Cueing training in the home improves mobility in Parkinson’s disease

Synopsis


Question: Does a 3-week, home-based cueing program improve gait, gait-related activity, and health-related quality of life in people with Parkinson’s disease (PD)? Design: A multicentre, single-blinded randomised crossover trial.

Setting: University medical centres in the UK, Belgium, and The Netherlands. Patients: 153 patients with PD aged between 41 and 80 years and in Hoehn and Yahr stage II–IV were randomly allocated to an ‘early’ or ‘late’ intervention group. Subjects in the late group were put on a 3-week waiting list, without intervention, followed immediately by three weeks of cueing training. The order of the 3-week periods was reversed in the early group. Both groups underwent a follow-up period of 6 weeks without training. Interventions: The cueing program was delivered at home and consisted of nine treatment sessions of 30 minutes. Patients were trained with their preferred cueing modality: auditory, visual (light flashes), or somatic-sensory (vibrations). Cueing strategies were trained during a variety of tasks and environmental situations (indoor and outdoor), aiming to improve step length and walking speed, prevent freezing episodes and improve balance, by correcting the temporal aspects of gait.

Outcomes: Posture and gait scores (PG scores) measured at 3, 6, and 12 weeks were the primary outcomes. The PG scores consisted of a composite score of gait and balance based on items of the Unified Parkinson’s Disease Rating Scale. Secondary outcomes included specific measures of gait, freezing and balance, functional activities, quality of life, and carer strain. Main results: Small but significant (p < 0.05) improvements were found after intervention of 4.2% on the PG scores, gait speed (5 cm/sec), step length (4 cm), timed balance tests, and the confidence to carry out functional activities as measured with the Falls Efficacy Scale (3.7%). Severity of freezing was reduced by 5.5% in freezers only. Conclusion: Cueing training in the home improves mobility in patients with PD.

Commentary

Idiopathic Parkinson’s disease (PD) is a complex and progressive disease. Even with optimal medical treatment, using drugs or neurosurgery, patients with PD face with increasing mobility-related problems. For these remaining impairments, activity limitations, and participation restrictions, many PD patients make use of physical therapy. An important physiotherapy intervention for gait-related problems due to PD is the use of cueing strategies (Morris 2006). However, in their review Lim et al (2005) showed that there is a lack of high quality studies evaluating the efficacy of cueing outside a laboratory setting in PD.

The study by Nieuwboer is the first large randomised controlled trial with sufficient power evaluating home-based cueing strategies in PD, provided by specifically trained physical therapists. Only one drop-out occurred, which is an exceptional performance. Hopefully, this will inspire others to carry out studies of equal quality in this field of research.

The results are a welcome addition to available recommendations for physical therapy in PD (Keus 2007). The current practice recommendation was that ‘it is plausible that gait is improved by using visual or auditory cues which have been trained during active gait training.’ Now, we can add ‘there are indications that a 3-week cueing intervention improves ‘posture and gait’ and the confidence to carry out functional activities, without an increased probability of a fall’. Moreover, by duplicating the results of Thaut (1996), Nieuwboer provides evidence for the recommendation ‘there are indications that a 3-week cueing intervention has no effects at 6-weeks after termination of the intervention.’ However, the present results were found when cues were absent during the assessments. In daily life, PD patients will use the cues in the circumstances they need them, eg, to increase their gait velocity when crossing a street. Therefore, the results found by Nieuwboer might be an underestimation of the real effect when using the cues. Future study might consider assessing the patients while using the cues.

Finally, as Nieuwboer discusses, it questionable whether the short period of treatment provided is optimal. In stroke rehabilitation, intensity was found to be more important than content. Future studies should focus on evaluating whether a prolonged period of cueing training increases the sizes of the effects found, to determine whether habituation occurs to the stimulus of the cue and to evaluate the falls risk over longer periods. Also, answers should be found to how, and in which patients, cues improve movement.

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References

Combination of exercise and advice was slightly better than placebo for subacute low back pain

Synopsis


Question: What is the effectiveness of physiotherapist-directed exercise, advice, or both for subacute low back pain? Design: Randomised controlled trial. Setting: 7 university hospitals and primary care clinics in Australia and New Zealand. Patients: 259 persons with non-specific, subacute low back pain lasting for at least 6 weeks, but no longer than 12 weeks. Interventions: Participants were randomised to four groups: exercise and advice, exercise and sham advice, sham exercise and advice, or sham exercise and sham advice. 12 exercise or sham exercise sessions were delivered over 6 weeks. The exercise program included an individualised, progressive, submaximal program of aerobic exercise, stretches, functional activities, activities to build speed, endurance and co-ordination, and trunk and limb-strengthening exercises. Participants also received a home exercise program. The sham exercise intervention consisted of sham shortwave diathermy and sham pulsed ultrasound. In weeks 1, 2 and 4 participants received advice or sham advice. Advice sessions aimed to encourage a graded return to normal activities. During the sham advice sessions the patients talked about their problems but received no advice. Participants were not informed whether their group allocation was active or sham for either intervention. Outcomes: Primary outcomes were average pain over the last week (0 to 10 scale), global perceived effect (~5 to 5 scale) and function (Patient Specific Functional Scale, 0 to 10) at 6 weeks and 12 months. Results: The effect of exercise (the adjusted difference in outcomes between exercise and sham exercise groups) at 6 weeks was ~0.8 points (95% CI –1.3 to –0.3 points) on the pain scale and 0.5 points (95% CI 0.1 to 1.0 points) on the global perceived effect scale. The effect of advice at 6 weeks was ~0.7 points (95% CI –1.2 to –0.2 points) on the pain scale and 0.8 points (95% CI 0.3 to 1.2 points) on the global perceived effect scale. The effect of advice on the function scale was significant at 6 weeks and 12 months. For pain, function, and global perceived effect, the effect of combined treatments was larger than the effect of exercise or advice alone. Conclusion: Physiotherapist-directed exercise and advice was slightly more effective than placebo at 6 weeks. The effect was greatest when the interventions were combined. At 12 months a small effect on participant-reported function was still reported.

