ACL Injuries: Evaluating components of Return to Play

Montana Athletic Trainers Association Summer Symposium

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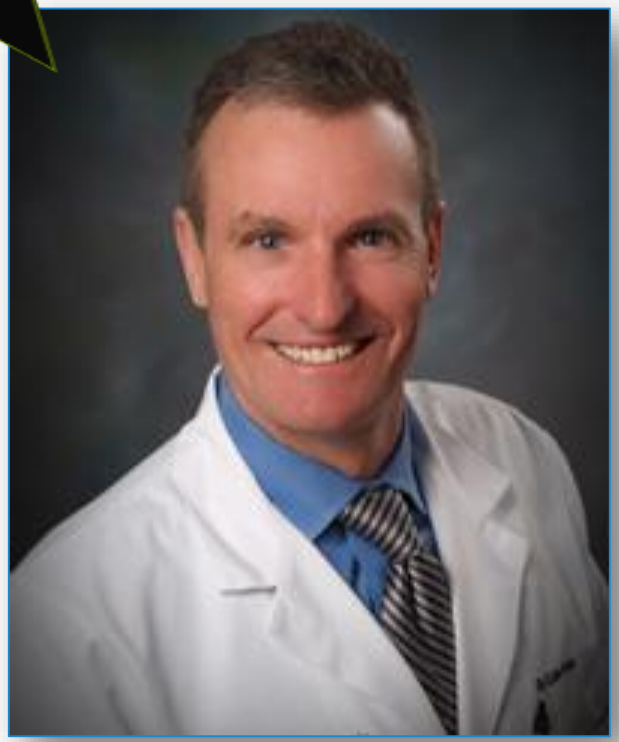
Disclosures

- No one pays me to talk about their products

The CANCER of the knee

"This is the cancer of the knee!!!"



What is this about??

Objectives

- Appreciate the evolution of the treatment and management of ACL injuries
- Recognize the percentage of patients who return to pre-injury level of activity
- Identify the factors that influence Return to Sport (RTS)
- Understand the psychological response to ACL-R
- Understand the limitations of RTS research
- Apply what we know, and DO NOT know, to develop a comprehensive RTS program

First……

Journal of Athletic Training 2008;43(5):538–540

www.nata.org/jat

summary

The ACL Injury Enigma: We Can't Prevent What We Don't Understand

Scott G. McLean, PhD

University of Michigan, Ann Arbor, MI

Multiple risk factors, both modifiable and nonmodifiable, are known to manifest within the noncontact anterior cruciate ligament (ACL) injury mechanism.[1] I will primarily address neuromechanical contributions to injury risk, which are often a key focus at meetings of this nature; such factors are amenable to training and, hence, largely modifiable. I hope, however, that as the reader progresses through the document, the critical importance of underlying nonmodifiable factors within the resultant neuromechanical strategy will not be common are largely governed by a random and often complex series of dynamic events, requiring an equally complex, centrally coordinated response.[16,17] Integrating more sport-relevant factors within the in vivo experimental testing environment may, therefore, provide further crucial insights into the causal factors of noncontact ACL injury, facilitating the development of more effective and adaptable prevention methods. Authors of recent studies have begun to acknowledge this fact by regularly incorporating into the experimental design fatiguing[8,18,19] and decision-making[20–22]

Where did we start?

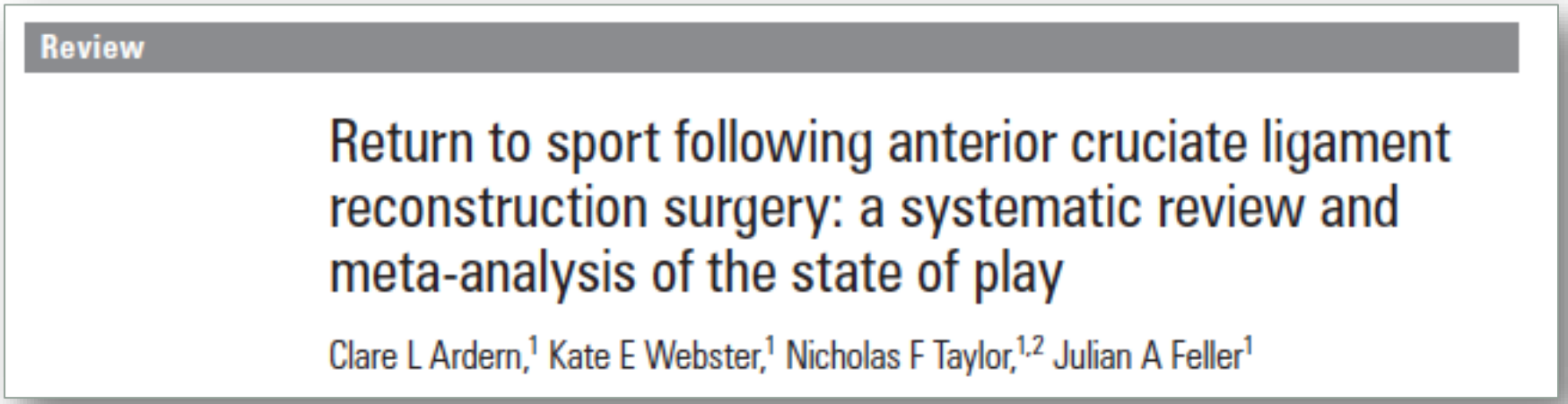
Where are we now??

