Thank You

- Thanks to RUSH 2016 CHI CAGO SPORTS MEDICINE SYMPOSIUM for the kind invitation to present this information.

- It is indeed an honor and privilege to be invited to participate and share information.

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George J. Davies, DPT, MED, PT, ACLS, ATC, NASM-PES, NASM-CES, ACSM-CET, NPTA-CC, SMAC, (REMT), FAPTA (Professor of Physical Therapy, AQU, Savannah, GA. (2004- )
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Sports PT, Coastal Therapy, Savannah, GA. (2004-present)
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JSPT - G&J-AG Excellence in Clinical Research Award, 2004
Fellow, APTA, 2005, Hall of Fame Award, SPTS-APTA, 2006
NATA, President's Award, 2007, NATA, Most Distinguished Athletic Trainer, 2009
Sports Health - Co-Founder & Co-Editor, 2009
AOSHN - Hall of Fame Award, 2013

Disclosures:

- Associate Editor, Sports Health
- Elsevier Book Royalties
- Human Kinetics Book Royalties
- North American Seminars DVD Royalties

No Conflicts

A Quantitative and Qualitative Functional Testing Algorithm for clinical decision making when examining a patient following a Knee Injury

A Quantitative and Qualitative Functional Testing Algorithm for clinical decision making to return athletes back to Sports following a Knee Injury

Disclosures:

- Gladly accept money from anyone for Institutional Research Support....

No Conflicts

Disclosures:

The following companies have provided research equipment support to Biodynamics & Human Performance Center - AASU:

Arthrometrics, Atlanta, GA
Biodex, Shirley, NY
CDM Sport/Monitored Rehab Systems, Fort Worth, TX
DS2 Rehab Systems, Missouri City, TX
ERMI, Atlanta, GA
ExerTools, Petaluma, CA
Innovative Sports Inc, Chicago, IL
TheraBand, Hygenic Corporation, Akron, OH

No Conflicts
We have to examine the patient and the knee in order to establish discharge criteria for RTP!

Clinical Decision-Making: Specific Parameters to return an athlete back to sports following a knee injury

What amazes me, is that many of us need to make this decision on a regular basis, however, there are:

1) very few guidelines published
2) few objective tests documented to support the clinical decision making process
3) limited evidence to support this process

Clinical Decision-Making: Specific Parameters to return an athlete back to sports following a knee injury

How many of us really have specific criteria that would stand up to:

1. Critical peer review
2. High levels of evidence to support our clinical decision making
3. Medico-legal critical analysis

Questions

1. What are the very specific criteria we use to discharge a patient from rehabilitation back to a high risk activity like competitive sports?
2. Do we have absolute confidence in our decision making?

Clearance to Return to Sports

One method is to have baseline preparticipation information, and have the athlete return back to “normal” for all the parameters

Clearance to Return to Sports

Being medically cleared to return to sports does not mean that the patient/athlete is functionally ready to return to sports!!!

Clinical Decision Making

So what happens when an athlete returns to sports after being “cleared by us”, and then they get reinjured???

“Experience”

Since I have been there and have made more mistakes than most in the audience, I can assure you that it is not a good feeling....

Clearance to Return to Sports

If a physician, physical therapist or athletic trainer allows an athlete to return to sports, they may be legally held responsible if the athlete encounters a serious injury.

Clinical Decision-Making

So, what else can we do???

So how do we do it ???
- One way is to perform a task analysis of the specific sport
- Try to establish a performance metric
- Check epidemiology information for MOI
- Then determine if there are appropriate tests with good psychometric properties to test and evaluate the specific “tasks” for the sport

Modifiable Risk Factors for ACLs
- Paterno, M, et.al. AOSM, 2014 (Multi-factorial)
- Hip IR (Transverse plane)
- Knee Dynamic valgus (Frontal plane)
- Knee muscle imbalance (Sagital plane)
- (Tri-Planar etiology)
- Balance (Biodex Balance Stabilometer (Single Leg Athletic Stance Test)

So how do we do it ???
- Task Analysis:
  - Energy system assessment: aerobic, anaerobic (ATP-PC, glycolytic systems)
  - Musculoskeletal Requirements: flexibility, strength, power endurance
  - Neumotor skill assessment
  - Technical assessment
  - Injury prevention techniques based on epidemiology of injuries

So, what else can we do???

