The Selective Functional Movement Assessment

Gray Cook, MSPT, OCS, CSCS
author, *Movement*
Thank you!

AAOM members,
Thank you for the opportunity to discuss movement assessment.

Dr. Kyle Kiesel and Dr. Todd Arnold
Where are we?
Annual Health Care Dollars Spent

Eye care = $31.4 Billion

Dental care = $269 Billion

Cardiac care = $444 Billion

Total = $744.4 Billion (CDC data)
Eye, Dental and Heart care all have screens . . .

For **signs**, before symptoms are present.
Where are we?
Annual Health Care Dollars Spent

Musculoskeletal care = $849 Billion
In Musculoskeletal care . . .
we wait for symptoms and then arbitrarily value the signs that we think contribute to the problem.
We wait for **symptoms** and then arbitrarily value the signs that we think contribute to the problem.

- Weak core?
- Tight muscles?
- Sedentary?
- Addicted to exercise?
- _______________?
Selective Functional Movement Assessment

Development began with a simple, but misguided request from Dr. Greg Rose - *Titleist Performance Institute*

“We need a standard orthopedic assessment for golfers.”

But then . . .

“We need a standard orthopedic assessment for runners.”

“We need a standard orthopedic assessment for ______.”

No.

We *need* a standard orthopedic assessment for humans.
Selective Functional Movement Assessment

We need a systematic way to identify the vital impairments of mobility and motor control associated with functional movement patterns complicated by pain.
Selective Functional Movement Assessment

1. Cervical Spine
2. Upper Extremity
3. Multi-Segmental Flexion
4. Multi-Segmental Extension
5. Multi-Segmental Rotation
6. Single-Leg Stance
7. Overhead Deep Squat

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Scoring of the SFMA

- **FN** - Functional and Non-Painful
- **FP** - Functional and Painful
- **DP** - Dysfunctional and Painful
- **DN** - Dysfunctional and Non-Painful
Scoring of the SFMA

- **FN**: Can without Pain
- **FP**: Can with Pain
- **DP**: Can’t with Pain
- **DN**: Can’t without Pain
MULTI-SEGMENTAL FLEXION BREAKOUTS

Limited Multi-Segmental Flexion

- Single Leg Forward Bend
  - FN
  - Bilateral DN, DP or FP
  - Unilateral DN, DP or FP

- Long Sitting Test
  - FN (80° Sacral Angle)
  - DN, DP or FP

- Weight-Bearing Hip Flexion pattern SMCD
  - Active SLR Test (70°)
  - FN
  - DN, DP or FP (<70°)

- Passive SLR Test (80°)
  - FN > 80°
  - DN, DP or FP

- Core SMCD &/or Active Hip Flexion SMCD
  - Prone Rocking Test
    - FN
    - FP or DP
    - DN
  - Supine Knee to Chest Test
    - FN
    - FP or DP
    - DN

If no previous mobility findings consider this a weight-bearing pain &/or Hip SMCD - otherwise treat orange boxes first.

SLE Hip Flexion TED or if PSB was FP could be Active Hip Flexion SMCD
- Treat Chemoin Pain in Hip
- Hip-JMD A/ or Posterior Chain TED
A really good question…

Where did we develop our opinions about movement function and dysfunction?
Movement Patterns

We started this journey by simply categorizing human movement patterns not by measuring body parts.
Movement Patterns

We started this journey by simply categorizing human movement patterns *not by measuring body parts*. 
What does the research say about movement screening?

