

Patience You Must Have, My Young Athlete

Rehabilitation Specific Outcomes after Anterior Cruciate Ligament Reconstruction

Akademisk avhandling

som för avläggande av medicine doktorsexamen vid Sahlgrenska akademien, Göteborgs universitet kommer att offentligen försvaras i Arvid Carlsson, Academicum, Meicinaregatan 3,

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Avhandlingen baseras på följande delarbeten

- I. Beischer S, Hamrin Senorski E, Thomeé C, Samuelsson K, Thomeé R. Young athletes return too early to knee strenuous sport, without acceptable knee function after anterior cruciate ligament reconstruction. *Knee Surgery Sports Traumatology Arthroscopy*, 2018;26(7):1966-1974
- II. Beischer S, Hamrin Senorski E, Thomeé C, Samuelsson K, Thomeé R. How is psychological outcome related to knee function and return to sport in adolescent athletes after ACL reconstruction? *American Journal of Sports Medicine (accepted manuscript)*
- III. Hamrin Senorski E, Svantesson E, Beischer S, Thomeé C, Thomeé R, Karlsson J, Samuelsson K. Low 1-year return to sport rate after anterior cruciate ligament reconstruction regardless of patient and surgical factors – A prospective cohort study on 272 patients. *American Journal of Sports Medicine*, 2018;46(7):1551-1558
- IV. Beischer S, Hamrin Senorski E, Thomeé C, Samuelsson K, Thomeé R. Knee strength, hop performance and self-efficacy at 4 months are associated with symmetrical knee muscle function in young athletes 1 year after an anterior cruciate ligament reconstruction. *BMJ Open Sport & Exercise Medicine*, 2019;5:e000504. doi: 10.1136/bmjsem-2018-000504
- V. Beischer S, Gustavsson L, Hamrin Senorski E, Karlsson J, Thomeé C, Samuelsson K, Thomeé R. 86% reduced risk for subsequent ACL injury in young athletes who return to knee-strenuous sport later than 9 months after ACL reconstruction. *Submitted to the Journal of Orthopaedic & Sports Physical Therapy*

**SAHLGRENSKA AKADEMIN
INSTITUTIONEN FÖR NEUROVETENSKAP
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Rehabilitation Specific Outcomes after Anterior Cruciate Ligament Reconstruction

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Abstract

An anterior cruciate ligament (ACL) injury is one of the most common knee-related injuries, usually occurring in younger individuals during sports participation. Moreover, almost 1 in 4 of younger athletes sustain a subsequent ACL injury once they return to sport (RTS). Few previous studies have, however, focused on outcomes in adolescent athletes (15-20 years of age) after a primary ACL reconstruction.

The overall aim of this thesis was to describe outcomes after a primary ACL reconstruction in terms of muscle function, RTS, concomitant injuries, subsequent ACL injury, psychological aspects and symptoms related to knee function in adolescent athletes, aged 15 to 20 years, and in adult athletes, aged 21 to 30 years.

This thesis comprises 5 studies, all based on data from a rehabilitation outcome register, Project ACL. The primary statistical methods used were comparative analyses between adolescents and adult athletes as well as uni- and multivariable analyses with different binary dependent outcomes. The results are presented under the following 4 topics: *symmetrical muscle function, return to sport, subsequent ACL injuries and self-reported knee function & psychological outcome.*

The first topic was evaluated in 2 prospective cohort studies (Studies I and IV). It was found that the majority of young athletes make an early return to knee-strenuous sport after a primary ACL reconstruction, without recovering their muscle function (Study I). In addition, athletes with more symmetrical knee-extension and knee-flexion strength, a more symmetrical hop performance and higher present self-efficacy after 4 months of rehabilitation had increased odds of achieving symmetrical muscle function 12 months after an ACL reconstruction (Study IV).

The second topic was evaluated in 1 prospective cohort study (Study I) and 1 case-control study (Study III). Study III combined data from Project ACL with surgical data from the Swedish National Knee Ligament Register. It was found that male sex, younger age, a higher preinjury level of physical activity and the absence of concomitant injuries to the medial collateral ligament and meniscus predicted RTS 12 months after ACL reconstruction. In addition, adolescent athletes had a higher RTS rate at 8 months, where as many as 50% had returned to knee-strenuous sport compared with 38% of the adult athletes (Study I).

The third topic was evaluated in 1 prospective cohort study (Study V). It was found that the time of RTS and the preinjury level of physical activity were associated with a subsequent ACL injury. Athletes who returned to sports before 9 months after an ACL reconstruction had a 7 times higher ACL reinjury rate compared with athletes who returned after 9 months.

Finally, the fourth topic was evaluated in 1 case-control study (Study II) which showed that adolescent athletes, especially females, perceived enhanced self-efficacy, had a higher RTS rate and were more motivated to reach their goals after the ACL reconstruction. In addition, athletes with symmetrical muscle function reported greater motivation and superior self-efficacy compared with athletes who had not recovered their muscle function 8 and 12 months after the ACL reconstruction. Regardless of age, athletes who had returned to sport had a stronger psychological profile.

Taken together, it appears to be important that young athletes receive information about not returning to sport before they are both physiologically and psychologically ready and that this may take longer than 12 months. Based on the findings in this thesis, the rehabilitation of young athletes, especially adolescent athletes, should be prolonged to more than 9 months, preferably to at least 12 months.

Keywords: ACL, adolescent, knee, physical therapy, predictors, psychological aspects of sport, return to sport, reconstruction, subsequent ACL injury.