Because whatever we are doing at the present time, we are NOT doing as well as many have advocated over the years!

Return to Play
- 69 articles
- 7556 participants
- 55% RTS - competitive level
- RTS: LSI-hop test, younger age, male gender, playing elite sport, positive psychological response

Return to Play
- Literature Review

Clinical Decision-Making
- So, what else can we do???

CLINICAL ARTICLE
Functional progression of a patient through a rehabilitation program
**RTP-after ACL-R**

- **ACL-R:**
- **May fail**
- **Rates of either reinjuring an ACL-R knee or sustaining an ACL rupture to contralateral knee range from 3-49%**

**Return to Play-Summary**

- **Weak Evidence**
- **Delphi Process - battery of tests including physiological and psychological tests**
- **Physical and psychological tests**
- **At 1 year after ACL, majority RTP at previous activity level and are not influenced by RTS criteria**
- **>50% LSI asymmetry based on RTS, place athletes at higher risk for activity**

**Haines, S, et.al. IJ SPT, 2013**

**RTP-after ACL-R**

- **Systematic review:**
- **264 studies:**
- **105 (40%) failed to provide any criteria for RTP**
- **84 (32%) amount of time post-op was only criteria**
- **40 (15%) time and subjective criteria**
- **35 (13%) objective criteria**
- **Muscle strength, stability, neuromuscular control, function**

**Return to Play**

- Thematic issue for RTP following ACL-R


**Return to Play-Summary**

- **Barber-Westin, SD, Noyes, FR. Factors used to determine return to unrestricted sports activities after ACL-R.**
- **Arthroscopy. 27:1697-1705, 2011**
- **(Systematic Review)**

**So what are most clinicians doing for criteria for RTP?**

**RTP-after ACL-R**

- **Systematic review:**
- **264 studies:**
- **35 (13%) objective criteria**
- **9% - muscle strength criteria of Q & H**
- **6% - effusion/ ROM**
- **4% - single leg hop**
- **1 study - stability**
- **1 study - validated questionnaires**
Algorithm

- A process consisting of steps, each step depending on the outcome of the previous one.
- Stedman's Medical Dictionary, 2002

Functional Testing Algorithm

Clinician-rated impairment measures

Functional Testing Algorithm for clinical decision making
For Return to Sports following a Knee Injury

Davies Functional Testing Algorithm
(∼36 years, [APTA-CSM, 1980])
- Sports Specific Tests
- Lower Extremity Functional Tests
- Functional Hop Tests
- Functional Jump Tests
- OKC Isokinetic Tests
- CKC Isokinetic Tests
- Kinesthetic/Balance Tests
- KT 1000 Tests
- Basic Measurements

FTA Specific Guidelines
- LEFT - M-1:30; F-2:00 minutes
- HOP - < 10% Ht.; < 10% bilat. Comp.; Norms/ various hops
- JUMP - < 15%/ Ht.; Norms
- OKC Isokinetics - < 25% bilateral comparison/ other criteria
- CKC Isokinetics - < 30% bilateral comparison
- Kinesthetic/Balance Testing - Bilat comp
- KT 1000 - < 3 mm bilateral comparison
- Basic Measurements - < 10% bilateral comparison

Functional Testing Algorithm - Knee

Objective, quantitative (and qualitative), systematic testing and rehabilitation method to safely and rapidly progress a patient from immediate post injury/post-op to return to full functional activities and return to play in sports

Functional Testing Algorithm - Knee

Progression to the next higher level of testing difficulty is predicted upon passing the prior test in the series...
Each successive test and its associated training regimen places increasing stress on the patient while at the same time decreasing clinical control

