

✓ PROTECTION
✓ PREVENTION (CONTACT)

4 POINTS-OF-LEVERAGE



FOURCEPOINT
TECHNOLOGY



CLINICALLY-PROVEN
ACL PROTECTION &
INJURY PREVENTION

✓ PREVENTION (NON-CONTACT)



KEEPS KNEE OUT OF
"AT RISK" POSITION
0°-30°

ACL INJURY: FACTS & FIGURES

Contributing Factors

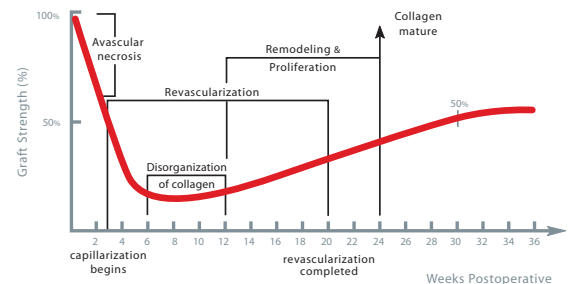
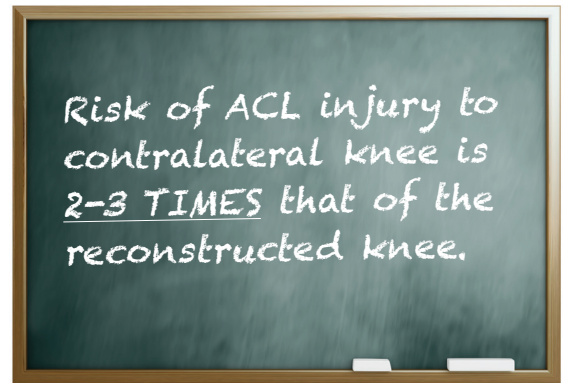
- Decreased knee flexion angle¹
- Anterior tibial shear forces²
- Combined valgus and knee internal rotation moments²
- Combined valgus and knee external rotation²

Incidence

- Approximately **200,000** ACL injuries per year occur in the U.S.³
- **50%** of ACL injuries occur in **15-25** year olds³
- **60-80%** of ACL injuries are **non-contact** related⁴
- **Women** are **2-10x** more likely to injure ACL⁵

Re-injury

- The **re-injury** rate for the ACL reconstructed knee is **5%-10%**⁶
- Risk of **ACL injury** to the **contralateral knee** is **double** that of the reconstructed knee⁶
- Only **1/3** of reconstructed athletes **attempt** to play competitive sports at their **pre-injury level** within **one year** following reconstruction⁷
- **1 in 5** active reconstructive athletes develop **new injuries**⁷
- **Fear of re-injury** prevented competitive college and high school football players from returning to play⁸



Immediately following ACL surgery, graft strength quickly declines. Graft healing research indicates that the graft is most vulnerable to injury around post-op weeks 6-12.^{9, 10, 11, 12, 13, 14}

References

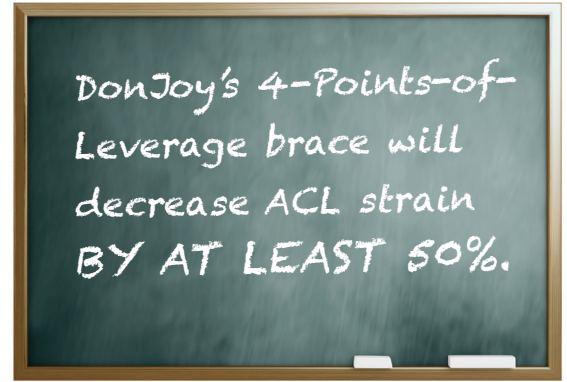
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7. Ardern CL, Webster KE, Taylor NF, Feller JA. Return to pre-injury level of competitive sports after anterior cruciate ligament reconstruction surgery: Two-thirds of patients have not returned by 12 months after surgery. *Am J Sports Med* 2011; 39(3):538-5438.
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PROTECTION

