·C·P·S·D·A·
FUELING VICTORY

Creating a "So What" out of Performance Data

Amanda Carlson-Phillips, MS, RD, CSSD
Vice President
Collegiate and Professional Sports Dietitians Association

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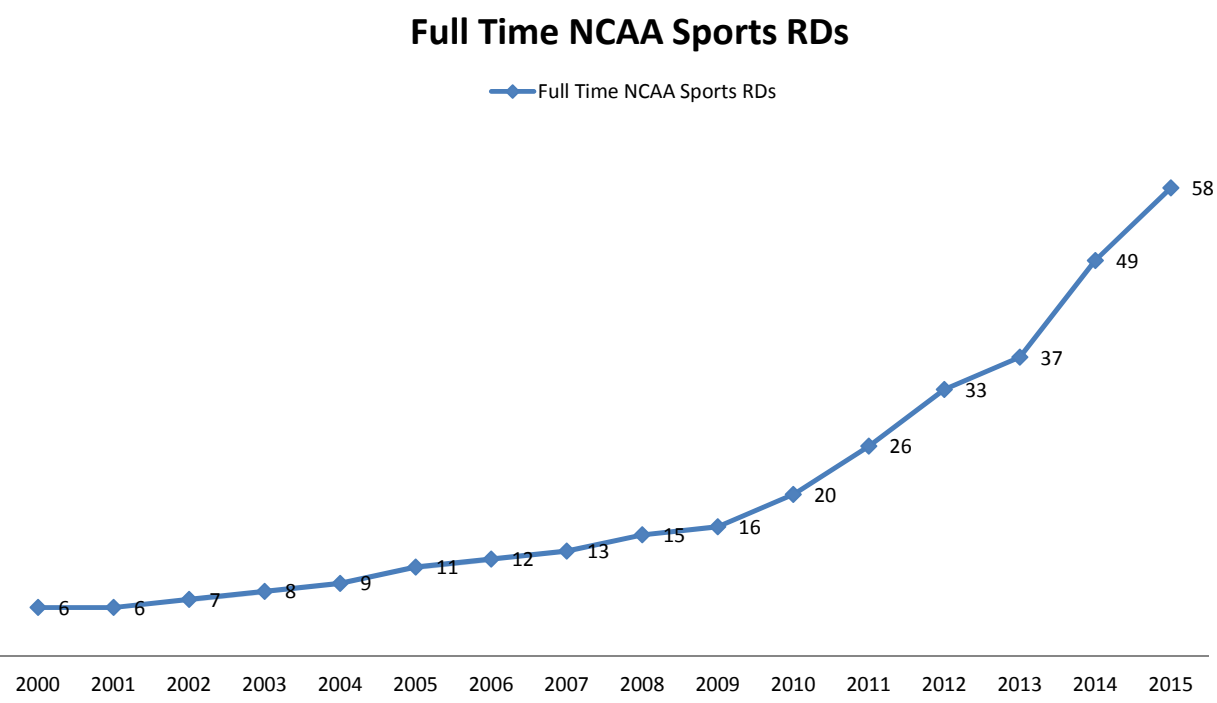
FUELING VICTORY

Creating a "So What" out of Performance Data

PROFILE	READINESS	LOAD	PERFORMANCE
Evaluations & Testing	**Cumulative Stress & Nervous System Response**	**Physical & Physiological Load Monitoring**	**Relevant Performance in sport**
The **grading** and **categorization** of an individuals current state across Mindset, Nutrition, Movement, Recovery	The balance between fitness & fatigue acting on an individual.	The cumulative stress an individual has incurred.	Resulting outcomes derived from the relevant task an athlete, office professional, or operator is measured by.
+Qualitative _behaviors + Quantitative _blood nutrient _microbiome _genome _sweat sodium content _anthropometric + Goals + Training Load	+ HRV Monitoring + Omega Wave + ANS Balance	+GPS +IMU +Heart Rate +Relative Training Loads +Cumulative Mass during strength training session	+Goals Scored +Batting Average +Shooting Percentage +Pitching Speed/Accuracy
FOUNDATIONAL PROGRAM	+ TO FOUNDATION	+ TO FOUNDATION	+ TO FOUNDATION