Accelerated Rehabilitation after Anterior Cruciate Ligament Reconstruction[1]

K. Donald Shelbourne, MD[2]
Paul Nitz, MD[2]

surgery, most patients were placed in a plaster cast covered by a splint for 1 month, then the cast was removed and replaced with a straight splint (Cubbins, Conley, Callahan, & Scuderi, 1932, Mayo Robson, 1903). The patient would attempt range of motion (ROM) after 6 weeks then attempt to walk after 14 weeks (Cubbins et al., 1932). Historically, this type of care was common after a surgery in the past.

Who is Returning to Sport?


Review

Return to sport following anterior cruciate ligament reconstruction surgery: a systematic review and meta-analysis of the state of play

Clare L Ardern,[1] Kate E Webster,[1] Nicholas F Taylor,[1,2] Julian A Feller[1]

- 48 studies with 5,770 participants w/ mean f/u of 41.5 months
- 82% had returned to some kind of sports participation
- 63% had returned to pre-injury level of sport
- 44% had returned to competitive sport

Ardern et al. BJSM 2011

Who is Returning to Sport?

Fifty-five per cent return to competitive sport following anterior cruciate ligament reconstruction surgery: an updated systematic review and meta-analysis including aspects of physical functioning and contextual factors

Clare L Ardern,[1] Nicholas F Taylor,[1] Julian A Feller,[1,2] Kate E Webster[1]

- 69 articles reporting on 7,556 participants
- 81% returned to any sport
- 65% returned to pre-injury level of sport
- 55% returned to competitive level of sport

Contextual Factors

Younger age

Male gender

Playing elite sport

+ Psych. response

Ardern et al. BJSM 2014

Who is Returning to Sport?

Study	No. of patients	Study Design	Sport	% RTS	Comments
Harris et al. (2013)	58	Case-control (III)	NBA	86% (50)	12% (7) Returned to lower level
Daruwalla et al. (2014)	184	Case Series (IV)	D-1 FB (ACC, SEC, PAC-12)	82% (151)	Starters, Scholarship players, higher on depth chart
Erickson et al. (2014)	36	Cohort (III)	NHL	97% (35)	1 player returned to lower level
Zaffagnini et al. (2014)	21	Case Series (IV)	Professional Soccer	95% (20) at 1-year	62% (13) at same level at 4-years
Howard et al. (2016)	78	Descriptive (IV)	D-1 Women's Soccer (SEC)	85% (66)	Years of eligibility and scholarship status

rt?

Table 1 (*continued*)

Sport-specific Return to Play Rates Following Anterior Cruciate Ligament Reconstruction

Study	No. of Patients	Study Design (Level of Evidence)	Sport	Graft Type	% RTP	Comment
Busfield et al[5]	27	Case series (IV)	NBA	Not specified	78% RTP	Average time to RTP = 325 ± 81 d; PER decreased by >1 point in 44% of players who returned to play
Roos et al[12]	86	Case series (IV)	Soccer	BTB	18% RTP at 7-yr follow-up	Poor RTP rates and Lysholm scores in soccer players with ACL injuries
Fabbriciani et al[13]	18	Case series (IV)	Rugby	Doubled HS	100% RTP at 6 mo	Normal or near-normal Tegner, IKDC scores, KT-1000 in 90% of cases
Plancher et al[14]	75	Case series (IV)	Bicycling, running, skiing, tennis	BTB	Bicycling: 100% RTP Jogging: 86% RTP Skiing: 91% RTP Tennis: 80% RTP	Mean time to RTP: Bicycling = 4 mo Jogging = 9 mo Skiing = 10 mo Tennis = 12 mo
Ardern et al[15]	503	Case series (IV)	Australian football, basketball, netball, soccer	HS	33% RTP at full competition 67% no RTP at competitive levels at 1 yr postoperative	Of those who had not returned to sport, 47% intended RTP in future
Brophy et al[16]	94	Case-control (III)	Collegiate football/ NFL	Not specified	History of isolated meniscectomy reduced length of career more than isolated ACLR	History of combined meniscectomy with ACLR more detrimental to athlete's durability than ACLR alone

ACL = anterior cruciate ligament, ACLR = anterior cruciate ligament reconstruction, BTB = bone-patellar tendon-bone autograft, HS = hamstring, IKDC = International Knee Documentation Committee, NBA = National Basketball Association, NFL = National Football League, OA = osteoarthritis, PER = player efficiency rating, RTP = return to play, WNBA = Women's National Basketball Association

Ellman et al., JAAOS 2015

Who is Returning to Sport?

Revision anterior cruciate ligament reconstruction: clinical outcome and evidence for return to sport

Luca Andriolo[1] · Giuseppe Filardo[1] · Elizaveta Kon[1,2] · Margherita Ricci[3] · Francesco Della Villa[3] · Stefano Della Villa[3] · Stefano Zaffagnini[1] · Maurilio Marcacci[1]

- 59 studies involving 5,365 patients
- 73% had good objective results and satisfactory subjective results
- 57% returned to same level of sport activity

Systematic review and Meta-analysis that included Level IV studies→ Level IV

Andriolo et al. 2015

Who is Returning to Sport?