• Reliable tool that can be quickly and easily administered in any setting

• Can be used as a tool to identify who is at risk for injury within certain population groups

• The screen score can be improved with simple, individualized exercises
## FMS (Reliability)

<table>
<thead>
<tr>
<th>Study</th>
<th>Journal</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onate et al, 2012</td>
<td><em>J Strength Cond Res</em></td>
<td>The FMS total scores displayed high intersession and interrater reliabilities</td>
</tr>
<tr>
<td>Bribble et al,</td>
<td><em>J Strength Cond Res</em></td>
<td>Intrarater reliability is strong and seems to strengthen when the individuals are exposed to the FMS in a clinical experience.</td>
</tr>
<tr>
<td>Teyhen et al, 2012</td>
<td><em>Journal of Orthopaedic &amp; Sports Physical Therapy</em></td>
<td>FMS composite score demonstrated moderate to good interrater and intrarater reliability</td>
</tr>
</tbody>
</table>
| Smith et al, 2013 | *J Strength Cond Res*                        | HS least Reliable test  
SM most reliable test |
| Gulan et al, 2014 | *Int J Sports Ther*                          | Level of experience of the rater scoring the FMS™ should be considered, as it appears that the expert rater was more critical than novice raters in the interpretation of the scoring criteria |


# FMS (Injury Validity)

<table>
<thead>
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<th>Population</th>
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<td>Teyhen et al, 2015</td>
<td><em>Clin Orthop Rel Res</em></td>
<td>US Army Rangers</td>
<td>211</td>
<td>Asymmetrical ankle dorsiflexion &amp; Pain with Functional Movement Screen clearing tests were associated with increased injury risk</td>
</tr>
<tr>
<td>Garrison et al, 2014</td>
<td><em>Int J Sports Phys Ther</em></td>
<td>College Athletes</td>
<td>160</td>
<td>Athletes with an FMS™ composite score at 14 or below combined with a self-reported past history of injury were at 15 times increased risk of injury.</td>
</tr>
<tr>
<td>Mccal et al, 2014</td>
<td><em>Br J Sports Med</em></td>
<td>Pro Soccer Teams</td>
<td>44</td>
<td>The FMS was ranked the number 1 tool to identify injury risk in Professional International Premier leagues teams</td>
</tr>
<tr>
<td>Kiesal et al, 2014</td>
<td><em>JSR Journal of Sport Rehabilitation</em></td>
<td>Pro Football Players</td>
<td>238</td>
<td>Combination of scoring below the 14 and exhibiting a movement asymmetry was leading cause of injury</td>
</tr>
<tr>
<td>O’Connor et al, 2011</td>
<td><em>Medicine &amp; Science in Sports &amp; Exercise</em></td>
<td>USMC Officer Candidates</td>
<td>874</td>
<td>FMS composite of 14 or below were twice as likely to drop out of basic training due to injury. 14 or below twice as likely to drop out, whether injured or not.</td>
</tr>
</tbody>
</table>


# FMS (Modifiability)

<table>
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<tr>
<th>Study</th>
<th>Journal</th>
<th>Population</th>
<th>n</th>
<th>Program Time</th>
<th>Control Group</th>
<th>FMS Composite Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goss et al., 2009</td>
<td><em>J Spec Oper Med</em></td>
<td>Special Ops Soldiers</td>
<td>90</td>
<td>6 weeks</td>
<td>N</td>
<td>2.5</td>
</tr>
<tr>
<td>Cowen et al., 2010</td>
<td><em>J Bodyw Mov Ther</em></td>
<td>Firefighters</td>
<td>77</td>
<td>6 weeks</td>
<td>N</td>
<td>3.3</td>
</tr>
<tr>
<td>Frost et al., 2011</td>
<td><em>J Strength Cond Res</em></td>
<td>Firefighters</td>
<td>60</td>
<td>12 weeks</td>
<td>Y</td>
<td>NC</td>
</tr>
</tbody>
</table>

**Movement training** does not change FMS score  
Not all training programs improve FMS results

Using basic information from the FMS screen and programming an exercise intervention from that data can lead to improvement

An Individualized Training Program May Improve Functional Movement Patterns Among Adults.
8-10 minute movement screen
Screening creates **perspective**
Movement Competency
Movement Function

Lack of Movement Competency
Movement Dysfunction

*Drawing the line creates the action point.*
“What gets measured gets done”