Funds and Staff to Support Data Insights



Impact of Deregulation

145% ↑ increase in budget

55% ↑ in athletes fed

_2013 – 2014 = $534,130.43

_2014- 2015 = $1,308,695.65

Safe Supplementation to Fill the Gaps

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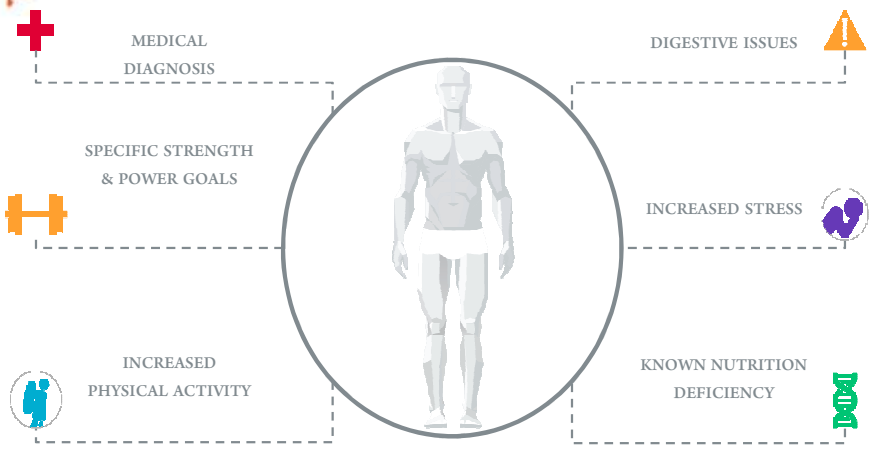

The NSF Certified For Sport Program on supplement manufacturing and sourcing process, provides key preventive measures to:

- Protect against adulteration of products
- Verify label claims against product contents
- Identify athletic banned substances in the finished product or ingredients

NSF
Certified for Sport®

2001
NSF launches a testing and certification program for dietary supplements to certify what is on the label is in the bottle and that the product does not contain harmful contaminants.

2002
NSF launches a dietary supplement GMP (good manufacturing practices) registration program.

2003
NSF develops first American National Standard for dietary

2004
NSF launches an athletic banned substances certification program (NSF Certified for Sport®), which is recognized by major sports organizations (NFL, MLB, PGA, etc.)

2016
65+ companies and over 400 products certified (protein, recovery, ergogenic aids, hydration formulas, MVI, fish oil, etc.)

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Harnessing the Potential:
Completely Integrated Sports Nutrition Programs

NOURISH	Nutritional strategy supports and propels health and performance of the body and brain
RECOVER	Resiliency created to better handle mental, physical, and metabolic stress
PREPARE	Being metabolically prepared for the upcoming task at hand
ENGAGE	The culture and environment perpetuates adoption of fueling concepts
INSPIRE	Fueling philosophy, intent and actions live beyond short term goals

What is Human Growth Hormone (hGH)?

- Protein hormone produced in the pituitary gland
  - Important role in the growth and proper functioning of the body.
  - Manages cell growth
    - Controls the size of the cells, their division, the way they release proteins, their absorption of fats and carbohydrates, and more.
  - Stimulates the liver, muscle and all other tissues.
- Recombinant HGH: made by genetically engineered bacteria, was first developed in 1981

Uses

Legal

- By prescription for clearly and narrowly defined indications.
  - In children – Treat poor growth
    - Turner's syndrome,
    - PraderWilli syndrome,
    - Chronic renal insufficiency,
    - hGH insufficiency/deficiency,
    - Children born small for gestational age, and
    - Idiopathic short stature
  - In adults:
    - Treatment of the wasting syndrome of AIDS and hGH deficiency

Illicit

- Anti-aging agent
  - Replenish declining hGH levels
- Bodybuilding
  - Reducing body fat and increasing skeletal muscle mass
- Improve athletic performance
  - Used with other PEDs like anabolic steroids
  - Recovery from injury

How is hGH taken?

- Oral Sprays
  - Ineffective: poor or no absorption
- Injections
  - About $2k per month for pharmaceutical grade
  - Online purchases – most from China - ~$150/month
    - Sold as “for research purpose only” GH releasing peptides
- Releasers/Supplements
  - Pills: claim to stimulate the pituitary gland into producing more hGH
  - Sold in health food stores
  - Very questionable effectiveness

Testing for hGH

- Very low positive test rate
- Blood test
- Isoform test has a limited window of detection
  - On the order of 24 hours
- Usually taken during the off season - athletes test negative when the tests are conducted during the season.
  - Only if the tests are introduced on no advance notice and out of competition strategy, they will be able to detect doping in athletes.

