

HARKNESS CENTER  
FOR DANCE INJURIES

Clinical Expertise and Evidence  
in Dance Medicine

April 30 - May 1, 2016  
New York, NY



# So many tests, so little time, can we reduce injuries in a realistic way?

Kyle Kiesel PT PhD



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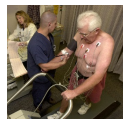
## Where are we? Annual Health Care Dollars Spent



Eye care = \$31.4 Billion



Dental care = \$269 Billion



Cardiac care = \$444 Billion

**Total = \$744.4 Billion** (CDC data)



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Eye, Dental and Heart care all have screens . . .

For **signs**, before symptoms are present.



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## Where are we? Annual Health Care Dollars Spent



Musculoskeletal care = **\$849 Billion**

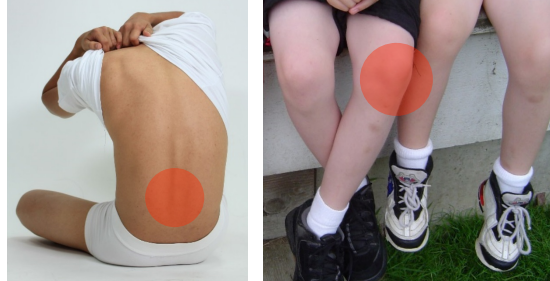


Eye, Dental and Heart = *\$744.4 Billion*



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



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## Why?.....need for a SOP



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## But.....where should we start?



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## But.....where should we start?

We started this by simply categorizing human *movement patterns* **not by measuring body parts**



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# Movement Pattern Screening



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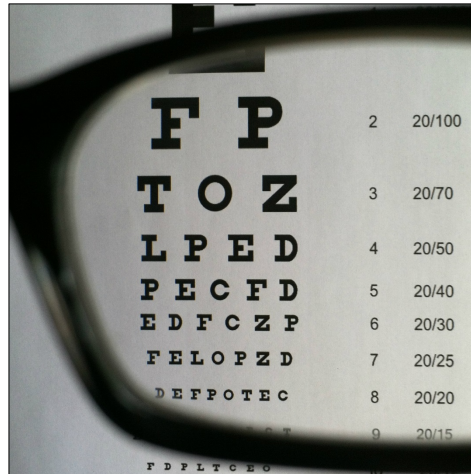
Simple to complex motor control requirements



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## Screening creates *perspective*



Movement Health?

Movement  
Competency?



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## Movement Pattern Testing



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# Movement Pattern Testing

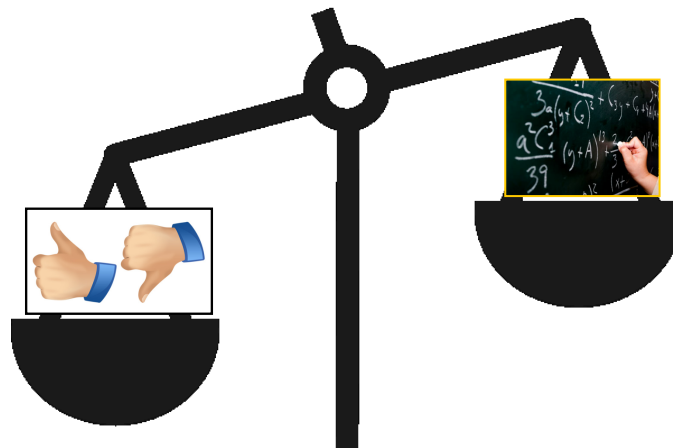


Body relative motor control at the limits of stability



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## Testing provides *measurement*



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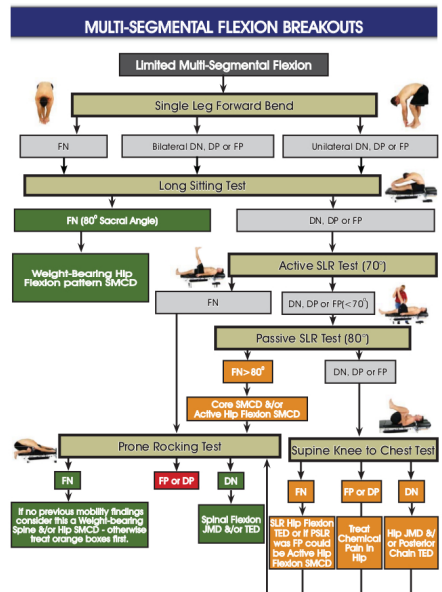


