9 (95% CI 26 to 5). Ankle sprains were further classified as those leading to loss of sports time, and those leading to costs of healthcare or lost productivity. Regardless of the classification used, significant reductions in the risk of ankle sprain were still evident after adjustment for age, type of sport, and level of sport. Conclusion: A home-based proprioceptive training program for athletes reduces the risk of ankle re-sprain in the following year, particularly for those who do not seek other treatment.

ARR, NNT, and 95% CIs calculated by the CAP Editor.

Commentary

The risk of having an ankle sprain is increased in people with a previous history of ankle sprain (Hiller et al 2008, Verhagen et al 2004). Hence, in addition to treating the acute symptoms of an ankle sprain, physiotherapists need to implement strategies that reduce the risk of recurrent sprains. Hupperets et al showed that adding a home-based proprioceptive training program to usual care reduced the risk of recurrent ankle sprains.

The program used in the trial was simple, required minimal equipment and time commitment from the patient, allowed progression through different levels of difficulties, and can be easily implemented by physiotherapists in clinical practice. Although the trial recruited ‘active sports participants’ (the criterion to assess this was unclear), it is possible that the positive effects associated with the program may also apply to the general population. The program requires minimal therapist-to-patient contact and therefore can be implemented in both urban and rural settings.

Compliance with the program was relatively low (52%), despite providing exercise sheets, a DVD, and web-based information. Additional strategies may boost compliance in clinical practice, eg, face-to-face or telephone follow-ups or email reminders. This needs to be balanced as too many follow-ups will increase patient burden and healthcare costs unnecessarily.

A few issues need to be taken into consideration when interpreting the results of this trial. The trial had an acceptable dropout rate of 14%, but there was a slight difference (n = 7) between the number of participants randomised in the trial report (Hupperets et al 2009) and its published protocol (Hupperets et al 2008). The protocol also reported that the trial collected secondary outcomes and conducted a cost-effectiveness analysis. These outcomes have not been included in the present publication. However, these issues should not detract physiotherapists from the overall findings of the study – that a proprioceptive training program is beneficial in reducing recurrent ankle sprains and should be implemented in addition to usual care when treating people with acute ankle sprain.

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References

A home-based program of simple quadriceps exercises reduces knee pain and improves knee function in overweight people with knee pain

Synopsis


Question: Does a program of quadriceps exercises or dietary advice, or both, reduce knee pain and improve knee function in people living in the community with knee pain? Design: Factorial, randomised, controlled trial. Setting: Five general practices in the United Kingdom with interventions delivered through home visits. Participants: Community dwellers aged at least 45 years, who were overweight or obese (BMI ≥ 28) and complained of knee pain on most days of the past month. Randomisation of 389 participants allotted 82 to the quadriceps exercise group, 122 to the dietary advice group, 109 to the quadriceps exercise and dietary advice group, and 76 to a control group. Interventions: The exercise groups were taught the exercises at home by a dietitian and received up to 6 further home visits over 24 months. Exercise participants were asked to complete ≥2 exercises a day, with 5 to 20 repetitions of each exercise. The exercises progressed from quadriceps setting exercises, to exercises with elasticised bands, to functional activities such as stepping up and down off a step. The dietary groups received individualised advice to reduce weight, newsletters with recipe ideas, and one home visit per month over 24 months. The control group received an advice leaflet. Outcome measures: The primary outcome was pain reduction by ≥30% on the pain subscale of the Western Ontario McMaster (WOMAC) osteoarthritis index at 24 months. Secondary outcome measures were change in the WOMAC pain, stiffness, and physical function subscales, hospital anxiety and depression rating scale, and the bodily pain and physical function domains of the Short Form 36 (SF-36). Results: 289 (74%) participants completed the study. At 24 months, those in the exercise groups were more likely to experience ≥30% reduction in pain compared to the non-exercise groups (relative risk 1.36, 95% CI 1.05 to 1.76) with number needed to treat of 9 (95% CI 5 to 55). Compared to the non-exercise groups the exercise groups showed improvement in WOMAC physical function of –3.64 units (95% CI –6.01 to –1.27), WOMAC stiffness (–0.35 units, 95% CI –0.66 to –0.03), and improvements in the SF-36 subscales of bodily pain and physical function. The dietary advice groups lost weight (2.95 kg, 95% CI 1.44 to 4.46 kg) and reduced depression at 24 months compared to the non-dietary groups, but showed no evidence of an effect on any other outcomes. Conclusion: A 2-year home-based quadriceps exercise program reduced knee pain and increased knee function in overweight and obese people with knee pain. The effect size was moderate. Dietary advice resulted in a modest weight loss that did not change pain or function, but did reduce depression.