Usage Rates of Synthetic HGH

- Pro sports: Rumors of very high usage rates
- Youth:
  - 11% of high school students admit use
    - 12% of boys admit use
    - 9% of girls admit use
  - Breakdown by race
    - 15% of African American teens
    - 13% of Spanish Teens
    - 9% of Caucasian Teens
  - Almost 2 million high school kids!

Epidemic!

Partnership for Drug Free Kids, 2014

The Concept of Physical Literacy
E. Paul Roetert, Ph.D.

- History
- A re-emerging concept
- Physical Literacy in the United States

The Concept of Physical Literacy

The ability to move with competence and confidence in a wide variety of physical activities in multiple environments that benefit the healthy development of the whole person (Mandigo, Francis, Lodewyk, & Lopez, 2012)

National Standards and Grade Level Outcomes for K-12 Physical Education

- Plan curricula to produce physically literate students
- Attain and maintain a lifetime of physical activity
- Assess and track student progress across grades
- Provide framework for what students should know and be able to do

Physical Literacy is the ability, confidence, and desire to be physical active for life

- The Aspen Institute – Project Play
- Response to declining rates of physical activity

A well-rounded curriculum

- Greater focus on importance of physical education as an academic subject
- Parallels terms used in other subject areas
- Skill acquisition & focus on deliberate practice of well-designed learning tasks
- Emphasis on lifetime activities for all (physical education, sport, recreation)
- Enriched quality of life for people themselves & those around them
- Potential decrease in sedentary behavior & obesity rates

Purpose of Inter-Association Best Practices

- To assure availability and accessibility of appropriate mental health care for all student-athletes
- To create and maintain an environment within the athletics department that de-stigmatizes and promotes help seeking
- Developed with input from a range of stakeholder groups
- *Final rounds of additional review and endorsements from medical and higher education associations.*

Guideline #1

- Care should be provided by: clinical or counseling psychologist, psychiatrist, licensed clinical social worker, psychiatric mental health nurse, licensed professional counselor, primary care physicians with Certificates of Added Qualifications (CAQs) in Sports Medicine and/or competency-based training in mental health.

- Individual providing care should have both societal cultural competency and cultural competency working with collegiate athletics.

Guideline #2

- Ensure that athletic departments have clarified their procedures for referring athletes with potential mental health concerns to appropriate personnel.
  - Emergency Action Management Plan.
  - Routine Mental Health Referrals.

Guideline #3

- Implement mental health screening as part of annual pre-participation exams
  - Determine screening approach in consultation with licensed mental health professional providing mental health care to student-athletes.
  - Specify when and to whom symptomatic or at-risk student-athletes identified through this screening process will be referred.

Guideline #4

- Create a health promoting environment that supports mental well-being and resilience.
- Coaches play a central role and should be:
  - educated on signs and symptoms of mental health disorders;
  - trained in empathic response;
  - encouraged to create a positive team culture;
  - advised of department referral protocols.

Making Physical Activity a Vital Sign

Joint Commission on Sports Medicine and Science
2016 Annual Meeting
February 12, 2016
Anaheim, California

Children and Adolescents

Strong Evidence

- Improved cardiorespiratpry and muscular fitness
- Improved bone health
- Improved cardiovascular and metabolic health biomarkers
- Favorable body composition