# Movement Pattern Assessment



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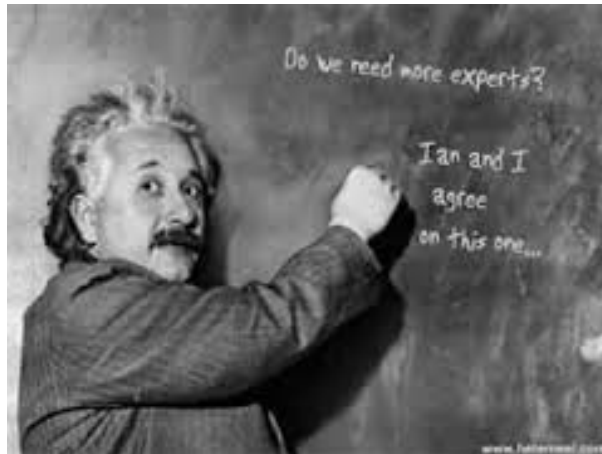
- FN - Functional and Non-Painful
- FP - Functional and Painful
- DP - Dysfunctional and Painful
- DN - Dysfunctional and Non-Painful



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# Assessment preserves expertise



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Movement Screening

Movement Testing

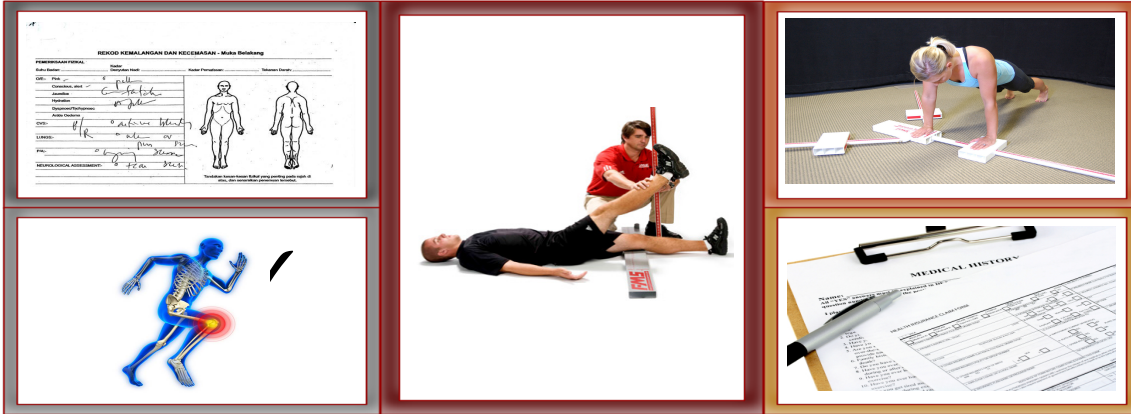
Movement Assessment



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# Injury Risk is Multifactorial





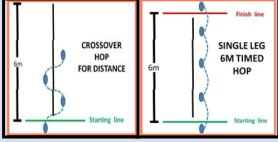


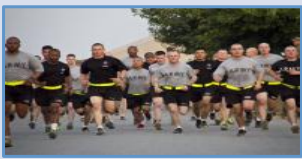


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## Risk is Multifactorial

Survey (n = 86)	Pain Provocation (n = 21)	Movement / Performance (n = 51)	
Prior Injury (Yes) Limited Duty (Yes) Perceived Recovery (SANE $\leq$ 92.5%)  	   	$\geq 4.5$ degrees  (A)	$\geq 7.75$ cm  (A) (R) $\leq 80.1\%$  $\leq 72\%$ (R)
			$\geq 15.3$ minutes

## Risk is Multifactorial

No Predictors Variables Present	Sn	Sp	+LR	-LR
$\leq 9$	0.01	1.00	NA	0.99
$\leq 8$	0.03	1.00	7.09	0.98
$\leq 7$	0.09	0.97	2.97	0.94
$\leq 6$	0.22	0.91	2.56	0.86
$\leq 5$	0.37	0.79	1.76	0.80
$\leq 4$	0.53	0.61	1.35	0.78
$\leq 3$	0.71	0.37	1.14	0.77
$\leq 2$	0.87	0.15	1.03	0.83
$\leq 1$	0.96	0.02	0.98	1.80
$\leq 0$	1.00	0.00	1.00	NA