Commentary

Knee pain due to osteoarthritis is common (Peat et al 2001) and will increase in prevalence as the population ages (Wilmoth 2000) and as obesity levels rise (James 2008). Thus this trial addresses an important problem. Most people are managed in primary care and the most recent UK guidance recommends that all patients receive advice about weight management and exercise (NICE 2008).

Overall, the design, conduct, and analysis of this trial are of high quality. The evaluation of the combined treatment is clinically sensible and a key strength of the trial is the 2-year follow-up. Two areas deserve consideration. The first is the way in which the interventions were delivered. Both the exercise and dietary interventions were delivered through home visits: those receiving only the exercise intervention had up to 7 home visits by the dietitian over 2 years, supplemented by telephone calls between visits (up to 15 ‘contacts’ with a health professional), and those receiving the dietary intervention had monthly home visits over 2 years (up to 24 ‘contacts’ with a health professional). It is difficult to view the interventions as ‘self-managed’ given that over 3700 home visits took place. The intensity of these interventions is not usual practice in the UK (Holden et al 2008), which raises questions about whether health care policy makers and those who purchase services will view the moderate effects of the exercise intervention in this trial as worth the high number of treatment ‘sessions/contacts’. The companion cost-effectiveness paper (Barton et al 2009) reports that, although the exercise and dietary interventions were more effective, they were not cost-effective. Future research should study less intensive interventions in primary care that nevertheless provide some ongoing support and review by health professionals.

The second key issue relates to exercise adherence. The exercise program provided clinically beneficial outcomes for pain and function, but only 45% adhered ‘highly’ to the recommended program and there were more withdrawals from the exercise intervention groups. Undoubtedly, future research needs to investigate how to support adults with knee pain to engage in exercise programs that they feel willing and able to continue over the long-term, helping them translate the improvements in knee pain and function into overall lifestyle change and wider health benefits.

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References


Airway clearance physiotherapy improves quality of life in people with bronchiectasis

Synopsis


**Question:** Does regular airway clearance using an oscillating positive expiratory pressure (PEP) device improve quality of life, sputum volume, respiratory function, and exercise capacity in people with bronchiectasis? **Design:** Randomised, crossover, controlled trial with 3-month intervention periods separated by a 1-month washout period. **Setting:** Acute teaching hospital in Scotland. **Participants:** 20 adults with radiologically diagnosed bronchiectasis and chronic sputum expectoration, who were not performing regular physiotherapy for airway clearance. Smoking, asthma, emphysema, and cystic fibrosis were exclusion criteria. **Interventions:** While in the intervention arm, participants performed 20–30 minutes of airway clearance twice daily. Each session consisted of three cycles of 10 breaths through an oscillating positive expiratory pressure (PEP) device called the Acapella, followed by the forced expiratory technique and coughing. Each participant’s technique was reviewed by a physiotherapist monthly during the intervention arm. During the control arm, the device was retained by the investigators and participants performed no physiotherapy for airway clearance. Throughout the study, both groups received all other standard management including antibiotics when exacerbation criteria were met. Any changes to the participants’ usual medication regimen were noted. **Outcome measures:** The primary outcome was the Leicester Cough Questionnaire (LCQ) – a 19-point, patient-reported measure of the impact of cough severity on quality of life with three domains (physical, psychological, and social). Secondary outcomes included the St George’s Respiratory Questionnaire (SGRQ), 24-hour sputum volume, lung function, maximum respiratory pressures, and the incremental shuttle walk test, measured at the end of each intervention arm. **Results:** All participants completed the study with no adverse events during airway clearance. During the 3-month intervention period, the total LCQ score showed significantly greater improvement than during the control period: difference in medians for total LCQ score 1.3 points, *p* = 0.002. Each of the three domains within the LCQ also showed significant benefits. Other outcomes that showed significantly greater improvements due to the airway clearance intervention were the SGRQ (difference in medians 8.5 points, *p* = 0.005), 24-hr sputum volume (difference in medians 3 ml, *p* = 0.02), and the incremental shuttle walk distance (difference in medians 40 m, *p* = 0.001). The groups did not differ significantly on the remaining secondary outcomes. **Conclusion:** Regular airway clearance with oscillating PEP improves disease-related quality of life and exercise capacity in people with bronchiectasis.

Commentary

This is the first long-term randomised trial of airway clearance physiotherapy in bronchiectasis. Previous short-term trials have only identified improvements in measures of sputum clearance (Jones & Rowe 2005). Long-term changes in sputum production are difficult to interpret because, while an increase may indicate more effective clearance, it could also indicate a greater mucus load in the lungs. So, while Murray and colleagues identified an effect on 24-hr sputum volume, of greater importance are the improvements in quality of life and incremental walk test distance.