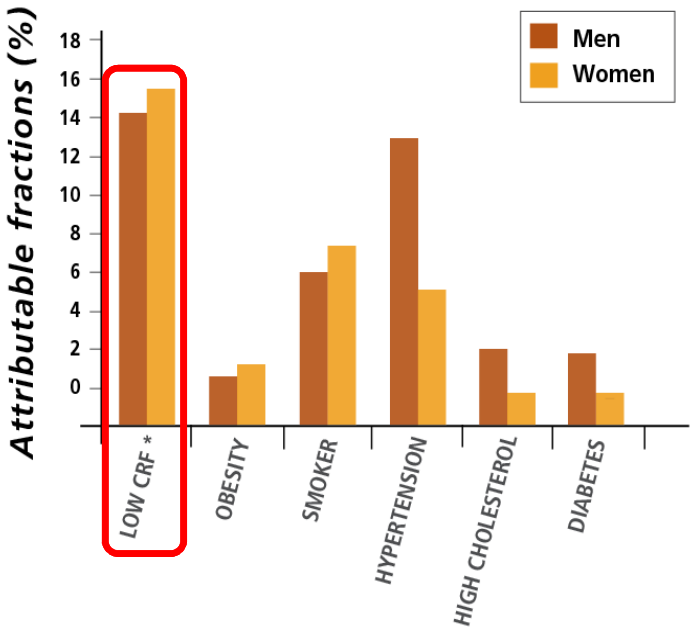
Adults & Older Adults

Strong Evidence

- Lower risk of early death
- Lower risk of coronary artery disease
- Lower risk of stroke
- Lower risk of high blood pressure
- Lower adverse blood lipid profile
- Lower risk of type II diabetes
- Lower risk of metabolic syndrome
- Lower risk of colon cancer
- Lower risk of breast cancer
- Prevention of weight gain
- Weight loss (combined with diet)
- Improved fitness
- Prevention of falls
- Reduced depression
- Better cognitive function

Making Physical Activity a Vital Sign

- Temperature
- Pulse
- Blood pressure
- Weight
- Height
- Respiratory rate
- Oxygen saturation
- Pain
- Tobacco use
- **Physical activity**



Blair SN; *Br J Sports Med.* 2009;43(1):1-2.

Intermountain Healthcare

HEALTHCARE STRATEGY 1

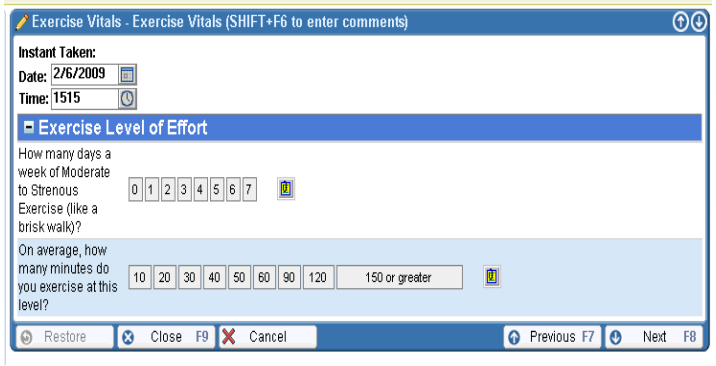
Make physical activity a patient "vital sign" that all healthcare providers assess and discuss with their patients

Your Prescription for Health
ExeRcise is Medicine™
www.ExerciseIsMedicine.org

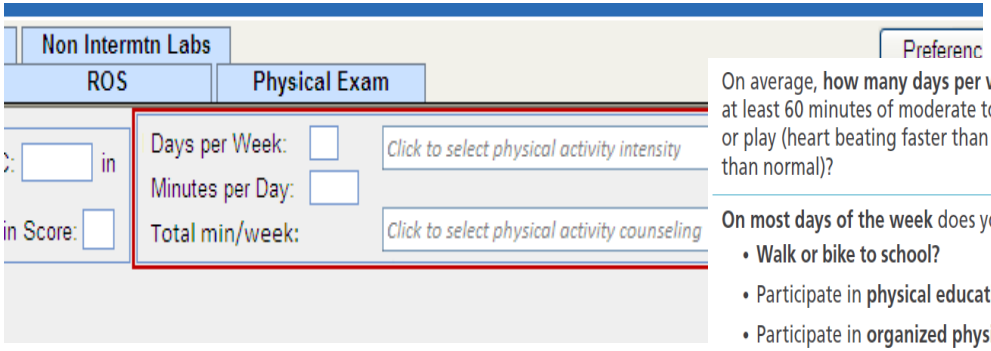
Calling on all health care providers to assess and review every patient's physical activity program at every visit.