After revision anterior cruciate ligament reconstruction, who returns to sport? A systematic review and meta-analysis

Alberto Grassi,[1] Stefano Zaffagnini,[1] Giulio Maria Marcheggiani Muccioli,[1] Maria Pia Neri,[1] Stefano Della Villa,[2] Maurilio Marcacci[1]

- 23 Studies overall involving 1,090 patients
- 16 studies involving 543 patients: 84% returned to any level of activity
- 15 studies involving 790 patients: 52% returned to pre-injury sport level
- 4 studies involving 186 patients: 51% returned to high-level/competitive sport
- Level of Evidence: IV

Grassi et al. 2015

Who is Returning to Sport?

Return to Sports and Subsequent Injury Rates After Revision Anterior Cruciate Ligament Reconstruction With Patellar Tendon Autograft

K. Donald Shelbourne,*† MD, Rodney W. Benner,† MD, and Tinker Gray,
Investigation performed at Shelbourne Knee Center, Indianapolis, Indiana

- Cohort study; Level of evidence, 2

Rate of Return to same sport at same level was:

- 74% in High School and College athletes (62/84 and 43/58, respectively)
- 62% of recreational athletes (73/117)

Shelbourne et al., 2014

Factors Affecting Return to Sport

More research being published identifying contextual and underlying factors that affect whether or not a person returns to the same, pre-injury level of sport or competition

Factors Involved in RTS Decision

- Time
- Functional Testing/Strength
  - Hop testing
  - Isokinetic testing
  - Other functional/balance tests
- Patient-reported knee function
  - IKDC Form
  - Lysholm Knee Score
  - KOOS Score
- Psychological Readiness
  - TSK-11
  - ACL-RSI

AAOS CPGs for RTS

ACL RETURN TO SPORTS

Limited strength evidence does not support waiting a specific time from surgery/ injury, or achieving a specific functional goal prior to return to sports participation after ACL injury or reconstruction.

Strength of Recommendation: Limited ★★☆☆

FUTURE RESEARCH

Future research is needed to identify the functional deficits that are associated with increased second injury risk and reduced long term outcomes. Future investigations may assess more directly individual graft healing times, alternative therapeutic exercises, changes in frequency or duration to individual programs, platelet rich plasma treatments, genetic markers/gene therapy.

Czuppon et al., BJSM 2014

Marx Activity Score (0 = lowest activity, 16 = highest activity)	At 2 years postsurgery, higher Marx Activity Score for patients who did return to sport versus did not return to sport (15 vs 7.5, p<0.001)[62]
Kinesiophobia (TSK score: 0 = lowest fear, 51 = highest fear; TSK-11 score: 11 = lowest fear, 44 = highest fear)	At 1-year postsurgery, lower TSK-11 score for patients returning to preinjury level of sport than those who did not return to sport (15.3 vs 19.6, p<0.01)[69]
Athletic c… (ACL-RSI: 0 = lowes… 100 = hig…	…g …ort …of
	At 6 months postsurgery, higher ACL-RSI for groups with return to preinjury level of sport than no return to sport (63.18 vs 51.80, p=0.005). At 1-year postsurgery, higher ACL-RSI for groups with full return to sport than no return to sport (72.05 vs 58.61, p=0.001)[68]
	At 1-year postsurgery, higher ACL-RSI for groups with return to preinjury level of sport versus no return to sport (70 vs 46, p<0.001)[66]
Self-motivation (psychovitality questionnaire: (3 = lowest motivation, 18 = highest motivation)	Higher preoperative psychovitality score for group that did return to sport versus did not return to sport at 2 years postsurgery (16 vs 9, p<0.001)[62]
	Higher preoperative psychovitality score correlated with higher Tegner activity score at 3 years postsurgery (R^2 linear=0253)[63]

Weak Evidence for association with return to sport

Czuppon et al., BJSM 2014

IKDC Subjective Form Score (0 = lowest subjective rating, 100 = highest rating)	At 1-year postsurgery, higher IKDC subjective form score for patients returning to preinjury level of sport than those who did not return to sport (93.8 vs 78, p<0.001)[69]
	At 5 years postsurgery, higher IKDC subjective form score for patients returning to preinjury level of sport (84.6) than those who did not return to sport due to fear of reinjury (73.5) or due to instability (60.1; between-groups difference, p<0.001)[6]
	At 2 years postsurgery, no difference between groups with return to preinjury level of sport versus decreased sports activity level or no sports activity[62]
IKDC grad… D = sever…	…sport
	…ith sport outcomes between patients with IKDC grade A and B and IKDC grade C and D (risk ratio 1.5; 95% CI 0.86 to 2.50)[58]
	At 2 years postsurgery no significant difference between groups with return to preinjury level of sport versus decreased sports activity level or no sports activity[62]
Lysholm Knee Score (0 = worst function, 100 = highest function)	At 5 years postsurgery, higher Lysholm Knee Score for patients returning to preinjury level of sport (88.5) than those who did not return to sport due to fear of reinjury (84) or due to instability (72; between-groups difference, p=0.001)[6]
	At 1.5–2 years postsurgery, no correlation with Tegner activity score[61]
	At 2 years postsurgery, no difference between groups with return to preinjury level of sport versus decreased sports activity level or no sports activity (p=0.38)[62]

Conflicting evidence for association with return to sport

What are we missing?