## Good News



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## Bad News

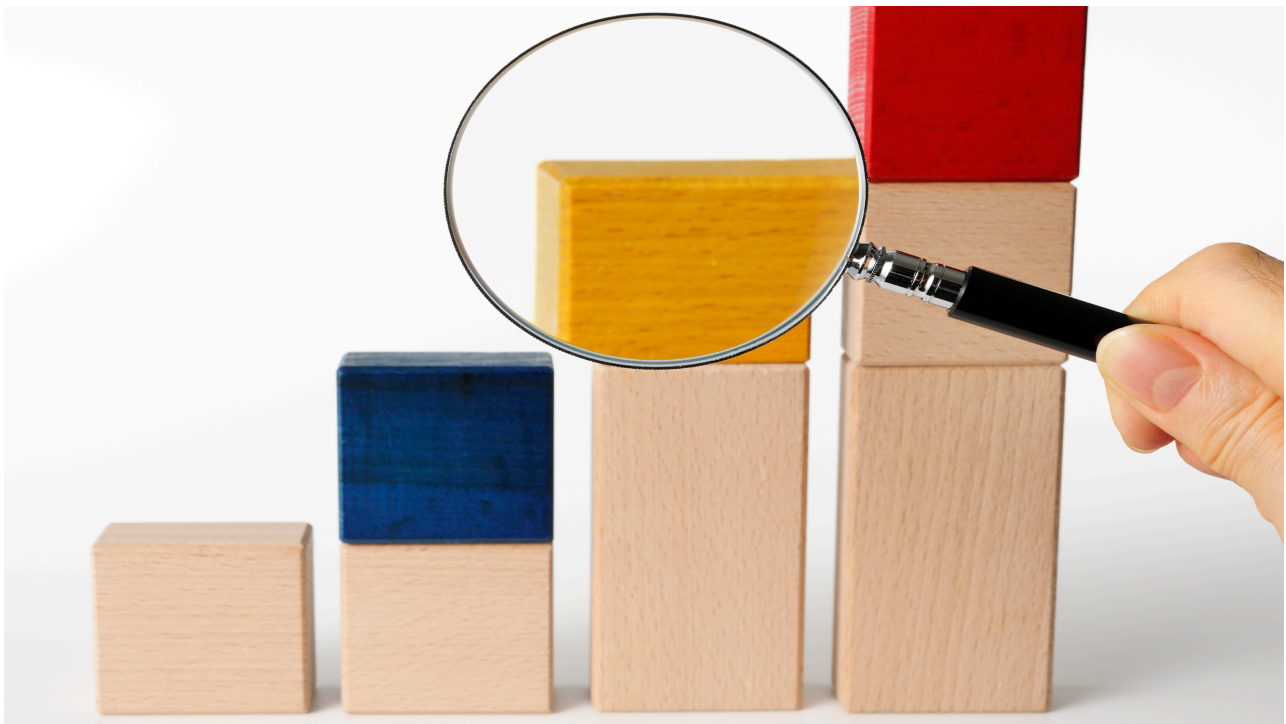


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Must have a *system*.....not a program in place