Intermountain Healthcare

Kaiser Permanente – Exercise Vital Sign



Intermountain Healthcare– Physical Activity Vital Sign



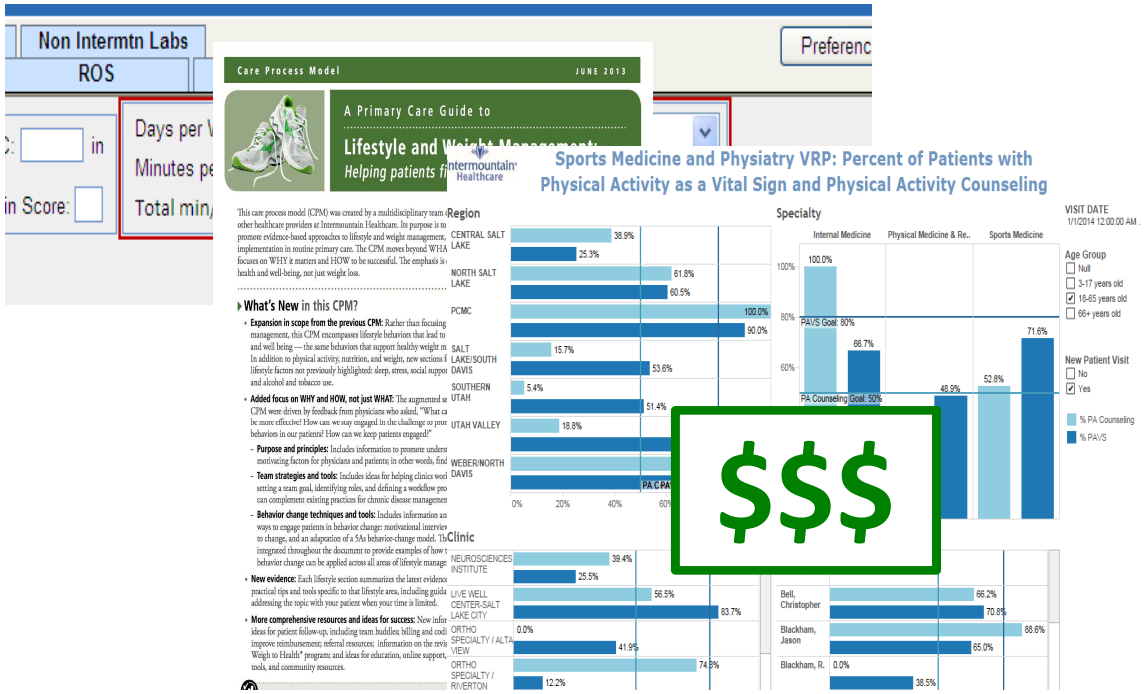
On average, **how many days per week** does your child get at least 60 minutes of moderate to vigorous physical activity or play (heart beating faster than normal, breathing harder than normal)? days per week: _____

On most days of the week does your child:

- **Walk or bike to school?** ☐ yes ☐ no
- Participate in **physical education class** at school? ☐ yes ☐ no
- Participate in **organized physical activity** (sports, dance, martial arts, etc.) or spend 30 minutes or more **playing outside** not during school hours? ☐ yes ☐ no
- Have LESS than 2 hours of recreational screen time (video games, TV, Internet, phone, etc.)? ☐ yes ☐ no

Intermountain Healthcare

Intermountain Experience



J Phys Act Health. 2015 Oct 7. [Epub ahead of print]

Predictive Validity of an Adult Physical Activity "Vital Sign" Recorded in Electronic Health Records.

Ball TJ[1], Joy EA, Gren LH, Cunningham R, Shaw JM.

Reaction Time Field Test

Elizabeth Moos, Ben Jelinek, Cailin Timm, Grace Edgar, Tim Stark

Northwestern Health Sciences University, Bloomington, Minnesota USA.

Presented by Ted Forcum, DC, DACBSP on behalf of **Ben Jelinek**

Northwestern Health Sciences University

Introduction

- Sports-related concussions have been gaining interest in the sports medicine community
- Consensus statement from the 4th International Conference on Concussion lists five clinical domains of a concussion, with reaction time (RT) included in the cognitive domain
- RT has been shown to be one of the most sensitive measures of neurocognitive change following injury (Erlanger et al 2001)
- Deficits in RT have been shown to persist longer than symptoms (Makdissi et al 2010)
- To date, a low-cost field test has been introduced but not yet fully developed and tested.

Northwestern Health Sciences University

Purpose

- Ekner et al introduced a simple RT test with a meter stick. He shows the methods to be sensitive to the effects of concussion (79% sensitivity, 62% specificity)(2014), with test-retest reliability similar to those found with computer based testing (2011)
- MacDonald et al subsequently found there to be marginal test-retest reliability and poor validity when compared to CBT (2015)
  - Moos, et.al. discovered a weakness to the MacDonald study (via their testing videos) that blinking at the wrong time resulted in significant delay in measurable reaction.
- Moos et.al. suggests modifying methods include raising the hand to eye level, using a 12” ruler rather than meter stick, and inserting the cue “do not blink during the trial” before beginning.