Surgical techniques have improved

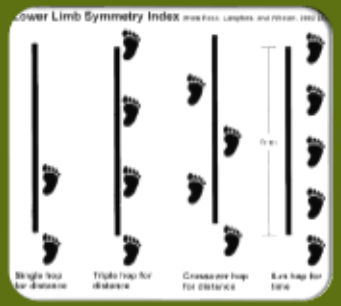
Rehabilitation efforts have improved

Patient-reported knee function scores are weakly correlated with RTS status

Functional knee performance not always correlated with RTS status

…….

What are we missing?



Objective, criteria-based RTS testing and protocols

Neglect of the psychological impact ACL tear, and subsequent reconstruction, has on our patients/athletes

Soap Box….

- Do our current RTS testing protocols assess true, multi-directional athletic performance/maneuvers?
- I know Quad and Hamstring strength is important (isokinetic testing), but don't they only control knee motion in one plane of motion????
- When planting and cutting is a known mechanism for NC-ACL injury, why are we so big on hop testing to determine RTS?
- When our focus on preventative interventions does not match our criteria for return to sport….there's a problem

Why are these things important?

Incidence of ACL injury following ACL-R 15 times greater than that of controls (Paterno et al., 2012)

- Females 4X more likely to suffer ACL graft rupture, 6X more likely to suffer contralateral ACL injury

29.5% of 78 patients who underwent ACL-R (Paterno et al., 2014)

- Risk of second ACL injury 6 times greater in ACL-R group
- Twice as likely to suffer contralateral ACL injury

For patients under 20 s/p ACL-R, odds of suffering ipsilateral and contralateral ACL injury increased 6-, and 3-fold, respectively (Webster et al., 2014)

Why are these things important?

Risk of Secondary Injury in Younger Athletes After Anterior Cruciate Ligament Reconstruction

A Systematic Review and Meta-analysis

Amelia J. Wiggins,* DO, Ravi K. Grandhi,†‡ MBA, Daniel K. Schneider,‡§ Denver Stanfield,‖ MD, Kate E. Webster,¶ PhD, and Gregory D. Myer,§#** PhD
Investigation performed at Cincinnati Children's Hospital, Cincinnati, Ohio, USA

Patients <25 that returned to high-risk sports:

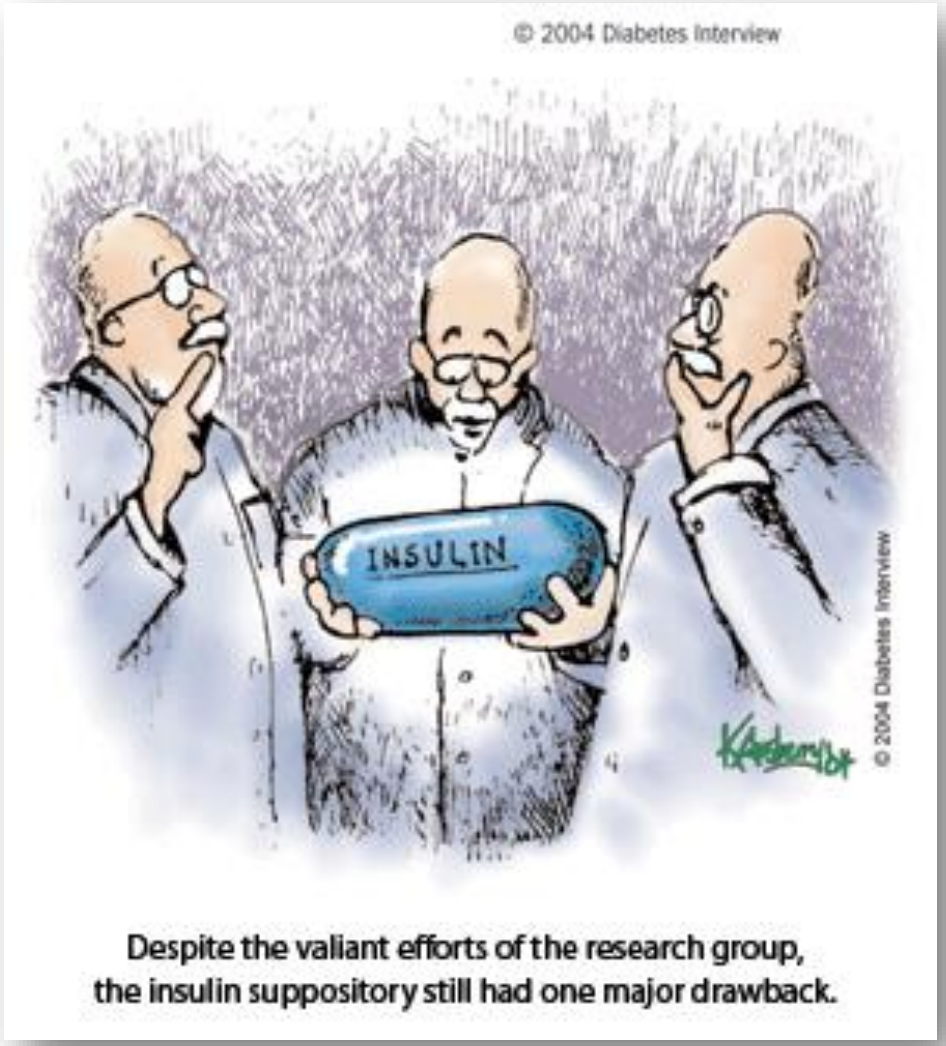
- Pooled rate of secondary injury was 23%
- Ipsilateral: 10%
- Contralateral: 12%
- 30-40x greater risk of secondary ACL injury

Wiggins et al., 2016

Are we as clinicians failing to prepare our patients for the physical and mental hardships of competitive sports, thereby increasing the risk of secondary ACL injury?