The trial was well designed. The use of a crossover design raises concerns about carryover effects. Although the authors report similar group characteristics before intervention periods 1 and 2, it would be more convincing to report similarity before treatment and control periods (eg, Hodgson et al 2007). The breathing regimen employed with the Acapella (3 sets of 10 breaths) was a small treatment stimulus compared to the 10 sets of 10 breaths utilised in traditional PEP therapy (Elkins et al 2006), even considering it was applied twice a day. Also, an advantage of the Acapella is its ability to provide oscillating PEP independent of gravity, but it is unclear whether this was utilised because the position of the participants was not described.

Despite the above issues, this paper provides much needed evidence to support the use of airway clearance physiotherapy as a maintenance strategy in this population. The worthwhile results in this mild patient group show that initiating airway clearance physiotherapy early in the disease process is appropriate. Patients with greater sputum production may have more to gain, so further trials with participants with more severe disease should be conducted. Such trials should employ blinded outcome assessment and a stronger treatment stimulus. Also, given the recent trend for measures of global satisfaction with treatment to be included in clinical trials (eg, Glinsky et al 2008, Kay et al 2008, Lau et al 2008), this could be reported, as could the proportion of participants who elect to continue with the intervention after completing the trial.

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References


Constraint-induced movement therapy after injection of Botulinum toxin improves spasticity and motor function in chronic stroke patients

Synopsis


**Question:** Does injection of Botulinum toxin followed by constraint-induced movement therapy improve spasticity and upper limb motor function more than the same injection followed by rehabilitation based on neurodevelopmental techniques? **Design:** Randomised trial with concealed allocation and blinded outcome assessment. **Setting:** Rehabilitation department of a tertiary hospital in Taiwan. **Participants:** Adults at least one year after a stroke with a Modified Ashworth Scale (MAS) score of 3 or more in the elbow, wrist, or finger flexors, and with at least 10 degrees of active interphalangeal and metacarpophalangeal extension and 20 degrees of wrist extension. Fixed contractures, major co-morbidities, and previous Botulinum toxin injection or surgery for spasticity were exclusion criteria. Randomisation of 32 participants allotted 16 to each group. **Interventions:** Both groups received a total dose of 1000 units of Botulinum toxin type A, injected at standard muscular sites in the affected upper limb, and commenced their 3-month rehabilitation regimen the following day. The intervention group underwent intensive training of the affected upper limb for 2 hours, 3 times per week, while the non-affected upper limb was restrained for at least 5 hours per day. Selected tasks were progressed in complexity, with some assistance with movements and verbal feedback and encouragement. The control group received 1 hour each of physiotherapy and occupational therapy, 3 times per week. Therapy was based on neurodevelopmental techniques, focusing on normalising tone, and movement patterns. **Outcome measures:** The primary outcome was the MAS (0 = no spasticity, 4 = rigid in flexion or extension). Secondary outcomes included the Motor Activity Log (MAL), comprising two 6-point scales of amount of use and quality of movement, and the Action Research Arm Test (ARAT), which rates 19 tasks from 0 (no movement possible) to 3 (normal movement), to give a total score out of 57. **Results:** 29 participants completed the study. At 6 months, the treatment group had significantly greater reduction in MAS scores for the elbow (0.7, 95% CI 0.1 to 1.3), wrist (0.7, 95% CI 0.2 to 1.2), and fingers (1.2, 95% CI 0.9 to 1.5). Also at 6 months, the treatment group had significantly greater improvement in amount of use (1.1, 95% CI 0.8 to 1.4), quality of movement (0.9, 95% CI 0.6 to 1.2), and ARAT scores (7, 95% CI 4 to 10). **Conclusion:** Injection of Botulinum toxin followed by constraint-induced movement therapy improves spasticity and upper limb motor function more than the same injection followed by rehabilitation based on neurodevelopmental techniques.

[95% CIs calculated by the CAP Editor.]

Commentary

This paper presents convincing evidence of the efficacy of combining Botulinum toxin type A injections with modified constraint-induced movement therapy in reducing spasticity and improving arm and hand function in patients with spasticity more than one year after stroke. The results are impressive, since the most consistent between-group differences occurred 6 months post-injection and 3 months post-training, suggesting that participants had ongoing gains even when the effect of the injections would be expected to have worn off. This strengthens the evidence that the benefits of constraint-induced movement therapy persist beyond the period of therapy (Kwakkel et al 2007), especially since some of these data were uncontrolled (Askim and Indredavik 2008).

