WHAT MAKES YOU SO SPECIAL?
CHOOSING THE RIGHT SPECIAL TEST IN CLINICAL PRACTICE

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What is diagnostic accuracy?

Define terms associated with diagnostic accuracy

Practical examples

CORE app
  - We have no financial interest or association with the CORE app.
  - We make no warranty to their reliability or validity
How does diagnostic accuracy relate to evidence based practice?

- Best research evidence
- Clinical expertise
- Patient values

• Diagnostic accuracy
  - The precision of a test
<table>
<thead>
<tr>
<th></th>
<th>MRI Positive</th>
<th>MRI Negative</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior Drawer (Positive)</td>
<td>25</td>
<td>10</td>
</tr>
<tr>
<td>Anterior Drawer (Negative)</td>
<td>5</td>
<td>60</td>
</tr>
</tbody>
</table>
• **False positive**
  - the athlete has a positive Anterior Drawer test but didn’t in fact tear his/her ACL

• **False negative**
  - the athlete has a negative Anterior Drawer test but does in fact have a torn ACL
• Among patients *with* the disease, the probability of a positive test

<table>
<thead>
<tr>
<th>Test Result</th>
<th>MRI Tear (Positive)</th>
<th>MRI Tear (Negative)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anterior Drawer (Positive)</td>
<td>True Positive A</td>
<td>False Positive</td>
</tr>
<tr>
<td>Anterior Drawer (Negative)</td>
<td>False Negative C</td>
<td>True Negative</td>
</tr>
</tbody>
</table>

• $A/(A + C)$
  – True-positive rate
Among patients *without* the disease (i.e. healthy patients), the probability of a negative test:

**MRI Tear (Positive)** | **MRI Tear (Negative)**
---|---
Anterior Drawer (Positive) | True Positive | False Positive **B**
Anterior Drawer (Negative) | False Negative | True Negative **D**

\[ D/(B + D) \]

- True-negative rate
• With high sensitivity a negative test rules out the diagnosis
  – SnOUT

• With high specificity a positive test rules in the diagnosis
  – SpIN
PRACTICAL EXAMPLES

• Breast Cancer Diagnosis

• HIV diagnosis

• You better ensure that your tests are both specific and sensitive to rule IN or OUT the diagnosis 😊
**Athletic Training Example**

- Meniscus Tests

<table>
<thead>
<tr>
<th>Test</th>
<th>Sensitivity</th>
<th>Specificity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apley Compression</td>
<td>.40</td>
<td>.80</td>
</tr>
<tr>
<td>McMurray</td>
<td>.50</td>
<td>.70</td>
</tr>
<tr>
<td>Thessaly</td>
<td>.90</td>
<td>.98</td>
</tr>
<tr>
<td>KKU Compression/Rotation</td>
<td>.86</td>
<td>.88</td>
</tr>
</tbody>
</table>
• Ratios used to determine the probability that the condition is present
  – Positive
  – Negative
• Only used when the clinical test is positive

\[
\text{Sensitivity} \over (1 - \text{Specificity})
\]

• Tests with \textit{large} positive likelihood ratios help the clinician to be more confident that the patient does indeed have the condition \textbf{greater than 5}

(Di Fabio, 2013 and Cleland, 2005)
NEGATIVE LIKELIHOOD RATIO

- Only used when the clinical test is negative

\[
\frac{1 - \text{Sensitivity}}{\text{Specificity}}
\]

- Tests with small negative likelihood ratios help the clinician to be more confident that the patient does not have the condition less than .20

(Di Fabio, 2013 and Cleland, 2005)
• Pre-Test Probability
• Likelihood Ratio
• Post-Test Probability

USING THE CORE APPLICATION IN CLINICAL PRACTICE
INTRODUCTION

- We are not being paid to ‘plug’ the CORE app
- Available with Apple and Android
  - Android
  - Apple
- Very user friendly
- Provides plenty of information
  - Test description
  - Video of the test
  - Test properties (Sp, Sn, +LR, -LR)
  - Updated frequently
LET’S TAKE A LOOK
Click on Test Bank

[Image of a list of tests and a skeleton diagram]
CLICK ON TEST CATEGORY

- ABDuction Inferior Instability Test
- ACP Low Back Pain Guidelines
- Abduction Test
- Accessory Motion Testing Carpal Joints
- Achilles Tendon Palpation Test
- Acromioclavicular Joint Differential Test
- Acromioclavicular Joint Palpation Tenderness Test
- Active Compression Test
- Active Floor Push-up Sign Test
- Active Hip ABDuction Test
- Active Lachman Test
- Active Straight Leg Raise Test
- Adduction Stress Test
- Compression Rotation Test
- Drop Arm Test
- Hawkins Test
- Hawkins-Kennedy
- Horizontal Adduction Test
- IRRST
- Infraspinatus Muscle Strength Test
- Internal Rotation Resisted Strength Test
- Kennedy Test
- Modified Scapular Assistance Test
- Neer Test
- Painful Arc Test
- Patte Test

Foot-Ankle
Neer Test

Purpose

This test is primarily used to diagnose Shoulder Impingement Syndrome (SIS) and has been used in determining the integrity of the labrum and the rotator cuff muscles.

Instructions

1. The patient stands while the examiner stands behind the patient.

2. The examiner stabilizes the scapula with one hand and forward-flexes the arm (hand at elbow) with the other hand until the patient reports pain or until full elevation (flexion) is reached.
Neer Test

Forward flexes with other arm until patient reports pain

Labrum, Impingement, Muscle/Tendinopathy

Test Properties
Test Properties

Pooled Summary Estimates (with 95% CI):
Sn = 0.78 (0.68-0.87)
Sp = 0.58 (0.47-0.68)
+LR = 1.86 (1.49-2.31)
-LR = 0.37 (0.25-0.55)

Meta-analysis from systematic review evaluating all studies that look at diagnostic accuracy of clinical tests for Shoulder Impingement Syndrome. 5 studies for Neer's Test with a total of 1127 subjects.
Test Properties

Sn = 0.70 / Sp = 0.92 / +LR = 8.75 / -LR = 0.33

N = 100 patients with "periarthrophatia scapulohumeralis" (64 females / 36 males / mean age = 57). Ref standard = ultrasonography.