Can we do better????

What should we use????



Determining when to RTS

Is the knee like the brain???

Multifactorial??

Knee Scores + Psychological response + Good Rehab + Hop testing + Other functional tests???

Patient-reported Knee Scores

- IKDC-2000
  - Developed in 1987
  - One of the more widely used knee function scores
- US: Cincinnati or Noyes Knee Rating Scale
- Europe: Tegner Activity Level Scale and KOOS
- Lower Extremity Functional Score (LEFS)

PICK ONE OR TWO AND USE THEM!

RTS & Patient-reported knee scores

Self-reported Knee Function Can Identify Athletes Who Fail Return to Activity Criteria up to 1 Year after Anterior Cruciate Ligament Reconstruction. A Delaware-Oslo ACL Cohort Study

David Logerstedt, PT, PhD, SCS[1], Stephanie Di Stasi, PT, PhD, OCS[2], Hege Grindem, PT, PhDM[3], Andrew Lynch, PT, PhD[4], Ingrid Eitzen, PT, PhD[3,5], Lars Engebretsen, MD, PhD[5], May Arna Risberg, PT, PhD[3], Michael J Axe, MD[1,6], and **Lynn Snyder-Mackler, PT, ScD, SCS, FAPTA[1]**

- Delaware-Oslo Cohort Study
- 158 Level I/II athletes
- Tested 6 and 12 months post-op
- IKDC2000 Subjective Knee Score
- Isokinetic testing, 4 SL hop tests
  - Single hop for distance, triple hop for distance, 6-m timed hop, cross-over hop for distance
- Criteria included LSI >90%

RTS & Patient-reported knee scores

Self-reported Knee Function Can Identify Athletes Who Fail Return to Activity Criteria up to 1 Year after Anterior Cruciate Ligament Reconstruction. A Delaware-Oslo ACL Cohort Study

David Logerstedt, PT, PhD, SCS[1], Stephanie Di Stasi, PT, PhD, OCS[2], Hege Grindem, PT, PhDM[3], Andrew Lynch, PT, PhD[4], Ingrid Eitzen, PT, PhD[3,5], Lars Engebretsen, MD, PhD[5], May Arna Risberg, PT, PhD[3], Michael J Axe, MD[1,6], and Lynn Snyder-Mackler, PT, ScD, SCS, FAPTA[1]

At 6 months:

- 52% (82) had "normal" knee scores
  - 47.6% (39) passed RTS criteria
- 48% (76) had knee scores below "normal"
  - 91% (69) failed RTS criteria

RTS & Patient-reported knee scores

Self-reported Knee Function Can Identify Athletes Who Fail Return to Activity Criteria up to 1 Year after Anterior Cruciate Ligament Reconstruction. A Delaware-Oslo ACL Cohort Study

David Logerstedt, PT, PhD, SCS[1], Stephanie Di Stasi, PT, PhD, OCS[2], Hege Grindem, PT, PhDM[3], Andrew Lynch, PT, PhD[4], Ingrid Eitzen, PT, PhD[3,5], Lars Engebretsen, MD, PhD[5], May Arna Risb
SCS, FAPTA[1]

At 12 Months: Low Sensitivity (37.3%), High Specificity (91.9%)

- 22% (31) had knee scores below "normal"
  - 80.6% (25) failed RTS criteria

Still Important

- Document our efforts AND outcomes in rehab!
- Super short, easy forms to fill out
- Can certainly tell us who is likely not ready for RTS…..
- Not as good at determining who is truly ready……