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Health



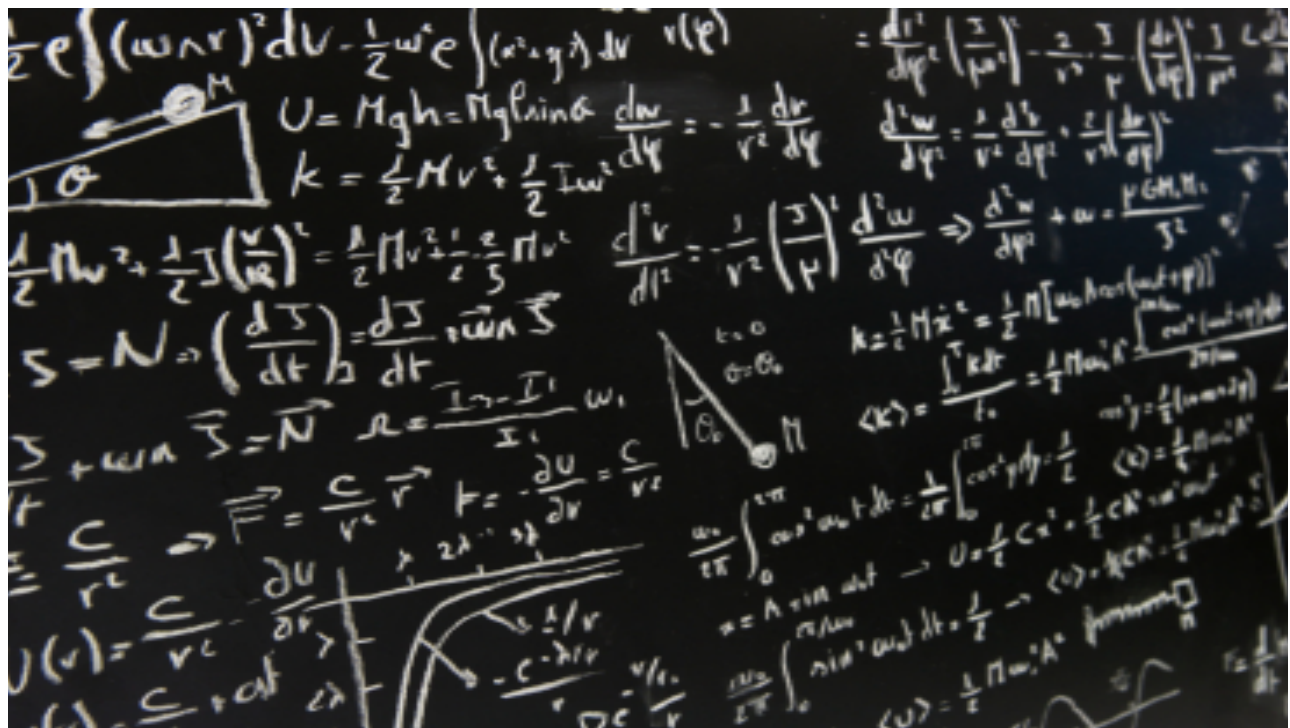
Competency







Capacity



Environment



Based on an algorithm, athletes are categorized according

-  **Substantial Deficit**
-  **Moderate Deficit**
-  **Slight Deficit**
-  **Optimal**



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## High Risk

Risk Level	N	Injured	%	RR	RR 95% CI
<b>Moderate &amp; Substantial Combined (High Risk)</b>	<b>63</b>	<b>27</b>	<b>43%</b>	<b>3.4*</b>	<b>2.0-6.0</b>



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Lehr et al 2013



move2perform The Science of Injury Prevention

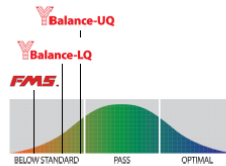
Name: Matt Kiesel	For questions about this report contact:
Date of Birth: 05/22/2002	Kyle Kiesel
Test Date: 11/18/2014	Functional Movement Systems
Report ID: G852FCCC	812.589.5826

Individual Summary Report

Matt, you have completed screening tests designed to determine your musculoskeletal status and injury potential. Injuries are difficult to predict, that's why we use only the most up-to-date, research-based tests. Because injury risk is related to multiple factors, we use the Move2Perform software to analyze your test results compared to data proven to predict injury. We combine these evidence based factors to categorize your individual performance. Here are the four categories and your results.

- Substantial Deficit
- Moderate Deficit  
Based on the research, the algorithm indicates you are more likely than your peers to lose time from your sport or activity because of an injury.
- Slight Deficit
- Optimal

Matt, you are in the MODERATE deficit category.  
Here are your results compared to other High School Baseball athletes.