Commentary

This trial is a highly-needed and well-conducted study which highlights a core question in clinical practice with low back pain (LBP) patients: should patients with subacute LBP have advice only, exercises only, or a combination of both? The results are in line with previous studies in subacute LBP concluding that advice and exercise each have beneficial effects. They add important new knowledge to the field, however, by demonstrating that combined exercise and advice is substantially more effective than either intervention alone.

The enhanced effect of combining a cognitive intervention with an exercise intervention may be explained by the complex nature of LBP and the fact that most patients get a nonspecific diagnosis. Hence, combining interventions with different fundamental mechanisms of action (cognitive or exercise) may increase the odds of targeting patients’ underlying problems. Additionally, although the underlying mechanisms of action theoretically differ between a cognitive intervention and exercise, the interventions obviously have the potential to complement and heighten each other. A previous study has shown that combining cognitive intervention and exercises, ensuring a good link between the information given and the content of the exercise, can challenge the effect of spinal surgery (Brox 2003).

In the present study, potential placebo effects were controlled for by providing sham advice and sham exercise. The fact that the same clinicians provided both the real advice and the sham advice may have introduced a bias. The equivalent problem probably did not occur for the distinction between exercise and sham exercise, because the sham exercise involved a totally different practical procedure. However, the distinction between advice and sham advice would have been much more challenging. Furthermore, to present sham exercises by providing ultrasound and electrotherapy may be questioned. Would not patients with LBP know the difference between exercises and passive treatment modalities? In our opinion, this may have lead to a nocebo effect for this particular intervention.

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References

Neuromuscular training optimises knee function after arthroscopic ACL reconstruction

Synopsis


Question: Does neuromuscular training improve knee function more than traditional strength training following anterior cruciate ligament (ACL) reconstruction? Design: Randomised controlled trial. Setting: Two outpatient rehabilitation clinics in Norway. Patients: 74 adults aged between 16 and 40 years (mean: 28 years), scheduled for arthroscopic reconstruction of the ACL using an autogenous bone-patellar tendon-bone graft. Exclusion criteria included age of ACL injury more than 3 years, meniscal damage requiring repair, or previous injury or surgery to either knee. Participants were allocated to one of two rehabilitation programs using concealed allocation. Interventions: A 6-month rehabilitation program was commenced during the second week after surgery following a home program to restore knee range of movement and reduce swelling. Exercises were supervised by physiotherapists during clinic visits twice per week. Knee braces were not used at any time. The neuromuscular training group performed balance exercises, plyometric exercises, agility drills, and sports-specific exercises. The strength training group performed mainly strengthening exercises of the lower extremity (quadriceps femoris, hamstring, gluteus medius, and gastrocnemius muscles) based on the American College of Sports Medicine guidelines. Outcomes: Participants were assessed preoperatively and at 3 and 6 months postoperatively. The primary outcome measure was the Cincinnati Knee Score (CKS) which has a scale of 0 to 100 (100 = normal knee). Secondary outcome measures included pain intensity (100 mm VAS where 0 = no pain, 100 = worst imaginable pain), global knee function (100 mm VAS where 0 = worst possible knee function, 100 = pre-injury knee function), isokinetic muscle strength, the 36-Item Short-Form Health Survey, hop tests, proprioception, and balance tests. The outcomes assessor was unaware of treatment allocation. Results: 89% of participants underwent the 6-month assessment. At this time the CKS score was higher in the neuromuscular training group compared with the strength training group by 7 points (95% CI 2 to 13). Similarly, global knee function VAS scores at 6 months were higher in the neuromuscular training group by 13 mm (95% CI 2 to 24). The groups did not differ significantly on the pain VAS or other outcomes. Adherence to the rehabilitation program was higher in the strength training group (91% adherent) compared with the neuromuscular program (71%). Conclusion: Neuromuscular rehabilitation results in superior knee function at 6 months after ACL reconstruction compared with standard strength training.

Commentary

ACL injuries are common with an annual incidence of about 1 per 1000 inhabitants aged 10 to 64 years (Frobell 2007). Training is normally included in the treatment after injury or reconstruction of the ACL.