Christino et al., JAAOS 2015

Figure 1

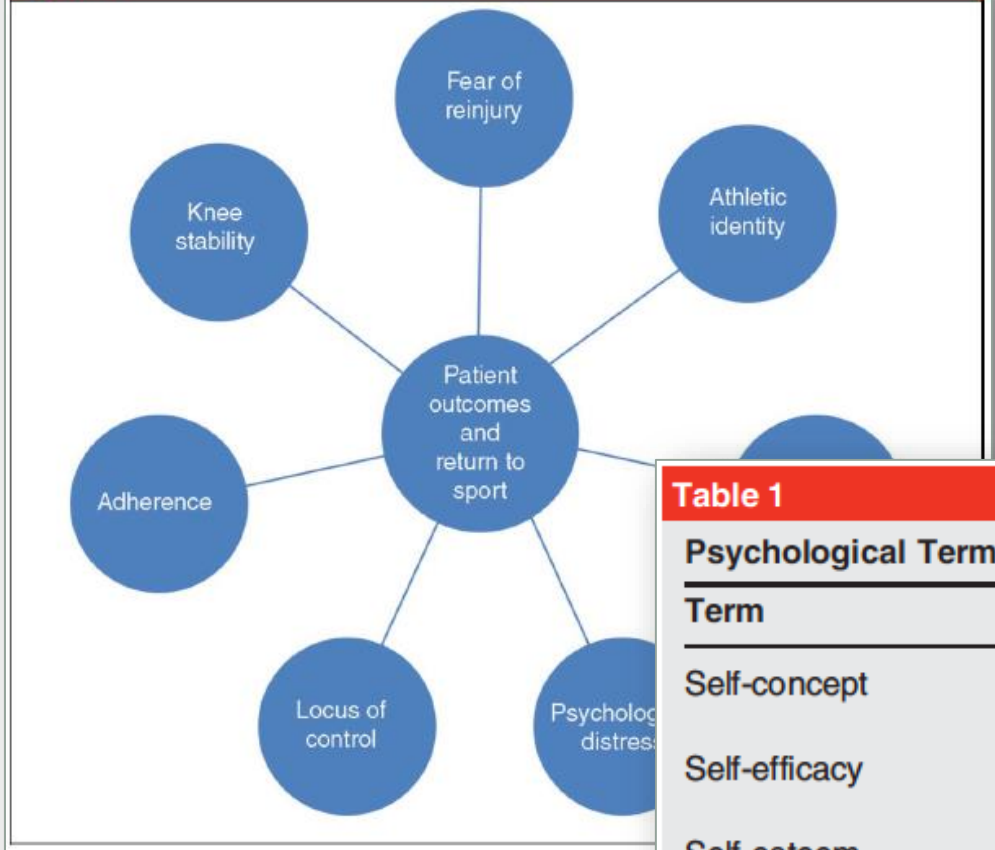


Illustration of physical and psychological factors that outcomes and allow patients to return to sport follow ligament reconstruction.

Table 1

Psychological Terms and Definitions

Term	Definition
Self-concept	Multidimensional construct that refers to the general way one perceives oneself
Self-efficacy	Belief in one's ability to succeed in a particular situation or execute actions
Self-esteem	Overall sense of self-worth and personal value
Locus of control	Belief in the relationship between action and outcome; feeling like one has control
Athletic identity	The degree to which one identifies with the athlete role
Psychological or emotional distress	Upsetting or intrusive feelings that prevent a person from optimal performance
Catastrophizing	Assuming the worst case scenario; interpreting any negative stimuli as disaster

Psy

Knee Surg Sports Traumatol Arthr

Table 1 Study scale definitions

Underlying theory	Ca
Fear-avoidance model of pain [37]	Fe
Theory of self-efficacy [6]	Op
Stress, health, and the buffering hypothesis of social support [13]	St

Table 2

Psychological Variables and Associations in Anterior Cruciate Ligament Recovery

Study	Psychological Variable	Effects
Tripp et al[23] Mainwaring et al[24] Smith et al[26] Morrey et al[27] Udry et al[33]	↑Psychological distress	↑: Emotional disturbance, anxiety, depression, mood disturbance, pain intolerance, catastrophizing ↓: Self-esteem
Thomeé et al[34] Thomeé et al[36] Thomeé et al[37] Mendonza et al[39]	↑Self-efficacy	↑: Activity level, KOOS scores, return to sport, knee-related QOL, single-leg hop test, internal LOC, adherence to rehabilitation ↓: Symptoms
Ardern et al[7] Nyland et al[35] Thomeé et al[37]	↑Locus of control	↑: KOOS scores, IKDC scores, satisfaction, mental health, physical function, social function, knee function, self-efficacy, return to sport at 1 year
Brewer et al[25] Stephan and Brewer[38] Brewer et al[40]	↑Athletic identity with injury	↑: Adherence ↓: Self-concept, self-esteem

↑ = increased
↓ = decreased
IKDC = International Knee Documentation Committee, KOOS = Knee Injury and Osteoarthritis Outcome Score, LOC = locus of control, QOL = quality of life

Everhart et al., 2015
Christino et al., 2015

Psychological Factors

Knee Surg Sports Traumatol Arthrosc
(2005) 13: 393–397

KNEE

DOI 10.1007/s00167-004-0591-8

Joanna Kvist
Anna Ek
Katja Spo
Lars Goo

Fear of re-injury: a hindrance for returning to sports after anterior cruciate ligament

Development and preliminary validation of a scale to measure the psychological impact of returning to sport following anterior cruciate ligament reconstruction surgery

Kate E. Webster*, Julian A. Feller, Christina Lambros

Musculoskeletal Research Centre, La Trobe University, Melbourne, Victoria 3086, Australia

A prospective longitudinal study to assess psychological changes following anterior cruciate ligament reconstruction surgery

J L Langford, K E Webster, J A Feller

Psychological Factors

1) Tampa Scale of Kinesiophobia (TSK-11)
   - Fear of re-injury → Activity avoidance
2) ACL-Return to Sports after Injury Scale (ACL-RSI)
   - Self-efficacy/self-motivation

Emotions

1. Are you nervous about playing your sport?
2. Do you find it frustrating to have to consider your knee with respect to your sport?[a]
3. Do you feel relaxed about playing your sport?
4. Are you fearful of re-injuring your knee by playing your sport?
5. Are you afraid of accidentally injuring your knee by playing your sport?