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# Movement Health and Competency



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# Health and Competency

**FMS.....Don't think total score!**

**Do Think Pass/Fail!**

**Any 0 = A Movement health problem (FMS 0)**

**Any 1 = Dysfunctional movement (FMS 1)**



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33



Competency Problem  
Dysfunctional Movement

1/1 Leg Raise



1/1 Shoulder Mobility



**Think  
Mobility!**

2/3s on everything else



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Competency Problem  
Dysfunctional Movement

3/3 Leg Raise



3/3 Shoulder  
Mobility



1/2s on everything  
else



**Think  
Motor  
Control!**



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Competency Problem  
Dysfunctional Movement

Lower Quarter Y Balance Test



	Left	Right	Difference	Standard
Anterior:	63	65	2	Optimal
Posteromedial:	98	100	2	Optimal
Posterolateral:	96	95	1	Optimal
Composite:	98.5	99.6		Pass

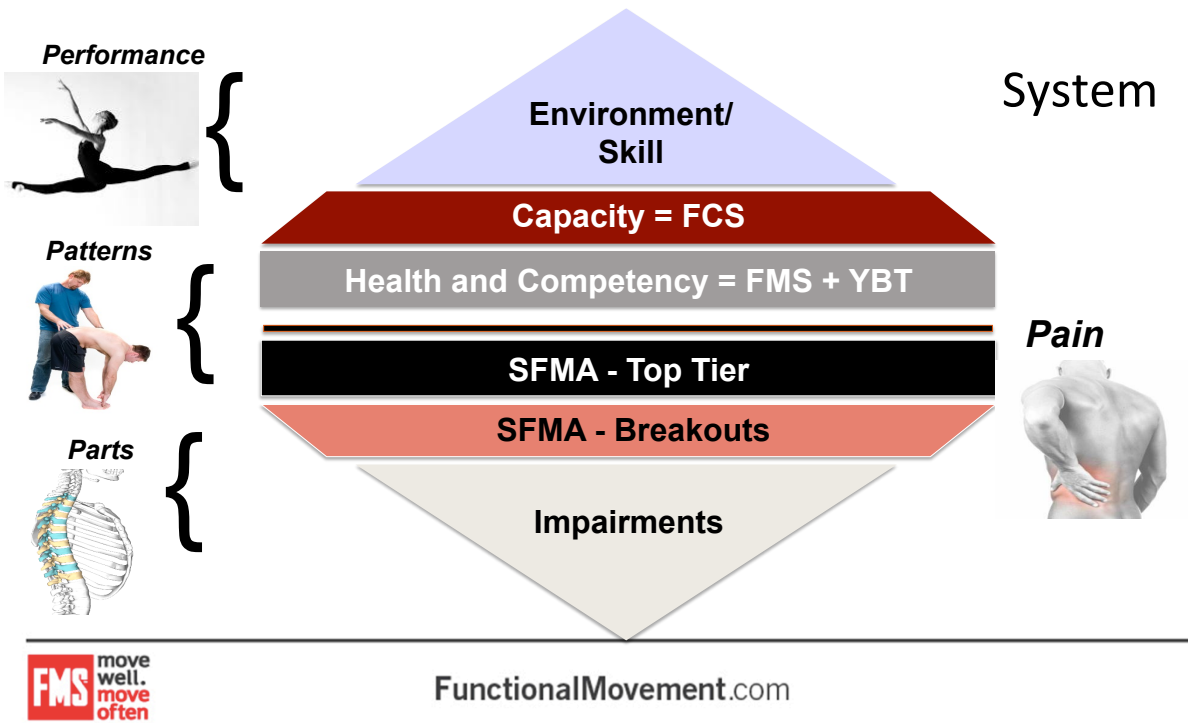


Must be interpreted relative to specific environment

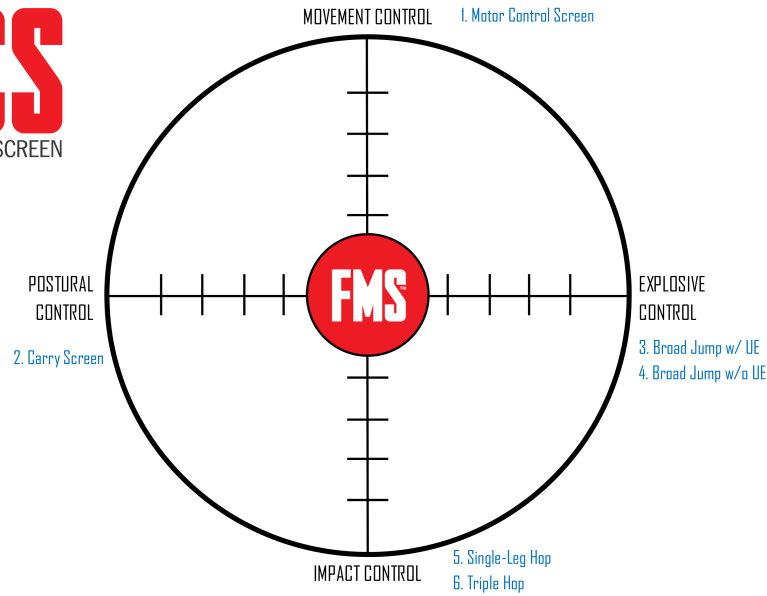


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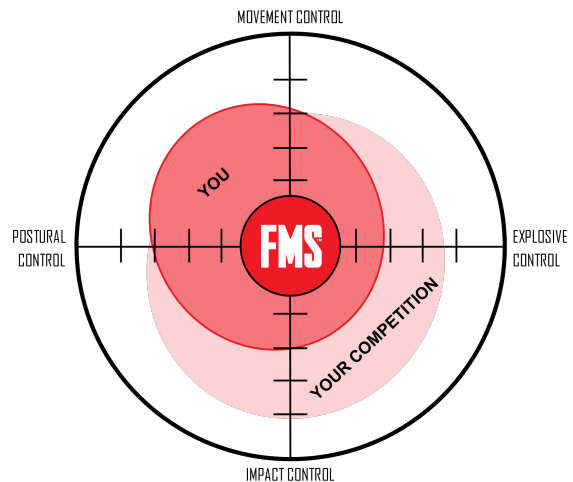