Functional Testing Algorithm - Knee

We can rehabilitate patients faster than ever because by testing them, we always know where the patient is in the rehab program and can focus the interventions specifically on the patient's particular condition and status
Functional Testing Algorithm - Knee - 2016

- Sport Specific Testing
- Lower Extremity Functional Tests
- Functional Hop Tests
- Functional Jump Tests
- OKC Isokinetic testing
- CKC Isokinetic Testing
- Sensorimotor System Testing: Balance/Proprioceptive Testing
- KT 1000/ 2000
- Basic Measurements

Competitive Athletes

Recreational Athletes

General Orthopaedic Patients

Basic Measurements

- Time/soft tissue healing
- VAS (0-10 scale)
- Anthropometric measurements
- AROM, PROM
- Special Tests
- Qualitative & Quantitative Movement Assessment
- Knee Rating scales: IKDC, etc.

Basic Measurements

- MD Clearance & Approval
- Time/soft tissue healing
- VAS (0-10 scale)
- Anthropometric measurements
- AROM, PROM
- Special Tests
- Qualitative & Quantitative Movement Assessment
- Knee Rating scales: IKDC, etc.

Regional Interdependency

TOTAL BODY INTERDEPENDENCY

If movement is one integrated pattern, regardless of its complexity,
then we must evaluate and treat

- The TOTAL PATIENT

Basic Measurements

- Qualitative & Quantitative Movement Assessment
- Step Down Tests:

Performance Tests

Single Leg Step Down

Analysis

P & S M, 1978
Functional Testing Algorithm

TIME:
Soft tissue healing
from the injury or
from a
post-surgical condition

We still have not
answered this Question?
• Biologics and “mother nature”
and the:
• Neoangiogenesis
• Maturation
• Ligamentization

Clinical Decision Making

Clinical Decision Making

Basic Measurements

• Time/soft
tissue healing
Clinical Decision Making

Then we return him back to sports

Functional Testing Algorithm

1. Sports Specific Tests
2. Lower Extremity Functional Tests
3. Functional Hop Tests
4. Functional Jump Tests
5. OKC Isokinetic Tests
6. CKC Isokinetic Tests
7. Kinesthetic/Balance Tests
8. KT 1000/2000 Tests
9. Basic Measurements

KT 1000

- When the KT 1000 scores are normalized according to the criteria (< 3 mm bilateral comparison), or if > 3, then guarded progression to the next stage of the FTA

It has been my clinical observation (performance motion assessment) that after a LE injury, individuals do not bear weight equally during double-leg exercises, especially on the injured leg.
ACL-R
- More flexion WB on ACL-R side
- More external weight WB on ACL-R side

3 months: unweighted ACL-R side
6 months: unweighted ACL-R side
12 months: normalized WB - ACL-R side

Majority of patients felt like they were performing equal WB on both legs

Balance/Proprioceptive Testing
- When prescribing squat exercises, it should be recognized that initially, patients with ACLR tend to unload the affected knee.
- More symmetrical loading patterns may be achieved by inducing bilateral fatigue.
- When fatigued, loading symmetry was similar between this patient group and controls.
- This is relevant information for those who implement rehabilitation training programs.


Balance/Kinesthetic/Proprioceptive Testing
- If the measurements are within 10% of normal, the patient progresses
- If the measurements are not within 10% of normal, then the rehab program is focused on kinesthetic/proprioceptive exercises

Functional Testing Algorithm - Knee - 2016
- Sport Specific Testing
- Lower Extremity Functional Tests
- Functional Hop Tests
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- Basic Measurements

Closed Kinetic Chain Exercise
A Comprehensive Guide to Multiple-Joint Exercises
Todd S. Ellenbecker, Greg J. Davis