PubMed: [Fodor, Ortop Traumatol Rehabil, 2009]
INTERNAL ROTATION RESISTED STRENGTH TEST

Test Properties

Sn=0.88 /Sp=0.96 /+LR=22.00 /-LR=0.13
N=115 surgical patients with + Neer Impingment Sign; Age=17-76; Ref standard = Arthroscopy.
QUADAS Score = 8 (Hegedus, 2008)
Limitation Described (Luime, JAMA, 2004)
- Disease progression bias possible, time between index and reference test not described.

PubMed: [Zaslav, JSES, 2001]
ANTERIOR SHOULDERS INSTABILITY

• Apprehension Test and Anterior Instability Cluster

• Sn/Sp and LR’s high for Hill-Sachs, Bankart, and Apprehension

• Low –LR for Surprise allowing you to be confident with negative finding

• Good Sp and Sn for Jobe especially if looking for apprehension releif
APPREHENSION TEST

SLAP Lesion:
Sn = 0.29 / Sp = 0.69
+ LR = 0.92 / -LR = 1.04

Rotator Cuff Pathology:
Sn = 0.22 / Sp = 0.63
+ LR = 0.58 / -LR = 1.25

Labrum Tear:
Sn = 0.32 / Sp = 0.71
+ LR = 1.10 / -LR = 0.96

Hill Sachs Lesion:
Sn = 0.81 / Sp = 0.81
+ LR = 4.23 / -LR = 0.23

Bankart Lesion:
Sn = 0.79 / Sp = 0.87
+ LR = 6.08 / -LR = 0.24

Apprehension:
Sn=0.72 / Sp=0.96 / +LR=18.00 / -LR=0.29
SURPRISE TEST

Sn=0.98 / Sp=0.78 / +LR=4.45 / -LR=0.03
RELOCATION TEST

Apprehension Relief:
Sn=0.81 / Sp=0.92 / +LR=10.13 / -LR=0.21

Pain Relief:
Sn=0.30 / Sp=0.90 / +LR=3.00 / -LR=0.78
• Clinical evaluation critical

• Use combination of tests

• Jerk and Kim Test allow for greatest Sn/Sp
Purpose
Assists with the diagnosis of glenohumeral joint instability which can be caused by pathology to the labrum, rotator cuff muscles, or joint capsule.

Instructions
1. Patient is in sitting position.

2. While stabilizing the patient’s scapula with one hand and holding the affected arm at 90 degrees abduction and internal rotation, the examiner grasps the elbow and axially loads the humerus in a proximal direction.

3. The arm is moved horizontally across the body.

4. A positive result is indicated by a sudden clunk as the humeral head slides off the back of the glenoid. When the arm is returned to the original position, a second jerk may be observed, that of the humeral head returning to the glenoid.

The test combines a compression force and a translation force, applied along the arm between the humeral head and the glenoid cavity. In so doing, a subluxation of the humeral head is provoked and it is accompanied with a jerk to prevent subluxation. The “Painful Jerk Test” is the same test, but there is pain in addition to the responsive “jerk”.

JERK TEST - HTTPS://WWW.YOUTUBE.COM/WATCH?V=MN7F6KVSCE
Kim Test

Purpose
Determine the integrity of the glenoid labrum of the shoulder and helps diagnose a labral tear.

Instructions
1. The patient is in a sitting position with the arm in 90 degrees of abduction.

2. The examiner holds the elbow and lateral aspect of the proximal arm, and then with arm elevated to 45 degrees, applies to the proximal arm a strong axial loading force diagonally upward, downward, and backward.

3. A sudden onset of posterior shoulder pain indicates a positive test result, regardless of accompanying posterior clunk of the humeral head.

4. During the test, it is important to apply a firm axial compression force to the glenoid surface by the humeral head. Therefore, having the patient sit against the back of a chair rather than on a stool provides a good countersupport for the axial loading in the examining arm.
JERK TEST

\[ Sn = 0.73 \quad /Sp = 0.98 \quad /+LR = 36.5 / -LR = 0.28 \]

When combined with [Kim Test] \( Sn = 0.97 \)

KIM TEST

\[ Sn = 0.80 \quad /Sp = 0.94 \quad /+LR = 13.33 / -LR = 0.21 \]

When combined with [Jerk Test] \( Sn = 0.97 \)
Knee Special Tests

- Anterior Drawer
  - Sn - .2; Sp - .88
  - Sn - .77; Sp - .87 (with anesthesia)
- Lachman
  - Sn. - .85; Sp. .94 (with or without anesthesia similar)
- Pivot Shift
  - Sn -/24; Sp. - .98 (without anesthesia)
  - Sn - .74; Sp - .99 (with anesthesia)
- Valgus
  - Sn – 86; Sp - .93; +LR – 13.1; -LR - .15
BE INFORMED

• Use available resources – research, CORE, etc

• Use clinical expertise

• Consider the athlete/patient

• Just because you once learned it, doesn’t mean it is still useable
Which of the following is the largest?

- A: A Peanut
- B: An Elephant
- C: The Moon
- D: A Kettle

ELEPHANTS

Larger than the moon

• Cleland, J. *Orthopaedic clinical examination: An evidence-based approach for physical therapists*. Icon Learning Systems, Carlstadt, NJ.