# Movement Capacity??



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## Movement Compass

- Results are plotted using the movement qualities as the four points
- It becomes easy to see a deficiency
- **Is there a sufficient base for the desired skill?**

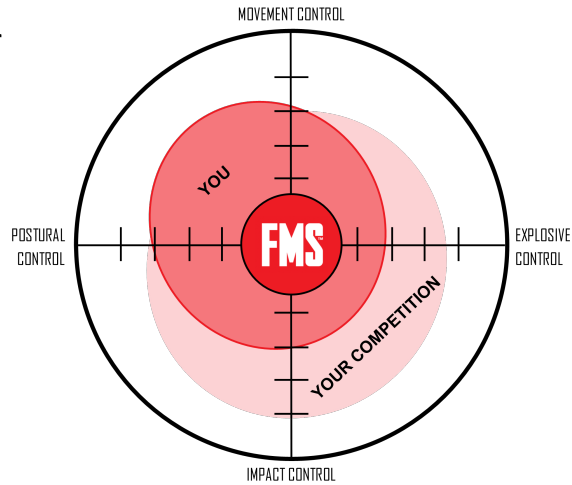


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# Movement Compass

• We can plot the movement qualities for specific groups, sports and occupations (Environments)

• Does your plot match the **minimum required resources** for the group you wish to be in?



*\*Meeting minimums is more important than single superlatives*



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## Environment Specific Patterns

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

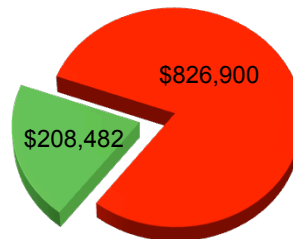
Orange County Fire Authority

■ 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



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



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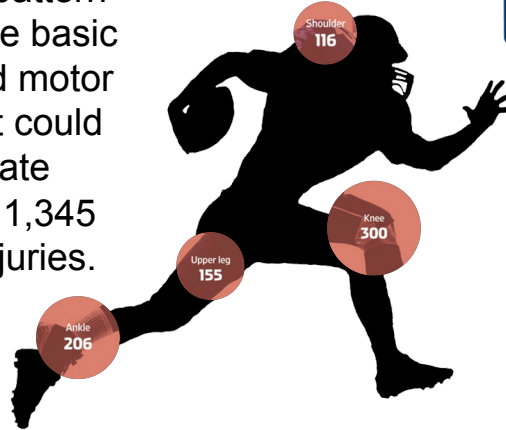


# Environment Specific Patterns



The lunge pattern confronts the basic mobility and motor control that could complicate 777 out of 1,345 of these injuries.