Open Kinetic Chain vs. Closed Kinetic Chain
Integrated Testing & Rehabilitation

Functional Testing Algorithm
- Sports Specific Tests
- Lower Extremity Functional Tests
- Functional Hop Tests
- Functional Jump Tests
- OKC Isokinetic Tests
- CKC Isokinetic Tests (Single leg wall slides, Leg Press)
- Kinesthetic/Balance Tests
- KT 1000 Tests
- Basic Measurements
**CKC - Testing**

- With CKC testing everything is being tested and we *do NOT KNOW* which muscles are contributing to the force production;
- Or which muscles are *NOT* contributing to the force production

---

**Functional Testing Algorithm - Knee - 2016**

- Sport Specific Testing
- Lower Extremity Functional Tests
- Functional Hop Tests
- Functional Jump Tests
- OKC Isokinetic testing
- CKC Isokinetic Testing
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- KT 1000/2000
- Basic Measurements

**Competitive Athletes**

**Recreational Athletes**

**General Orthopaedic Patients**

---

**Advantages of OKC/Isolated Exercises**

- Check for proximal and distal muscles compensating for weak areas.
- Check to see if there are deficits distant from the actual injury site.
- Prevent compensations from other muscle groups in the kinetic chain from "masking" weaknesses
- You know you are specifically "targeting" a muscle group when you test it
- There is a correlation between OKC testing and functional activities

---

**Questions?**

- So why do we have to test "each link" in the kinematic chain?

---

**REFERENCE**

- Well documented
- in the knee....
- 
- Seminal Article
Isokinetic Testing

- PubMed Search: 7/1/16
- Isokinetics: 5,460 references
- Isokinetics and Knee: 2,629 (48%)

Isokinetic Data

- What information do we use from isokinetics?
  - Bilateral comparison
  - Unilateral ratio of agonist/antagonist
  - Torque to body weight (relative/normalized data)
  - TAD, TBS
  - Angle specific torque
  - TAE/ TRTD
  - Endurance analysis
  - Normative data
  - Functional correlation
  - Sport specific correlation

Isokinetic Testing

- OKC Testing
- And/or Rehab

Reference

- Lower-extremity compensations following ACL reconstruction
  - Vertical Jump - No difference in summate ext. moment
  - OKC testing - Knee extensor moment significantly lower
  - Hip and/or ankle extensors compensate for knee

1984

Entire chapter on isokinetic testing and data analysis; i.e., TRTD, TAE
Entire chapter on correlation of isokinetic torque curves with pathologies

Return to Play

Importance of Quads

- Early resolution of quadriceps strength deficits may be important for improving confidence and knee-related function.
- Interestingly, QSBW with isokinetic testing, had a stronger association with function in patients who did not RTS at 6 months

Importance of Quads

- Elsen, I, et.al. Preoperative quadriceps strength is a significant predictor of knee function two years after ACL-R.
- Preoperative quadriceps muscle strength has significant negative consequences for the long-term functional outcome after ACL reconstruction. Patients with quad deficits above 20% also had SS strength deficits 2 years after surgery.
- Recommendation: Quad strength < 20% before ACL-R (IMPORTANCE-PRE-HAB)

Data Analysis

(Davies, GJ, A Compendium of Isokinetics, 1984, 1992)
- Bilateral comparison
- Unilateral ratio of agonist/antagonist
- Torque to body weight (relative/normalized data)
- TAD, TBS
- Angle specific torque
- TAE/ TRTD
- Endurance analysis
- Normative data
- Functional correlation
- Sport specific correlation

OKC Testing

OKC Testing

OKC Testing And/ or Rehab

OKC Testing

OKC Testing and/or Rehab

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OKC Testing and or Rehab

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OKC Testing And/or Rehab

OKC Testing
Isokinetic Testing and Correlation to Functional Performance


Isokinetic Testing


Isokinetic Testing


Isokinetic Testing


Isokinetic Testing


Isokinetic Testing


Functional Testing Algorithm
1. Sports Specific Tests
2. Lower Extremity Functional Tests
3. Functional Hop Tests
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5. OKC Isokinetic Tests
6. CKC Isokinetic Tests
7. Kinesthetic/Balance Tests
8. KT1000 Tests
9. Basic Measurements
10. JUNE 2000

