

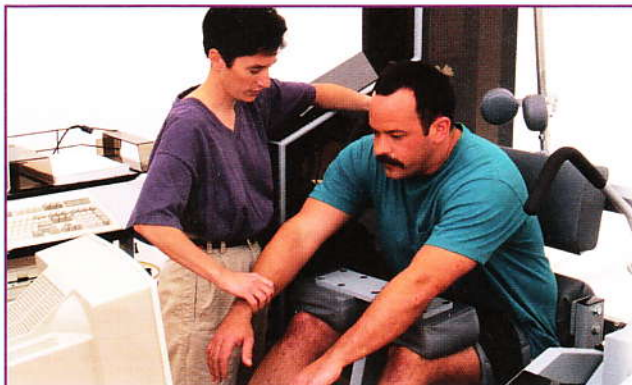
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Update on

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Neuromuscular Training Improves Outcomes Following ACL Reconstruction

Loss of muscle strength and neuromuscular control of the lower extremity are 2 primary impairments following anterior cruciate ligament (ACL) injury. Thus, rehabilitation programs aim to restore dynamic knee joint stability through neuromuscular training (NT) and muscle force generation capacity through strength training (ST) following ACL reconstruction. But whether or not one type of program is superior to the other in restoring function is not known and was the focus of an investigation by Risberg et al from Ullevaal University Hospital, Norway.

Seventy-four patients (27 females, 47 males; mean age, 28.4 years) received arthroscopic reconstruction of the ACL using an autoge-

nous bone patellar tendon–bone graft. Patients were randomized into either an NT group or ST group. Both outpatient rehabilitation programs were initiated the second week after surgery, with treatment sessions occurring 2–3×/week for 6 months.

The NT program consisted of balance exercises, dynamic joint stability exercises, plyometric exercises, agility drills and sports-specific exercises. The ST program, based on the recommendations of the American College of Sports Medicine, focused on lower extremity muscle strengthening emphasizing quadriceps femoris, hamstring, gluteus medius and gastrocnemius muscle groups. Adherence for all patients was documented using daily log sheets.

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The NT and ST groups were tested preoperatively and at 3 and 6 months. The primary outcome measurement of the Cincinnati Knee Score assessed pain, swelling, giving way, general activity level, walking, stair climbing, running, jumping and twisting activities with a maximum score of 100 for a normal knee. Secondary outcome measures included visual analogue scales (VAS) for pain and function, the Short Form-36 Health Survey, hop tests, isokinetic muscle strength, proprioception, and static and dynamic balance tests.

Sixty-seven patients (92%) returned for the 3-month follow-up examination and 65 patients (89%) returned for the 6-month follow-up. Preoperatively, the groups did not differ for the variables measured. At 3 months, there were no significant differences between the NT and ST groups for any of the outcome measurements. At the 6-month follow-up, significant differences between groups were found in the Cincinnati Knee Scores ($p = .01$), with greater improvement in the NT group (Figure 1). The NT group also had significantly better VAS scores for global knee function. Both training programs provided similar improvements in strength, balance, proprioception and hop tests.

The significant differences between the NT and ST programs seemed to take place between 3 and 6 months. The running, jumping and agility phases of the NT program may have resulted in improvement in patients' perception of knee function com-

pared with traditional training and running exercises included in the ST program. Longer term follow-up is needed to see if the modest differences found with the NT program persist.

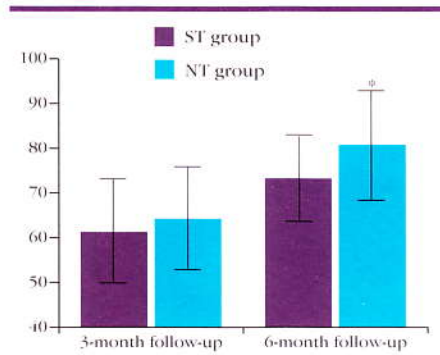


Figure 1. Cincinnati Knee Score at 3- and 6-month follow-ups for ST and NT groups. *indicates significant differences between groups at 6 months ($p = .01$).

Risberg MA, Holm I, Myklebust G, Engerbretsen L. Neuromuscular training versus strength training during first 6 months after anterior cruciate ligament reconstruction: a randomized clinical trial. *Phys Ther* 2007;87:737-750.