Simple to complex motor control requirements within the FMS help you find that developmental level.
FMS Scoring

3  Perform pattern as directed

2  Perform pattern with compensation/imperfection

1  Unable to perform pattern

0  Pain with pattern regardless of quality
What is the “Real” Objective?

VITAL SIGN

3 Perform pattern as directed
2 Perform pattern with compensation/imperfection
1 Unable to perform pattern
0 Pain with pattern regardless of quality

DYSFUNCTION
FMS: across age groups

Perry in press, Schneiders 2011
A simple battery of **seven movements** over the course of less than **10 minutes** demonstrates pain in over **20%** of people preparing to go into an athletic or strenuous endeavor, and who have been declared healthy themselves and/or by a physician.
Adaptability/Prediction
Injury Risk/Prediction

If the goal is prediction you must consider characteristics that are *meaningful* and *modifiable*:

1. Previous injury
2. Severity of previous injury
3. Pain with any movement test
4. Ankle mobility (ROM symmetry)
5. Performance on movement screening and balance testing
Once an injury occurs . . . the more 2s and 3s individual has, the faster they return to activity.

33% fewer missed training days
Costs for Sprain/Strain Injuries

Academy 33-36 (4 recruit classes)
Actual Claim Costs for S/S-related Injuries over $500

- 13 and Below* (30% of recruits) have created 80% of costs to date
- 14 and Above* (70% of recruits) have incurred 20% of costs to date

*Out of FMS composite score of 21

Orange County Fire Authority

$826,900

$208,482
FMS Past to Present

- U.S. Military
- U.S. Olympic Teams
- NFL
- NBA
- EPL
- MLB
- NHL
- D1 Universities
- Titleist Golf
- Equinox Fitness

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Why talk injury risk?

- Injury is inevitable, or
- Injury has already occurred
Should we look at patterns or parts?

A standardized lunge pattern confronts the basic mobility and motor control that could complicate 777 out of 1,345 of these injuries. 58%
Perfect In-line Lunge Pattern:
A competitive advantage for those who actively manage it...
The **lunge pattern** is beginning to show its importance in other populations:

**ARMY RANGERS:**
Ankle DF ROM Asymmetry is predictive of lower extremity/spine injury.
What about other patterns?

Over 95% of golfers who can't perform an overhead deep squat lose their posture in their golf swing.

Dr. Greg Rose
Titleist Performance Institute
We’ve seen predictive qualities in individual patterns . . .

. . . and the interplay of multiple patterns has even more powerful implications.
Adaptability/Prediction

“Adaptation”
“Don’t train movement-fitness in the presence of movement-dysfunction. This data was collected in extremely elite athletes. I believe that the results would apply to developing athletes even more.”

Todd Arnold, MD - USATF Sports Performance Scientist
FMS composite of 14 or below were twice as likely to drop out of USMC basic training due to injury.

Functional Movement Screening: Predicting Injuries in Officer Candidates. Medicine & Science in Sports & Exercise
“Poor movement leads to
• *preventable injuries*,
• *loss of duty time* and
• *poor physical performance in combat.*
FMS allows us to identify Marines who move poorly, but more importantly, prescribe exercises that correct these discrepancies.”

– Maj Matt Zummo, USMC
Commanding Officer
Recruiting Station Orange
Notice anything about the line between Vital Signs and Dysfunction in these diverse populations?

14

What do they have in common?

Movement
Action Point #1
You must be the ambassador for screening in your region, because 20% of the individuals you screen need you . . . they just don’t know it yet.
Does your rehab team have a Standard Operating Procedure (SOP)?

*Is it this impressive?*
Your rehab team’s responsibility:

To investigate the dysfunctional or painful pattern and provide you the **vital impairments** responsible for those behaviors as well as the **prognosis** and **plan** of care for resolution and management.
Your responsibility:

To identify **dysfunctional patterns** and **painful patterns** on your examination.
This can be done in two minutes
(and will be the focus of our workshop).
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