CLOSED KINETIC CHAIN EXERCISE
A Comprehensive Guide to Multi-joint Exercises
TODD S. STEINBERGER GREG J. HAYES
Open Kinetic Chain vs. Closed Kinetic Chain (Functional WB Position)
Integrated Testing & Rehabilitation

Functional Tests

LE FUNCTIONAL TESTS
- Single Leg Hop Tests
  - Single leg forward hop
  - Triple hop for distance
  - Single leg timed hop
  - Cross-over hop for distance

- Agility Tests
  - Shuttle run
  - Side step
  - Carioca
  - LEFT

Performance Tests

Functional Testing Algorithm
- Single Leg Step Down
- Analysis

Davies' Modified Jump/Hop Tests
- Both legs = Jump Test
  - Uninvolved Leg = Hop Test
  - Involved Leg = Hop Test

CKC WB Isokinetic Testing

Functional Testing Algorithm - Knee - 2016
- Sport Specific Testing
- Lower Extremity Functional Tests
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Competitive Athletes
Recreational Athletes
General Orthopaedic Patients

Performance Tests

Davies' Modified Jump/Hop Tests
- Both legs = Jump Test
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  - Involved Leg = Hop Test

Drop Jump Test
Analysis

Functional Testing Algorithm
- Single Leg Hop Tests
  - Single leg forward hop
  - Triple hop for distance
  - Single leg timed hop
  - Cross-over hop for distance

- Agility Tests
  - Shuttle run
  - Side step
  - Carioca
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LE FUNCTIONAL TESTS
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  - LEFT

Performance Tests

Davies' Modified Jump/Hop Tests
- Both legs = Jump Test
  - Uninvolved Leg = Hop Test
  - Involved Leg = Hop Test

Drop Jump Test
Analysis
Arms clasped behind back
Minimal neck movements
Minimal trunk movements

Segmented Contributions to forces in vertical jump

<table>
<thead>
<tr>
<th>Components</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knee</td>
<td>56%</td>
</tr>
<tr>
<td>Ankle</td>
<td>32%</td>
</tr>
<tr>
<td>Trunk</td>
<td>10%</td>
</tr>
<tr>
<td>Arm Swing</td>
<td>10%</td>
</tr>
<tr>
<td>Head Swing</td>
<td>2%</td>
</tr>
<tr>
<td>Total Performance</td>
<td>78%</td>
</tr>
<tr>
<td>Optimal Timing of Segmented Performance</td>
<td>84%</td>
</tr>
</tbody>
</table>

Davies’ Modified Jump Test

Lathan, Komi, Europ J App Phys, 1978

Absolute (Quantitative Number) vs. Relative Data
(Normalized to patient’s height)

Functional Jump Test

Relative Data

<table>
<thead>
<tr>
<th></th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
<tbody>
<tr>
<td>R + L</td>
<td>100%</td>
<td>90%</td>
</tr>
<tr>
<td>HT.</td>
<td>HT.</td>
<td>HT.</td>
</tr>
</tbody>
</table>

Functional Testing Algorithm

<table>
<thead>
<tr>
<th>Sports Specific Tests</th>
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<td>KT 1000 Tests</td>
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<tr>
<td>Basic Measurements</td>
</tr>
</tbody>
</table>

Functional Hop Test

Hop is on one leg

Psychological Readiness Test

- Quantitative
- (LSI)
- vs
- Qualitative values
Performance

- Quantitative analysis is part of assessment
- But, also important to perform qualitative assessment of the concentric power performance phase
- And most importantly, eccentric deceleration phase