Eckner et al

Modified

Results

Demographic Data

Participants (Male/Female)	Age Mean ± SD, y	Handedness (Right/Left)	Past TBI	Past Whiplash	Weight Mean ± SD, lbs	BMI ± SD
175 (105/67) 3 missing	31.6o ± 12.14 6 missing	163/10 2 missing	35/175	32/175	176.03±36.43 18 Missing	25.59±3.76 16 Missing

Self Reported Data

	Hours of sleep	Restfulness (out of 10)	Stress (out of 10)
N	170	174	173
Missing	5	1	2
Mean	6.50	5.46	6.05
Std. Deviation	1.07	2.00	1.99
Minimum	3.5	.00	1.00
Maximum	9.0	10.00	10.00

Results

- The results indicate that Trial 1 Reaction Time is significantly slower than Trial 2, 3, and average RT ($p < .002$), suggesting a practice trial may be needed in order to reduce the inclusion of a learning effect.
- Regression analysis showed that when Age, Weight, BMI, Hours of Sleep, Restfulness, and Stress are considered, **Age** and **Stress** were found to be significantly affecting the Average RT ($p < .01$)
  - Higher age and higher stress level resulted in a higher reaction time (poorer performance on the test)
- After the initial performance of the study, the data collected will be used to help determine if the test-retest reliability of Eckner et al's study can be improved using our methods
- Tips For Best Practices
  - Allow the Athlete a practice trial
  - Cue the athlete to "not blink" prior to the trial
  - Establish the athlete's perceived level of stress

Slide 30

---

1 Doesn't make sense. Re-wrod please.

-tstark
-
, 5/5/2016

SMART System:
Industrial Injury Management; Sports Medicine Model

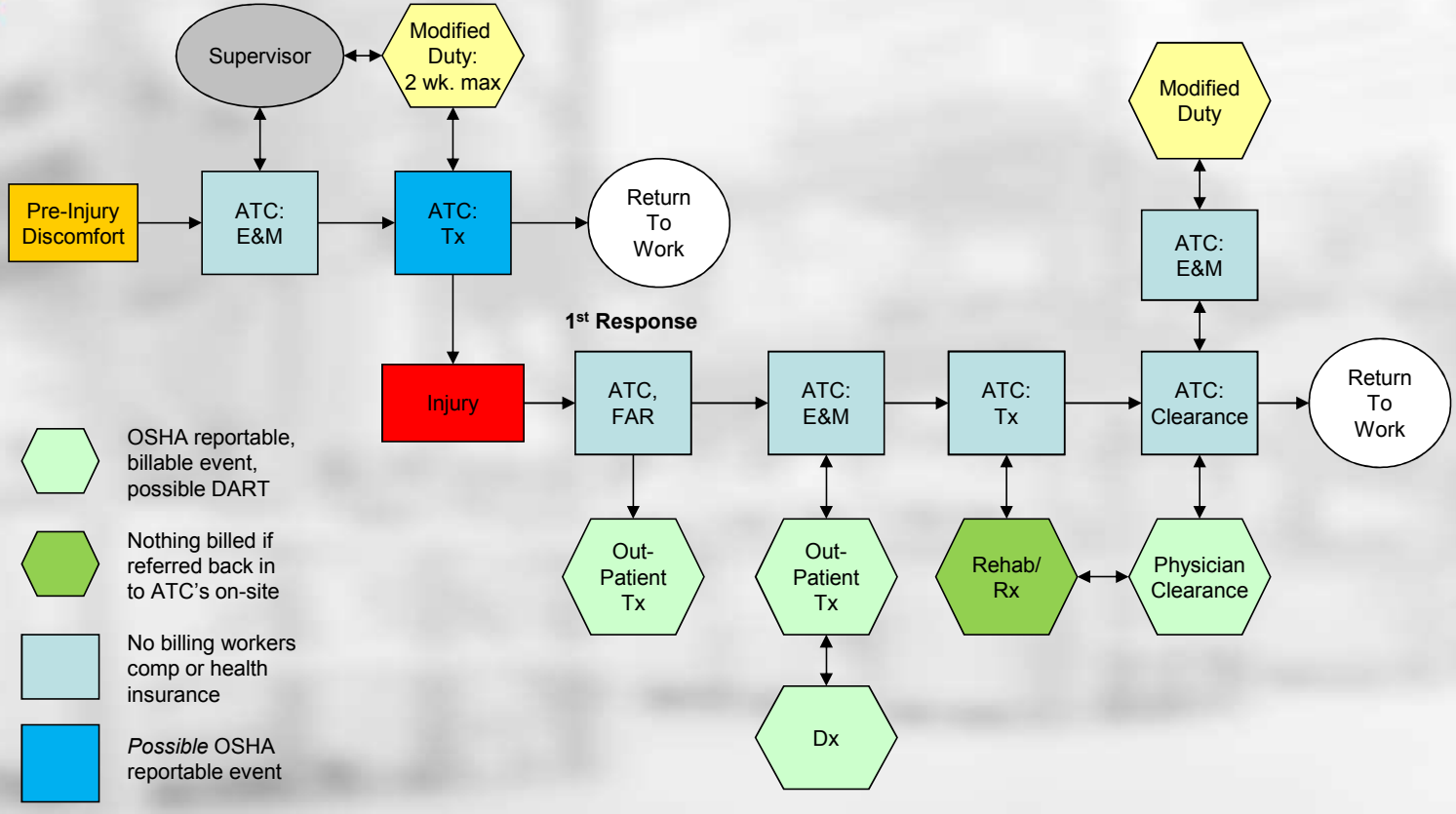
L/ATC w/ added certifications in:

- First aid/CPR/AED/BBP Instructor (ARC)
- Certified Ergonomic Assessment Spec
- NSCA CSCS

Under direction of AOASM, AMSSM primary care sports medicine physician

TIA, Inc. - Sports Medicine, Athletic Rehabilitation & Training (SMART)

Injury Management System



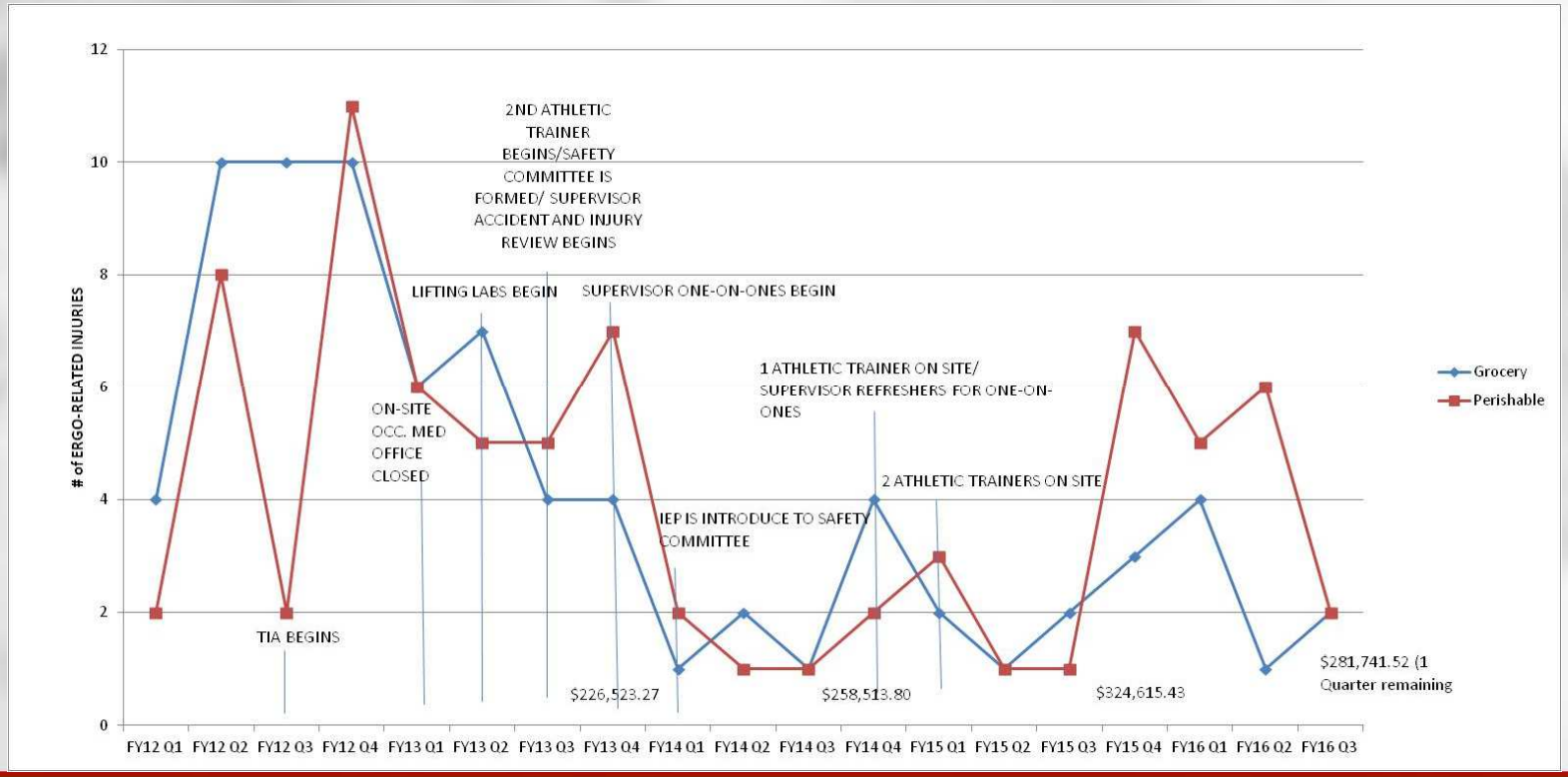
ATC = Certified Athletic Trainer **FAR** = First Aid Rep **E&M** = Evaluation & Management