Previously, training programs focused mainly on restoration of muscle strength. In the 1990s, the sensory function of ligaments in relation to functional joint stability was recognised as important in training (Johansson 1991). Therefore, training programs including exercises that facilitate compensatory functional joint stabilisation have been advocated. However, there is a lack of studies evaluating the effects of neuromuscular training compared with more traditional training programs (Risberg 2004).

In this well-conducted RCT, the neuromuscular training (NT) group perceived better knee function compared with the traditional strength training (ST) group. However, there were no differences between the groups in observed knee function (hop tests, knee muscle strength, balance, proprioception). There were some similarities between the training programs, which may explain the few and small differences between the groups. The ST group performed mainly strengthening exercises for the lower extremity muscles, but also exercises that are included in neuromuscular training, such as core stability, balance, and functional exercises, where the quality of the performance of movements is emphasised (eg, accurate position of the knee in relation to adjacent joints). Another reason may be that too few patients were included to detect differences between groups. An interesting finding is that the ST group did not achieve better muscle strength than the NT group. This has also been reported by others (Zätterström 1992). Thus, training isolated muscles selectively may not be needed.

This study gives further support to the use of neuromuscular training after ACL injury.

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References

Resistance exercise training improves strength and quality of life in patients undergoing haemodialysis

Synopsis


Question: Does 12 weeks of progressive, resistance exercise administered during haemodialysis improve skeletal muscle quality and quantity, muscle strength, exercise capacity, and quality of life compared with standard care? Design: Randomised, controlled trial with concealed allocation and blinded assessment of primary outcomes. Setting: Outpatient haemodialysis unit of an Australian hospital. Participants: Adults who had received haemodialysis for more than three months, were independently ambulant > 50 m, and were able to perform resistance exercises. Randomisation of 49 subjects allotted 24 to the intervention group and 25 to standard care. Interventions: Both groups received standard medical care. In addition the intervention group undertook two sets of eight repetitions of 10 different exercises for the major muscle groups of the upper and lower limbs in supine or sitting during each dialysis session, three times per week for 12 weeks. This was performed to a rating of perceived exertion of hard to very hard. The arm used for vascular access was exercised immediately before each haemodialysis session. Outcome measures: The primary outcomes were the change from baseline to 12 weeks of thigh muscle cross sectional area (muscle quantity) and the intramuscular lipid infiltration using computed tomography scan (a measure of muscle quality where a reduction in Hounsfield units represents improvement). Secondary outcome measures were strength of the knee extensors, hip abductors, and triceps measured using a digital dynamometer and summed to give a total score; exercise capacity measured using a six-minute walk test; C reactive protein assayed from blood samples; anthropometric measures; and quality of life using the SF-36. Results: 44 subjects (90%) were followed up. Change in muscle quantity did not differ significantly between groups but the change in muscle quality, −0.4 Hounsfield units (95% CI −0.8 to 0.0), significantly favoured the intervention group. Changes in the intervention group were also significantly better for total muscle strength by 18 kg (95% CI 9 to 26); C reactive protein by log −0.32 (95% CI −0.53 to −0.11); and two domains of quality of life: physical function by 9 (95% CI 1 to 18), and vitality by 10 (95% CI 1 to 19). Changes in body weight, BMI and mid arm and mid thigh circumference were also significantly better in the intervention group. Conclusions: Twelve weeks of progressive resistance training during routine haemodialysis showed clinically meaningful benefits.

Commentary

Muscle atrophy is extremely common amongst patients with end-stage renal disease (Kouidi 1998). It may occur as a consequence of acidosis, corticosteroid use, oxidative stress, and disturbances due to haemodialysis. Disuse is another major contributory factor, with reductions in daily activity and formal exercise participation due to both musculoskeletal sequelae of renal disease (cramps, myoclonus, fatigue) and the prolonged periods devoted to haemodialysis. This further reduces function and quality of life.

Evidence of the beneficial effects of exercise training in this population has been accumulating since the 1980s (Nakao 1982, Goldberg 1983, Shalom 1984, Castellino 1987). One previous trial has investigated resistance training during routine haemodialysis treatment (Johansen 2006). That factorial trial demonstrated improvement in quadriceps muscle cross-sectional area in response to exercise training – an effect that was still evident even when the anabolic steroid nandrolone decanoate was used as a co-intervention. Unfortunately, an improvement in lean body mass was not identified, since this correlates with long-term survival in haemodialysis patients (Desmeules 2004).

The current study extends knowledge in this area by examining a more comprehensive (full body) and higher intensity exercise intervention. Previously identified improvements in muscle strength were confirmed, however the effect on muscle cross-sectional area was not statistically significant. The increases in total strength, body weight, body mass index, and limb circumference were both statistically significant and clinically worthwhile. It is unfortunate that lean body mass was not measured directly since it is an excellent prognostic indicator (Desmeules 2004).

The current study is of excellent quality, scoring 8/10 on the PEDro scale (Maher 2003) and with patient compliance over 80%. Hopefully this will increase physiotherapy involvement in the haemodialysis unit and provision of this worthwhile intervention, which has not received the active promotion it deserves in many haemodialysis units worldwide.

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References