SINGLE LEGGED HOP TESTS

- STANDARDIZED INSTRUCTIONS
- MULTIPLE VARIATIONS BASED ON SPECIFIC FUNCTION OF ATHLETE / PATIENT BEING TESTED

SINGLE LEG HOP

- Hand placement varies
- Land on same leg
- Average 3 trials each leg

IKDC ONE LEG HOP TEST

- BILATERAL COMPARISON & NORMATIVE DATA

<table>
<thead>
<tr>
<th>Activity</th>
<th>Males distance as % of height</th>
<th>Females distance as % of height</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jump test (R + L)</td>
<td>50-100</td>
<td>25-50</td>
</tr>
<tr>
<td>Hop test (independent leg)</td>
<td>60-90</td>
<td>30-60</td>
</tr>
<tr>
<td>Hop test (supported leg)</td>
<td>80-120</td>
<td>70-110</td>
</tr>
</tbody>
</table>

TRIPLE HOP FOR DISTANCE

- Hand placement varies
- 3rd hop land on one foot
- 1-3 trials each leg

SINGLE LEG TIMED HOP

- Hand placement
- 6 meter line
- Single leg hop entire distance
- 1-3 trials each leg

CROSS-OVER HOP FOR DISTANCE

- 6 meter line, 15 cm wide
- 3 single leg hops for distance - 1st hop medial
- 1-3 trials each leg

Return to sport following ACL Injuries


While unilateral deficits are present in individuals following ACL-R, they may not be evident during bipedal performance or during modified versions of double-limb performance activities. Isolation of the involved limb with unilateral hopping tasks should be used to identify deficits in performance.
Return to sport following ACL-R

- 12 months: 33% attempted competitive sports
- IKDC scores did not discriminate who returned to sports
- Patients with good hop test results (>85% LSI) were more likely to return than patients with poor results (<85% LSI)
- People may require a longer post-op rehab period than that typically advocated to return to competitive sport after ACL-R surgery

Return to sport following ACL Injuries

- ROC-measure of discriminate accuracy
- Optimal single leg hop for distance LSI
- Combinations of any 2 of 4 single-legged hop tests did not give higher discriminate accuracy
- LSI (88%) - sensitivity (71.4%) & specificity (71.7%)
- Single hop for distance (LSI) significantly predicted self-reported knee function after 1 year in a nonoperatively treated ACL-injured patients

Return to sport following ACL Injuries

- Crossover hop and 6-m timed hop LSI 6 months after ACL-R were the strongest individual predictors of self-reported knee function.
- <88% cutoff scores at 6 months may benefit from targeted training to improve LSI. >88% - good knee function at 1 year
- Single-legged hop tests conducted 6 months after ACL-R can predict the likelihood of successful and unsuccessful outcomes 1 year after ACL-R.

Functional Testing Algorithm

<table>
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<tr>
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<tbody>
<tr>
<td>Agility Tests</td>
</tr>
<tr>
<td>• Shuttle run</td>
</tr>
<tr>
<td>• Side step</td>
</tr>
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<td>• Carioca</td>
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<th>LE FUNCTIONAL TESTS</th>
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</thead>
<tbody>
<tr>
<td>agility Test</td>
</tr>
<tr>
<td>• 6.3 meter surface</td>
</tr>
<tr>
<td>• Stop after 4 lengths</td>
</tr>
<tr>
<td>• No crossover with step</td>
</tr>
<tr>
<td>• Step on each baseline</td>
</tr>
<tr>
<td>• 1 practice</td>
</tr>
<tr>
<td>• 1 timed trial</td>
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<tr>
<td>• Must crossover step</td>
</tr>
<tr>
<td>• and step on each</td>
</tr>
<tr>
<td>• baseline</td>
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</table>

SHUTTLE RUN

- 6.3 meter surface
- Injured leg must touch each baseline
- Stop after 4 lengths
- 1 practice
- 1 timed trial

SIDE STEP

- 6.3 meter surface
- Stop after 4 lengths
- No crossover with step
- Step on each baseline
- 1 practice
- 1 timed trial