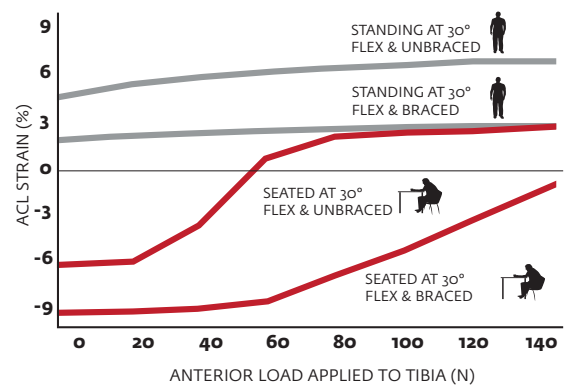
Reducing the risk of ACL reinjury to the reconstructed knee

Wearing a 4-Points-of-Leverage brace:

- Decreases ACL strain by 50% for anteriorly directed loads during weight bearing and non-weight bearing activities^{1,2,3}
- Significantly reduces tibial rotation vs. unbraced and sleeved groups⁵
- May improve both proprioception and postural control⁶
- Increases patient confidence after ACL reconstruction⁷



4-POINTS-OF-LEVERAGE STUDY



ACL strain values produced by anterior tibial loading.²

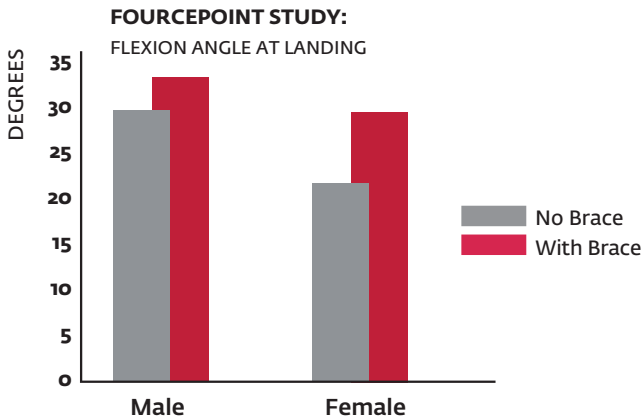
Braces utilizing 4-Points-of-Leverage technology effectively reduce ACL strain which could be particularly important during rehabilitation while the graft is remodeling.^{1,2,3,4}

Supporting Studies

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6. Palm HG, et al. *Effects of Knee Bracing on Postural Control after ACL Ligament Rupture.* *Knee.* 2011 Aug 24 [Epub ahead of print]
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PROTECTION

Reducing the risk of ACL reinjury to the reconstructed knee

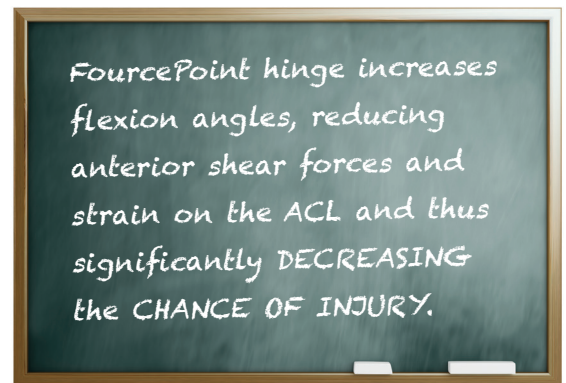


The anterior shear force applied on the tibia was reduced by 9% for females & 13% for males.⁵

The decrease in anterior shear force on the tibia should substantially reduce the load on the ACL.^{2,4}

Using a brace with FourcePoint hinge technology in conjunction with a 4-Points-of-Leverage frame design:

- Significantly increases knee flexion angle at peak posterior ground reaction force (PPGRF) by 9° vs. a standard braced knee and a non-braced knee^{1,3}
- Significantly decreases PPGRF during stop jump task landing and side-cutting activities¹
- No significant performance limitations were associated with the knee brace with FourcePoint hinge technology¹



Supporting Studies

1. Lin CH, Liu H, Garrett WE, Yu B. Effects of Knee Extension Constraint Brace on Selected Lower Extremity Motion Patterns During a Stop-Jump Task. *Journal of Applied Biomechanics*. 2008;4:158-165.

2. Markolf KL, Gorek JF, Kabo JM, et al. Direct measurement of resultant forces in the anterior cruciate ligament. *Journal of Bone & Joint Surgery, Am*. 1990; 72:557-567.