The Impact of Comorbidities on Outcomes Following Rotator Cuff Repair

Rotator cuff tears are increasingly common among individuals ≥ 40 years of age and can have a debilitating effect on function and overall health status. Surgery, with the goals of decreasing pain, improving function and limiting the progression of tendinopathy, is often the choice of treatment for patients who do not respond to conservative care. The presence of comorbidities at the time of surgery has often been linked to

poor outcomes in other diseases but has not been widely studied in patients with rotator cuff repair surgery.

In this study, Boissonnault et al from the University of Wisconsin–Madison assessed the functional and health-status outcomes in patients following physical therapy management after rotator cuff surgery. They also studied the impact of patients' existing medical comorbidities on shoulder function and general health status.

One hundred eighteen patients ≥ 45 years of age who had undergone a rotator cuff surgical repair participated in this multi-center study. All patients underwent a rehabilitation protocol that included therapeutic exercise, manual therapy, electrotherapeutic modalities and physical agents.

The mean treatment duration was 13 weeks and the average number of visits was 25. Patient background, health history and information on shoulder function and general health status were collected at initial visit. Shoulder function was assessed using the Disabilities of the Arm, Shoulder and Hand (DASH) Questionnaire, and general health status was assessed using the Short Form-36 (SF-36) Health Survey. Shoulder function and general health were assessed at discharge and at 6 months postdischarge.

The DASH scores ($p = .0001$) and SF-36 scores (emotional role [$p = .01$], physical role, social function, vitality, bodily pain and physical function [$p = .0001$]) significantly improved following

Table 1. Frequency of conditions for the 3 comorbidity groups

Condition	Number of comorbidities		
	0-1 (n = 30)	2 (n = 30)	≥3 (n = 26)
Asthma	1 (1.2)	2 (2.3)	9 (10.5)
Degenerative osteoarthritis	2 (2.3)	5 (5.8)	11 (12.8)
Depression	0 (0)	0 (0)	2 (2.3)
Headache	0 (0)	1 (1.2)	6 (7.0)
High blood pressure	0 (0)	18 (20.9)	19 (22.0)
Kidney disease	0 (0)	1 (1.2)	3 (3.5)
Pneumonia	0 (0)	0 (0)	3 (3.5)
Sinus infection	1 (1.2)	3 (3.5)	14 (16.3)
Body mass index >25 kg/m ²	20 (23.3)	30 (34.9)	22 (25.6)

*Values expressed in n (% of patients); n = 86.

rehabilitation. These health status outcomes were maintained at the 6-month follow-up with additional improvements noted in the DASH scores and physical dimension scores of the SF-36.

The mean number of patient comorbidities was 2.01 (Table 1). The most frequently noted comorbidities were a body mass index >25, high blood pressure and degenerative osteoarthritis. Having more comorbidities was associated with poorer SF-36 scores, although the number of comorbidities did not significantly affect final shoulder function, as assessed by the DASH scores.

The findings of this study show that a higher number of comorbidities should not be considered a negative factor in the decision-making process for rotator cuff repair and subsequent rehabilitation. Although patients improved relatively the same (changes between pre- and posttreatment scores) regardless of the presence of comorbidities, those patients who had more comorbidities also had lower general health-status outcomes.

Boissonnault WG, Badke MB, Wooden MJ, et al. Patient outcome following rehabilitation for rotator cuff repair surgery: the impact of selected medical comorbidities. J Orthop Sports Phys Ther 2007;37:312-319.

Aerobic Training Improves Walking Capacity Among Patients with MS

Poor exercise tolerance and exertion fatigue commonly interfere with daily living activities in persons with multiple sclerosis (MS). To date, there is limited information regarding the effects of aerobic training (AT) on exercise capacity in persons with MS. Rampello et al from University Hospital of Parma, Italy, compared the effects of 2 different types of rehabilitation interventions on the walking capacity, exercise tolerance, fatigue and health-related quality of life (QOL) in patients with mild-to-moderate disability secondary to MS.

Nineteen patients (14 females, 5 males) with a mean age of 41 ±

8 years were enrolled in a randomized, crossover controlled study. Patients were randomized into either an 8-week AT group or an 8-week neurological rehabilitation (NR) group. Following completion of the protocol in either the AT or NR groups, all patients waited 8 weeks before initiating the second intervention in the alternative group. Eleven patients completed the study.