There are a number of challenges to be addressed in implementing this intervention in clinical practice. First, evaluation of potential patients should include assessment of spasticity and active movement. The combined protocol was effective for a group of patients who had moderate to severe spasticity in the elbow, wrist and/or finger flexors, as well as enough strength to be able to produce 10 degrees of active extension of the interphalangeal and metacarpophalangeal joints and 20 degrees of active wrist extension. The absence of either of these criteria should suggest an alternate intervention. For example, modified constraint-induced movement therapy alone is effective in patients without spasticity (Langhorne et al 2009), so in these cases the use of Botulinum toxin injections is not recommended. In patients with significant weakness, the use of mental practice has shown promising results as a precursor to implementing modified constraint-induced movement therapy (Page et al 2007).

The second major challenge is the feasibility of providing one-on-one supervised practice for 3 2-hour sessions per week over 3 months, ie, a total of 72 hrs of supervised outpatient physiotherapy. The expense of travel to and from the facility is a further obstacle to implementation (Wolf et al 2007). It is unlikely that this amount of therapy could be funded in many circumstances. Physiotherapists are therefore challenged to deliver modified constraint-induced movement therapy by incorporating group and/or home-based practice (English et al 2008, Williams et al 2009).

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References


Community-based pulmonary rehabilitation is effective for people with chronic obstructive pulmonary disease (COPD)


**Question:** Does community-based pulmonary rehabilitation improve quality of life, respiratory exacerbations, exercise performance, and lung function in people with COPD?

**Design:** Randomised, controlled trial with concealed allocation and blinded outcome assessment. **Setting:** Two hospitals in The Netherlands. **Participants:** People with COPD (GOLD Stages 2 or 3) and impaired exercise capacity (≤ 70% of predicted peak work during incremental cycle ergometry). Prior rehabilitation and major co-morbidities were exclusion criteria. Randomisation of 199 participants allotted 102 to an intervention group and 97 to a control group. **Interventions:** All participants had their medications optimised before randomisation. Over 4 months, the intervention group visited a local physiotherapist twice a week for 30-minute intensive exercise training (endurance cycling and walking, upper and lower limb strength/endurance exercises). They were instructed to do the exercises for 30 minutes twice daily at home and to walk and cycle outside. They also completed an individualised education program using a booklet and, if required, received smoking cessation counselling (minimal intervention strategy) and 4 visits from a diettian for counselling and supplements. This was followed by a 20-month maintenance program, involving monthly visits to the physiotherapist.

**Results:** Follow-up was 93% at 4 months and 79% at 24 months. At 4 months, improvement in SGRQ score was significantly better in the intervention group by 4.2 points (95% CI 3.9 to 4.5), but exacerbations did not significantly differ, RR 1.01 (95% CI 0.57 to 1.79). Other outcomes that were significantly better in the intervention group were SGRQ activity and impact scores, MRC score, cycle endurance time, peak work, 6MWD, handgrip force, and fat-free mass. At 24 months, SGRQ, cycle endurance time, and 6WMD remained significantly better in the intervention group and exacerbations remained not significantly different. The intervention was perceived as significantly more effective. **Conclusion:** Community-based pulmonary rehabilitation is effective for people with COPD.

[95% CI calculated by the CAP Co-ordinator using unadjusted data.]

**Commentary**

COPD is the third leading cause of ‘burden of disease’ in Australia behind ischaemic heart disease and stroke (Mathers et al 1999). Pulmonary rehabilitation has proven efficacy in managing people with moderate-to-severe COPD (Ries et al 2007). While COPD is usually not diagnosed until it is moderately advanced, a survey conducted in France (Roche et al 2008) has indicated that even people with mild COPD suffer from significant dyspnoea and reduced quality of life. Thus, it is appropriate to evaluate the effects of pulmonary rehabilitation in people with milder COPD.

The study by van Wetering et al (2009) claims to investigate the value of pulmonary rehabilitation in people with ‘less advanced’ COPD who have impairment in exercise capacity. The study is well designed and believable being a single blinded, randomised controlled study with an acceptable dropout rate. However, the eligibility criteria excluded people with ‘less advanced’ COPD in terms of lung function. The study recruited people with COPD in GOLD stages I (FEV1/FVC < 0.7, 50% ≤ FEV1 < 80% predicted) and III (FEV1/FVC < 0.7, 30% ≤ FEV1 < 50% predicted), which equate to moderate and severe COPD. It would have been more novel to recruit people with mild COPD (GOLD stage I) who have some impairment to exercise capacity.

The study’s short-term results confirm the results of previous RCTs, with improvements in quality of life and exercise capacity following four months of rehabilitation compared to usual care. The results particularly support the effectiveness of community rehabilitation programs run by physiotherapists. Unfortunately, the results are difficult to extrapolate to all clinical environments where rehabilitation programs may only have the resources to run for a two-month period.

Although treatment benefits were still evident as significant between-group differences at 24 months, the maintenance strategy used was not sufficient to maintain exercise capacity and quality of life at the levels seen at the end of the 4-month program. Further studies evaluating more intensive maintenance programs in the community are required.

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**References**