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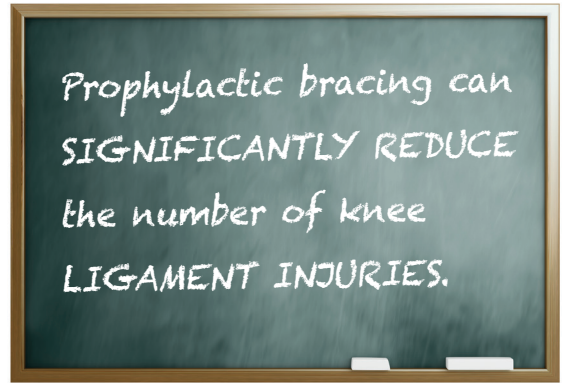
PREVENTION (CONTACT)

Reducing the risk of contact/high impact knee ligament injuries

Football

Prophylactic brace use:

- May be effective in reducing the risk of incurring an MCL sprain in football, and generally provide 20-30% greater MCL resistance to a lateral blow³
- Reduces injury rates among college football players, linemen, linebackers and tight ends when worn in both practices and games vs. unbraced players^{1,5}
- During one season at a Division I University, football players who wore braces missed only 43 practices and 3 games vs. 258 and 43 respectively for unbraced players²
- Of the 12 knee surgeries of the season, only one occurred in a player who was wearing a brace at the time of injury²
- In a 2 year study at a major Division I university football program, the number of days lost due to knee injury (and related associated healthcare costs) was reduced by 99% from year 1 to year 2 through the use of a custom fitted prophylactic knee brace in the 2nd year⁷



Off-road Motorcycling

Prophylactic brace use:

- Reduces ACL injury rates by 50% with a 7-fold decrease in MCL injury rates⁴

Skiing

Prophylactic brace use:

- Reduces ACL reinjury by 3-times⁶

Supporting Studies

1. Albright JP et al. Medial Collateral Ligament Knee Sprains in College Football: Effectiveness of Preventive Braces. *American Journal of Sports Medicine*. 1994; 22:1: 12-18.

2. Jones C. Prophylactic Knee Bracing. DonJoy ATC Seminar, University of Richmond, July 2006.

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PREVENTION (NON-CONTACT)

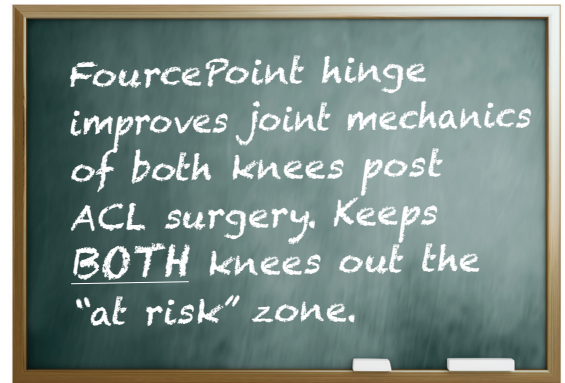
Reducing the risk of injury to the contralateral knee

Wearing NO brace or a knee brace without FourcePoint hinge technology (results at 6-12 months post-op):

- 30% deficit in joint mechanics
- Asymmetry of mechanics in both knees¹

Wearing a knee brace with FourcePoint hinge technology:

- Improved joint mechanics on **BOTH** the surgical and non-surgical knees for enhanced symmetry¹
- Improved mechanics caused **BOTH** knees to act more symmetrical¹
- Increased peak knee flexion velocity of **BOTH** knees¹
- Helped keep **BOTH** knees out of the “at risk” position (0°- 30° flexion)^{1,2}



Supporting Studies

1. Queen R, Butler RJ, Dai B, Garrett WE. Effects of Knee Extension Constraint Bracing on Lower Extremity Motion Patterns in Post-ACL Reconstruction Patients. Interim report of six and twelve month data from the ongoing study, 2012.