All patients participated in 3 training sessions per week, each lasting approximately 1 hour. In the AT group, they used a leg-cycle ergometer, progressively increasing their workloads up to 80% of their maximum work rate. This was followed by a 15-minute stretching program. The NR program employed active movements and gait exercises with emphasis placed on breathing during the exercises.

Walking distance and walking speed changed significantly from baseline ($p = .02$ and $p = .02$, respectively) after the AT program, but not after the NR program. However, these differences were not significant between the groups. After the AT program, 82% of patients had increased their maximum work rate >10% over baseline values, indicative of an improvement in fitness. There were no differences between the AT and NR groups in perceived effects on fatigue as measured using the Modified Fatigue Impact Scale. Each group responded differently for health-related QOL measures, assessed using the Multiple Sclerosis Quality of Life-54 questionnaire. After the AT program, patients reported improvement in emotional well-



being, energy and health distress. After the NR program, patients had significant improvement in health distress and mental health composite scores, but a significant reduction in emotional well-being scores.

The positive findings of this study show that an AT program was effective in improving maximum exercise tolerance and walking capacity in patients with MS and mild-to-moderate disability. However, it is important to note that this was a small sample size. It is unknown whether the patients lost to follow-up had similar results, or if they got worse. Further studies are needed to determine whether a more graded AT program can improve the adherence of patients with MS.

Rampello A, Franceschini M, Piepoli M, et al. Effect of aerobic training on walking capacity and maximal exercise tolerance in patients with multiple sclerosis: a randomized crossover controlled study. Phys Ther 2007;87:545-555.

A Comprehensive Program Improves Function in Chronic Ankle Instability

Approximately 10–30% of individuals will have persistent symptoms or reinjury following a lateral ankle sprain. Multiple factors have been implicated in chronic ankle instability (CAI) and include ligament laxity, muscle weakness, diminished proprioception, postural control, altered joint mechanics and joint structure. The majority of studies examining the efficacy

of conservative interventions have assessed specific treatment approaches such as the effect of strengthening or balance training in isolation. Hale et al from Shenandoah University, Virginia, examined the effects of a 4-week comprehensive program on postural control, balance and self-reported functional limitations in patients with CAI.

Twenty-nine patients with CAI and 19 healthy patients were enrolled in the study. Patients with a history of unilateral CAI were randomly assigned to either a control group (CAI-control) or the rehabilitation group (CAI-rehabilitation). The 4-week rehabilitation program consisted of 6 visits to the laboratory and a home program that was to be performed 5×/week. The comprehensive program consisted of flexibility, strengthening and balance training, and the program progressed in intensity (resistance and/or repetitions) over the 4 weeks.

Postural control was assessed on the force plate using center of pressure excursion velocities (COPVs). Balance and functional limitations were assessed using the star excursion balance test (SEBT), the Foot and Ankle Disability Index (FADI) and FADI-Sports Subscale (FADI-Sport), respectively. The differences between involved and uninvolved limbs were assessed for patients with CAI. These differences were compared with inter-limb differences in the healthy group.

Side-to-side differences were found in patients with CAI for postural control when compared with the healthy group, as demon-

strated by greater COPVs. There was not a significant change in these values following the 4-week rehabilitation program.

At baseline, significant differences were also found between limbs in patients with CAI when compared with the healthy controls for the SEBT. These scores significantly improved for the mean reach distance on the involved limb ($p = .026$) following the 4-week program. Improvement was also noted for the FADI scores between CAI-control and CAI-rehabilitation groups ($p = .003$), and FADI-Sport scores ($p < .0005$), indicating improvement in functional measures.

Although this was a short-term rehabilitation program, the results were positive in terms of functional outcomes for patients with CAI. The successful outcomes may be due, in part, to the progressive, comprehensive nature of the program that addressed the multifaceted nature of CAI.

Hale SA, Hertel J, Olmsted-Kramer LC. The effect of a 4-week comprehensive rehabilitation program on postural control and lower extremity function in individuals with chronic ankle instability. J Orthop Sports Phys Ther 2007;37:303-311.

IN THE NEXT ISSUE

Effective treatment for frozen shoulder

Biomechanical factors and iliotibial band syndrome