

Effects of Anterior Cruciate Reconstruction Surgery and Non-Concurrent Strength and Endurance Rehabilitation on Self-Perceived Function: A Prospective, Random-Allocation Controlled Study

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Summary:

This novel study found significant improvements in subjective outcomes (IKDC, KOOS and PP), when post-operative ACL reconstructed patients followed a non-concurrent rehabilitation programme, sequencing strength and endurance exercises into different training sessions.

Abstract:

Context: Evidence from healthy populations, suggests that strength might be attenuated by cardio-vascular endurance conditioning performed in close proximity. Yet, traditionally ACL rehabilitation is offered in a concurrent format, whereby strength and cardio-vascular endurance exercises are performed in the same session. Therefore, it is possible that structuring rehabilitation in a non-concurrent fashion will improve functional performance. No study has previously investigated this phenomenon, whether it might compromise the efficacy of treatment or recovery, or its potential influence on patients' perception of functional outcome.

Objective: The purpose of this RCT was to assess the effects of reconstruction surgery and 24 weeks of non-concurrent strength and endurance rehabilitation (with 48 week post-operative follow-up) on self-perceived outcome measures of function (IKDC, KOOS, PP). **Setting:** Orthopaedic Hospital NHS Foundation Trust. **Design:** Prospective random-allocation to group trial involving iso-volume rehabilitative intervention versus contemporary practice, using contralateral limb assessment and clinico-social approbation controls. The design compared the effects of experimental post-surgical rehabilitation comprising non-concurrent strength and endurance conditioning with two conditions of control reflecting contemporary clinical practice (matched versus minimal assessment interaction). **Participants:** Eighty two patients (69 males, 13 females, age: 35.4 ± 8.6 yr; time from injury to surgery 9.4 ± 6.9 months [mean \pm SD]) electing to undergo unilateral ACL reconstructive surgery were randomly allocated to groups (2:2:1 purposive sampling ratio, respectively). Nineteen patients were lost to follow-up. **Intervention:** A patient group following a standardised traditional concurrent (CON) ACL rehabilitation programme acted as the control versus a group following an experimental non-concurrent (NCON) ACL rehabilitation programme that involved separation of strength and cardio-vascular endurance conditioning. An additional control group (Limited testing CON) matched the CON group rehabilitation applied within contemporary clinical practice. **Main Outcome Measures:** The outcome measures of function were IKDC, KOOS and PP were assessed on five separate occasions (pre-surgery, and at 6, 12, 24 and 48 weeks post-surgery). However, assessment occasions were purposefully reduced to pre-operative and at 48 weeks post-operative only for the Limited testing CON group. **Results:** Factorial analyses of variance (ANOVAs) with repeated-measures showed significant group (NCON; CON) by test occasion (pre-surgery, 6, 12, 24 and 48 weeks post-surgery) interactions for IKDC, KOOS and PP confirmed increased clinical effectiveness of NCON conditioning ($F(2.0, 82.9)GG = 4.0 p < 0.05$, $F(2.2, 134.7)GG = 5.5 p < 0.001$, $F(1.9, 121.4)GG = 14.6 p < 0.001$, respectively) and the group mean peak relative difference in improvement for NCON was -5.9%

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12.7% superior to CON. The greatest interaction effect was found to occur between pre-surgery and the 12 weeks post-operative test occasion for IKDC and KOOS, and between pre-surgery and the 24 week test occasion for PP. Patterns of improvements in self-perceived fitness over time were represented by a relative effect size range of 0.71 to 1.92. Improvement patterns were not significantly different between control groups, indicating that clinical approbation by patients had not contributed to the outcome. Conclusion: Overall, the patterning and extent of changes amongst subjective functional performance scores offer support for the efficacy of using NCON strength and endurance conditioning to enhance post-surgery rehabilitation.