**58%**

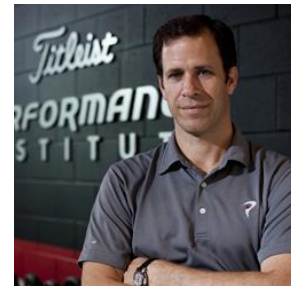


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# Environment Specific Patterns

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



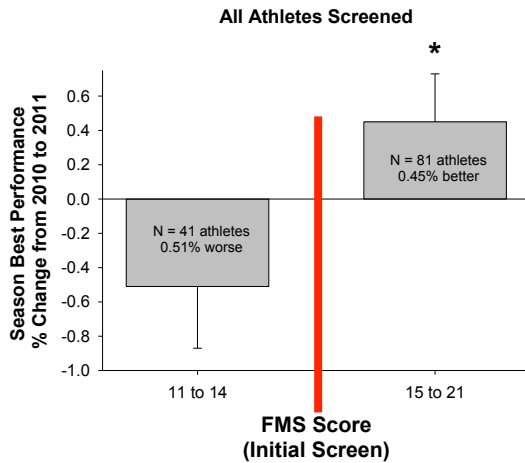
*Dr. Greg Rose*



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## Environment Specific Patterns



*“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*



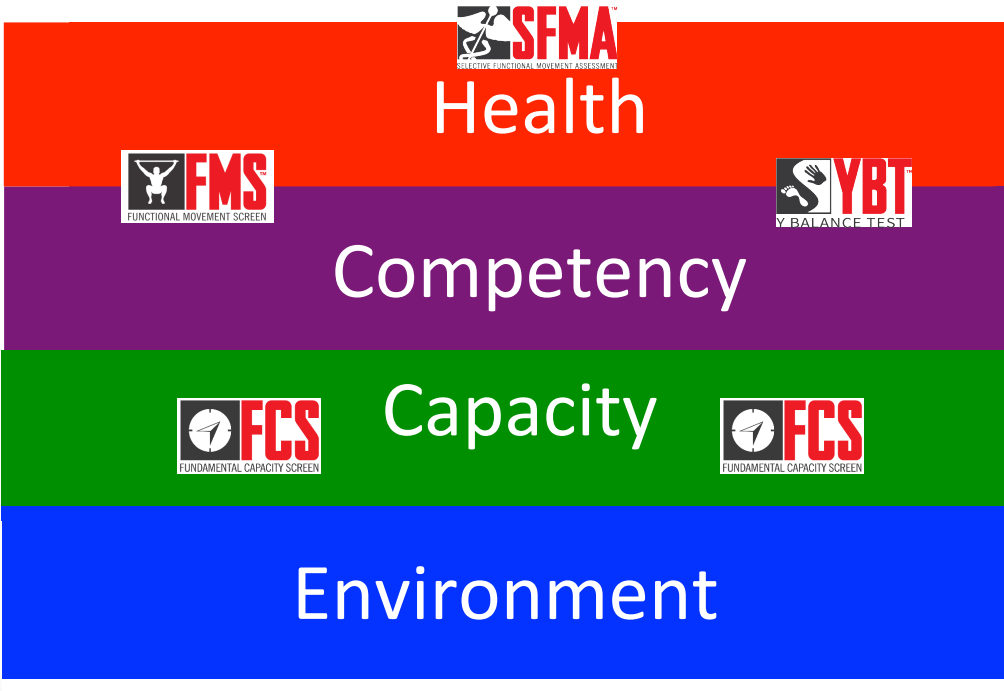
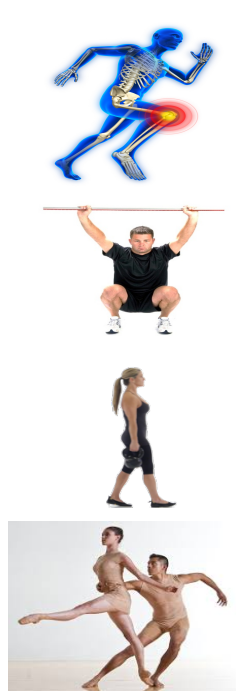
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## Environment Specific??



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**Health**

**Competency**

**Capacity**

**Environment**



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Presentation available at  
[www.functionalmovement.com](http://www.functionalmovement.com)

“Features”

**Thank you!!**



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