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ACL rupture is a single leg injury but a double leg problem: too much focus on 'symmetry' alone and that's not enough!

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Abstract

The authors present their thoughts on the focus on targeting asymmetry in rehabilitation after ACL reconstruction, which they think may not be rich enough to identify deficits.

After initial ACL injury, young athletes are at a greatly increased risk for second (ipsi-lateral or contralateral) ACL injury.[1] Nearly 1 in 4 youth who return to high-risk sport sustain another ACL injury at some point in their career, and they most likely sustain it early in the return-to-sports period.[1] For patients younger than 20 years, the increased risk for sustaining an ACL graft rupture or contralateral injury is as high as threefold to sixfold, respectively, with the risk of reinjury being higher for females than males.[1] Post-ACL reconstruction (ACLR) rehabilitation too often focuses only on the restoration of limb-to-limb symmetry for strength and function. While symmetry is one potential important goal, regaining symmetry alone will not prevent athletes returning to play with the same underlying deficits that likely contributed to the primary ACL injury.[2] Rehabilitation after ACLR should focus on addressing the underlying neuro-muscular control deficits that led to the initial injury and that may be amplified subsequent to ACL injury and reconstruction.

SINGLE LEG INJURY, DOUBLE LEG PROBLEM

Following ACL injury and ACLR, active individuals demonstrate a change in preinjury lower extremity biomechanics with an increase in frontal plane movement and decrease in sagittal plane loading during double leg jump landing, both in the injured as well as the uninjured leg.[2] These alterations in movement strategies after initial injury can potentially

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increase the risk for second-time ACL injury and may partly explain the extremely high risk for second ACL injury.[3]

Criteria-based return to sport has focused on symmetry during hop and strength tests. However, leg symmetry index (LSI) measures underestimate the magnitude of performance and functional deficits. Therefore, LSIs should be analysed with caution when used as the primary criterion for returning to sport (RTS) after ACLR. Movement limitations can exist in players who have regained symmetry but still do not meet the required preinjury knee function and are thus still at higher risk for second ACL injury. In one study where 11 out of 70 athletes sustained a second ACL injury,[4] up to 3 out of 4 of those athletes who go onto second ACL injury pass 90% LSI return-to-sport criteria in quadriceps strength and single-leg hop tests 6 months after initial ACLR.[4] Most athletes did not achieve required preinjury knee function,[4] which may have been the underlying determinant of their second ACL injury risk. This example addresses the need for a multidimensional approach in the return-to-sport decision-making process. Contemporary approaches should focus on a broad spectrum of individual sensorimotor and biomechanical outcomes within a biopsychosocial framework.[5]

FUTURE PERSPECTIVES

The contralateral (uninjured) limb may not provide an appropriate ‘gold standard’ benchmark for rehabilitation, particularly considering the neurological changes that occur after injury.[6] If the primary risk factors are not addressed during rehabilitation, asymmetries that magnify initial injury risk factors likely underlie the ‘healthy’ limb injury risk after a primary ACL injury. Similarly, as the uninjured leg is affected too after ACL injury, rehabilitation should not only focus on regaining function of the injured leg and trying to reach peripheral symmetry again with the uninjured leg. An optimised approach to this problem would consider more global mechanics and potentially consider more central neurological (brain) drivers of control in rehabilitation and ultimately second injury prevention strategies.[7]

As an example, during rehabilitation using a drop vertical jump technique to restore asymmetry, it would be suboptimal to instruct the athlete to control the knee of the injured leg with a unilateral cueing such as ‘don’t let your knee roll inward when landing’ (internal focus). Rather, the emphasis should be on cueing on an external goal; for example, ‘reach your knees towards the cones when landing’ (external focus) (figure 1).[8] The latter is a more central approach, aimed at reducing the increased reliance on conscious (internal) control during movement seen after initial ACL injury. Adoption of this approach during rehabilitation thus potentially better addresses and optimises the neurological deficits in motor planning, sensory processing and visual motor control seen after ACLR and even return to play.[8]

READY TO RETURN TO SPORT?

The current return-to-sports strategies associated with peripheral approaches to restore asymmetry may not be sufficient to address neurological alterations that are amplified following ACL injury and reconstruction. Based on these perspectives, we encourage

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clinicians and researchers to be innovative in attempts to optimise ACL rehabilitation strategies and integrate a central approach to visual–spatial–cognitive rehabilitation using externally focused curing to support neurocognitive-driven motor control optimisation for safer return to sport.

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Figure 1.

Single leg and peripheral focus (left) versus double leg and central focus (right). The athlete (left) is instructed with an internal focus of attention, and the athlete (right) is instructed with an external focus of attention.