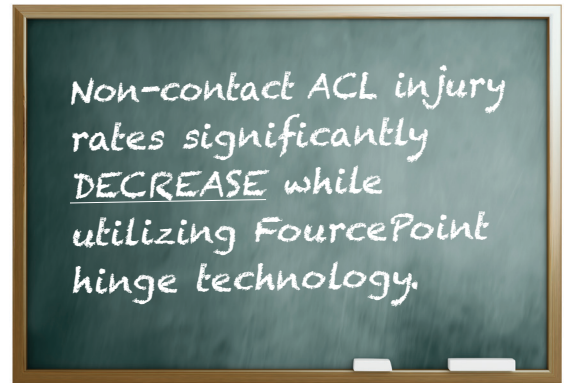
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PREVENTION (NON-CONTACT)

Reducing the risk of non-contact ACL Injury

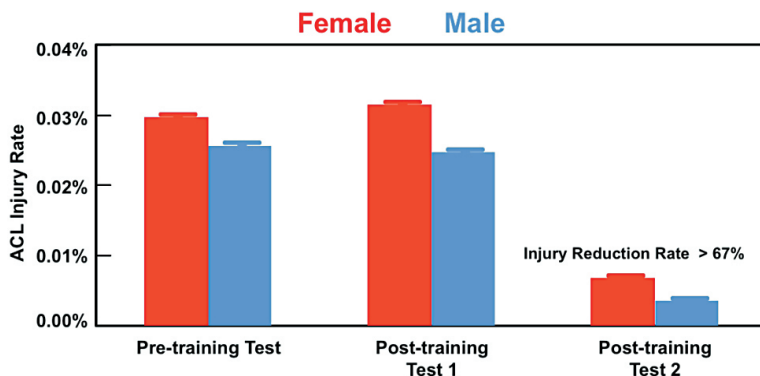
Significant reduction in ACL injury rate

- > 80% while wearing brace with FourcePoint hinge¹
- > 50% after training in brace with FourcePoint hinge¹
- Training effects (increased flexion angles) retained by > 50% while not wearing the brace¹
- Training in a **SINGLE** (one leg brace) with FourcePoint technology results in a 6-fold decrease in non-contact ACL injury rate in both knees¹
- Inertial sensor-based feedback system used in training during jump landings showed reduced key risk metrics for ACL injury²



Training Effects – Group A

Estimated Non-contact ACL Injury Rate In Stop-Jump Task*

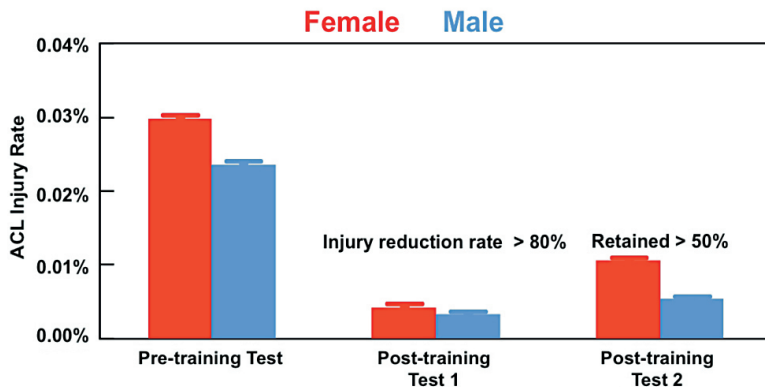


*probability for non-contact ACL injuries (stochastic biomechanical modeling, accepted Feb 2008 in Journal of Biomechanics)

Subjects wore brace a minimum of one (1) hour 3x per week for 4 weeks

Retention of Training Effects – Group B

Estimated Non-contact ACL Injury Rate in Stop-jump Task*



*probability for non-contact ACL injuries (stochastic biomechanical modeling, accepted Feb 2008 in Journal of Biomechanics)

Supporting Studies

1. Lin CH, Liu H, Garrett WE, Yu B. Effects of Knee Extension Constraint Brace on Selected Lower Extremity Motion Patterns During a Stop-Jump Task. Journal of Applied Biomechanics. 2008;4:158-165.
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PRESCRIBE CONFIDENCE

Clinical Biomechanics Review

- Training **WITH** FourcePoint hinge will encourage the knee to stay out of the “at risk” position (0°-30° of flexion)
- Training effect **WITH** FourcePoint hinge will be retained despite intermittent brace wear
- Rehab training after ACL reconstruction **WITHOUT** a FourcePoint hinged brace leads to abnormal joint mechanics of **BOTH** knees
- Rehab training after ACL reconstruction **WITH** a FourcePoint hinged brace improves joint mechanics in **BOTH** knees

CLINICAL PERFORMANCE OVERVIEW