Confidence in performance

6. Are you confident that your knee will not give way by playing your sport?
7. Are you confident that you could play your sport without concern for your knee?
8. Are your confident about your knee holding up under pressure?
9. Are you confident that you can perform at your previous level of sport participation?
10. Are you confident about your ability to perform well at your sport?

Risk appraisal

11. Do you think you are likely to re-injure your knee by participating in your sport?
12. Do thoughts of having to go through surgery and rehabilitation again prevent you from playing your sport?

Functional Testing

Limb Symmetry Index (LSI)

- Single Hop for Distance
- Triple Hop for Distance
- Cross-over Triple Hop for Distance

Functional Testing

Jesper Augustsson
Roland Thomeé
Jon Karlsson

Ability of a new hop test to determine functional deficits

68% (13/19) failed hop testing after exhaustion protocol

- 19
- Me
- All passed SL hop test with LSI >90%
- Fatigue Protocol → unilateral knee extension, 50% 1RM to exhaustion

Additional Tests

- Y-Balance Test

Y BALANCE TEST™ ANTERIOR REACH SYMMETRY AT THREE MONTHS IS RELATED TO SINGLE LEG FUNCTIONAL PERFORMANCE AT TIME OF RETURN TO SPORTS FOLLOWING ANTERIOR CRUCIATE LIGAMENT RECONSTRUCTION

J. Craig Garrison, PhD, PT, SCS, ATC[1]
James M. Bothwell, MD[1]
Gina Wolf, SPT, ATC[2]
Subhash Aryal, PhD[3]
Charles A. Thigpen, PhD, PT, ATC[4]

- Vail Sport Test
- Landing Error Scoring System (LESS)

Screening Programs

Landing Error Scoring System (LESS)

- Valid and reliable (Padua et al., 2009)
- Intra- and inter-rater reliability good to excellent (Padua et al., 2009, Onate et al., 2010)
- LESS scores higher in subjects s/p ACL-R (Bell et al., 2014)

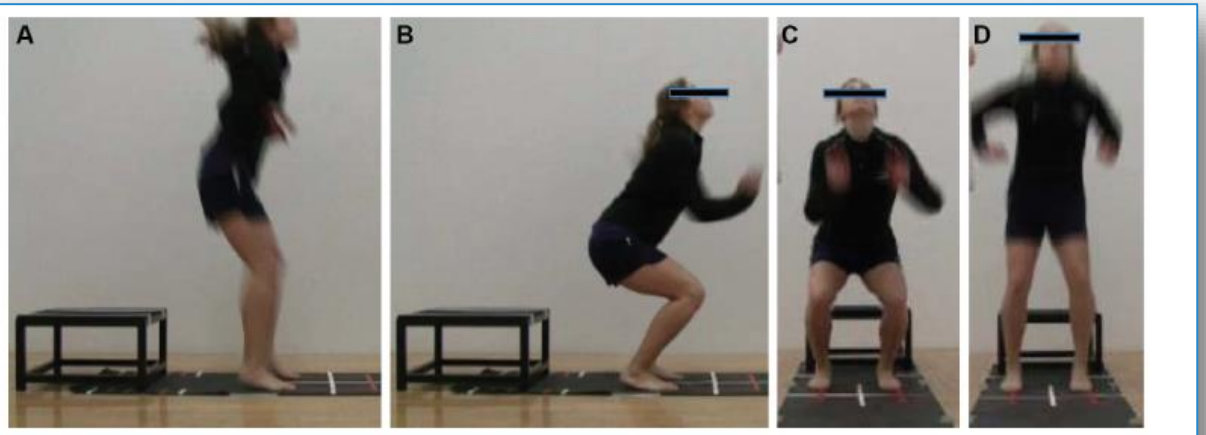


Figure 1. The drop vertical jump shown from the lateral camera view at initial contact (A) and maximum flexion (B) and from the frontal camera view at initial contact (C) and maximum flexion (D).

Screening Programs

A Prospective Evaluation of the Landing Error Scoring System (LESS) as a Screening Tool for Anterior Cruciate Ligament Injury Risk

Helen C. Smith,* MS, ATC, Robert J. Johnson,* MD, Sandra J. Shultz,† PhD, ATC, Timothy Tourville,* MEd, ATC, CSCS, Leigh Ann Holterman,* BS, James Slauterbeck,* MD, Pamela M. Vacek,* PhD, and Bruce D. Beynnon,*‡ PhD
Investigation performed at the Department of Orthopedics and Rehabilitation, McClure Musculoskeletal Research Center, University of Vermont College of Medicine, Burlington, Vermont

Results: There was no relationship between the risk of suffering ACL injury and LESS score whether measured as a continuous or a categorical variable. This was the case for all participants combined (odds ratio, 1.04 per unit increase in LESS score; 95% confidence interval, 0.80-1.35) as well as within each subgroup (odds ratio range, 0.99-1.14).

Smith et al., 2012

Things to Consider

- Is an LSI of 90% sufficient????
- Fatigue protocol prior to functional testing??
- Jump-landing mechanics
  - Landing Error Scoring System
  - Motion Analysis?

Asymmetry at RTS

Ryan Mizner PT, PhD University of Montana

Growing body of evidence showing significant asymmetries in la
al
20

A
la

Do we need to include 3-D motion analysis in our RTS criteria?