CARI OCA

- 6.3 meter surface
- Must crossover step
- and step on each baseline
- Stop after 4 lengths
- 1 practice
- 1 timed trial
### Functional Testing Algorithm - Knee - 2016

<table>
<thead>
<tr>
<th>Competitive Athletes</th>
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<th>General Orthopaedic Patients</th>
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### Simulation of multiple sports performance characteristics in an in-clinic functional test

- Sprint - Front
- Sprint - Retro Run
- Side Shuffles – Both Ways
- Cariocas – Both Ways
- Figure 8’s – Both Ways
- 90° Angle Cuts – Both Way
- Cross-Over Steps – Both Ways
- Sprint - Front
- Sprint - Retro Run

### WOW !!!

- That’s a pretty complicated test; but is it really reliable?
ICCs

- When the LEFT is normalized according to the criteria (< 10% from the normative data), then progression is to the next stage of the FTA.

**Return to Play**
- These results suggest a significant relationship between LE OKC and CKC lower extremity strength and functional performance. (Negrete, R, et al., J Sport Rehab. 2002)

**Specificity Testing**
- This is individualized to the patient and his/her specific ADL's vocational or recreational activities.

**Sport Specific Tests**
- When the sport specific tests are normalized according to the criteria (< 10% compared to sport specific data), then progression is to return the patient back to practice and then competitive sports.

**Functional Testing Algorithm**
- Outcome performance scales;
- Clinician-generated impairment measurements;
- Patient-centered self-reported values;
- Generic/Global Health-Related Quality of Life (HRQOL) scales;
- Specific Joint/pathology scales;
- Specific Joint/activity level scales.
LE Specific Outcome Scales

- Smith, MV, et al.
- Lower extremity-specific measures of disability and outcomes in orthopaedic surgery.

Outcome Scales

- KOOS
- IKDC
- Lysholm
- Cincinnati Knee Rating Scale
- Tegner Activity Scale
- ACL Quality of Life
- Marx Activity Scale

Return to Play - Psychological Factors

- Knee impairments and psychological variables were associated with self-report of function
- Kinesiophobia needs to be addressed in rehab


Return to Play - Psychosocial Measures

- Elevated pain-related fear of movement/re-injury, quadriceps weakness, and reduced IKDC scores distinguish patients who are unable to return to pre-injury sports participation because of fear of re-injury/lack of confidence


Return to Play

- 69 articles
- 7556 participants
- 55% RTS - competitive level
- RTS: LSI-hop test, younger age, male gender, playing elite sport, positive psychological response


Functional Testing Algorithm

- After passing the tests, the athlete returns to:
- Sport specific training programs
- Practice simulations
- Practices
- Scrimmages
- Competition

Summary and Conclusions

Functional Testing Algorithm

- Sports Specific Tests
- Lower Extremity Functional Tests
- Functional Hop Tests
- Functional Jump Tests
- OKC Isokinetic Tests
- CKC Isokinetic Tests
- Kinesthetic/Balance Tests
- KT 1000 Tests
- Basic Measurements
FTA Specific Guidelines
- LEFT - M:1:30; F: 2:00 minutes
- HOP - < 10% Ht.; < 10% Bilat. Comp.; Norms/various hops
- JUMP - < 15%/Ht.; Norms
- OKC Isokinetics - < 25% bilateral comparison/other criteria
- OKC Isokinetics - < 30% bilateral comparison
- Kinesthetic/Balance Testing - Bilat comp
- KT 1000 - < 3 mm bilateral comparison
- Basic Measurements - < 10% bilateral comparison

Functional Testing Algorithm - Knee
- Clinical decision making (CDM) (based on history, subjective exam, objective physical exam, imaging, etc.) states the athlete is ready to return to activity
- But if we also have all the functional tests to support the CDM, it strengthens the argument to return the athlete back to activity safely.

Clinical Implications
- As Davies has said for the last 51 years, it MUST be an INTEGRATED APPROACH for testing and rehabilitation!!!