Asymmetries present even in those who have passed RTS testing (Di Stasi et al., 2013)

What Does Research Tell us We Should Use?

1) IKDC2000 and/or KOOS Patient-reported knee function
2) Lower Extremity Functional Scale
3) ACL-RSI and/or TSK-11
4) At the very least…..Single and Triple hop for distance, crossover triple hop w/ >90% LSI

What Do I Think We Should Use?

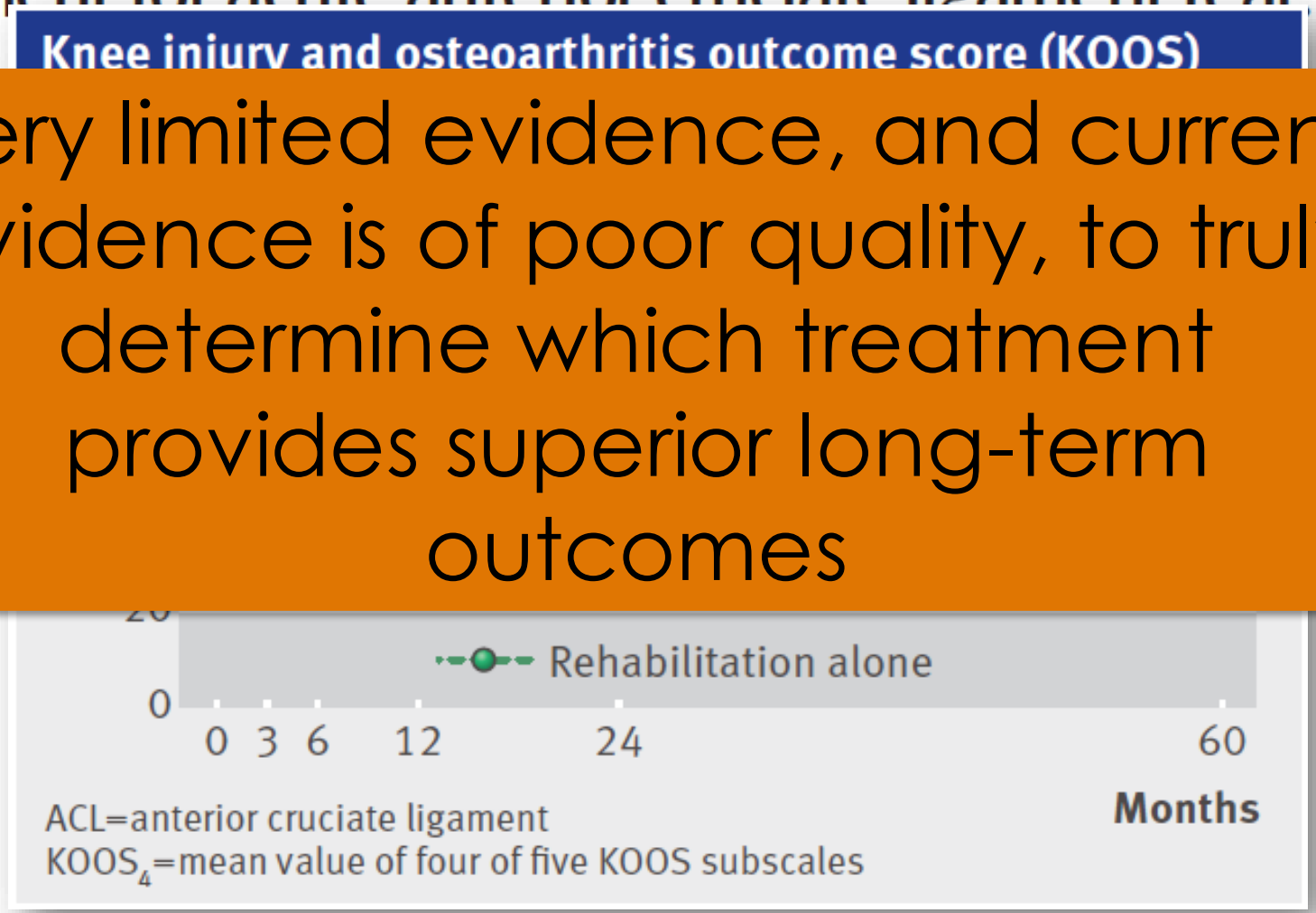
1) IKDC2000/KOOS Patient-reported knee function
2) Lower Extremity Functional Scale
3) ACL-RSI and/or TSK-11
4) >95% Limb Symmetry Index
5) Fatigue protocol prior to testing to RTS
6) Y-balance
7) LESS Screen
8) 3D Motion Analysis

Clinical Take-home Points

- Don't use TIME as a RTS criteria
- Document Patient-reported knee function
- Evaluate fear of re-injury/psychological preparedness throughout rehabilitation
- Use objective, validated and reliable hop testing protocols
- Consider higher LSI (95%) and fatigue protocol for RTS testing
- Consider motion analysis in high-level athletes

Things to Consider….

Very limited evidence, and current evidence is of poor quality, to truly determine which treatment provides superior long-term outcomes



Resources

- Phil Plisky, PT, ATC, SCSC
  - http://philplisky.com/
- https://www.move2perform.com/

I want to change peoples lives through dialogue about injury prevention research and return to activity testing.

Thank You!