Rehab = Physical Rehabilitation **Tx** = Treatment **Dx** = Diagnostic

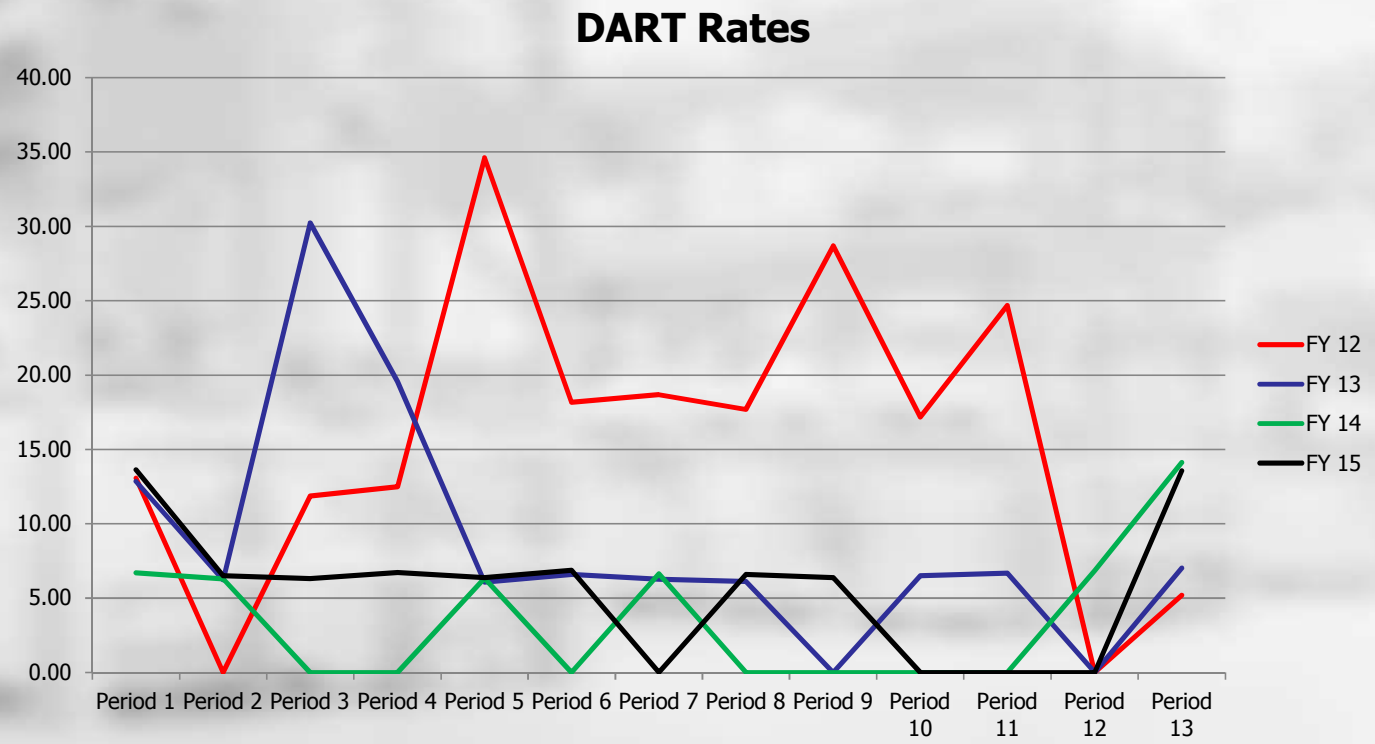
Rx = Prescription Medication

Research & Education

Milestones and Impact



Research & Education



Research & Education

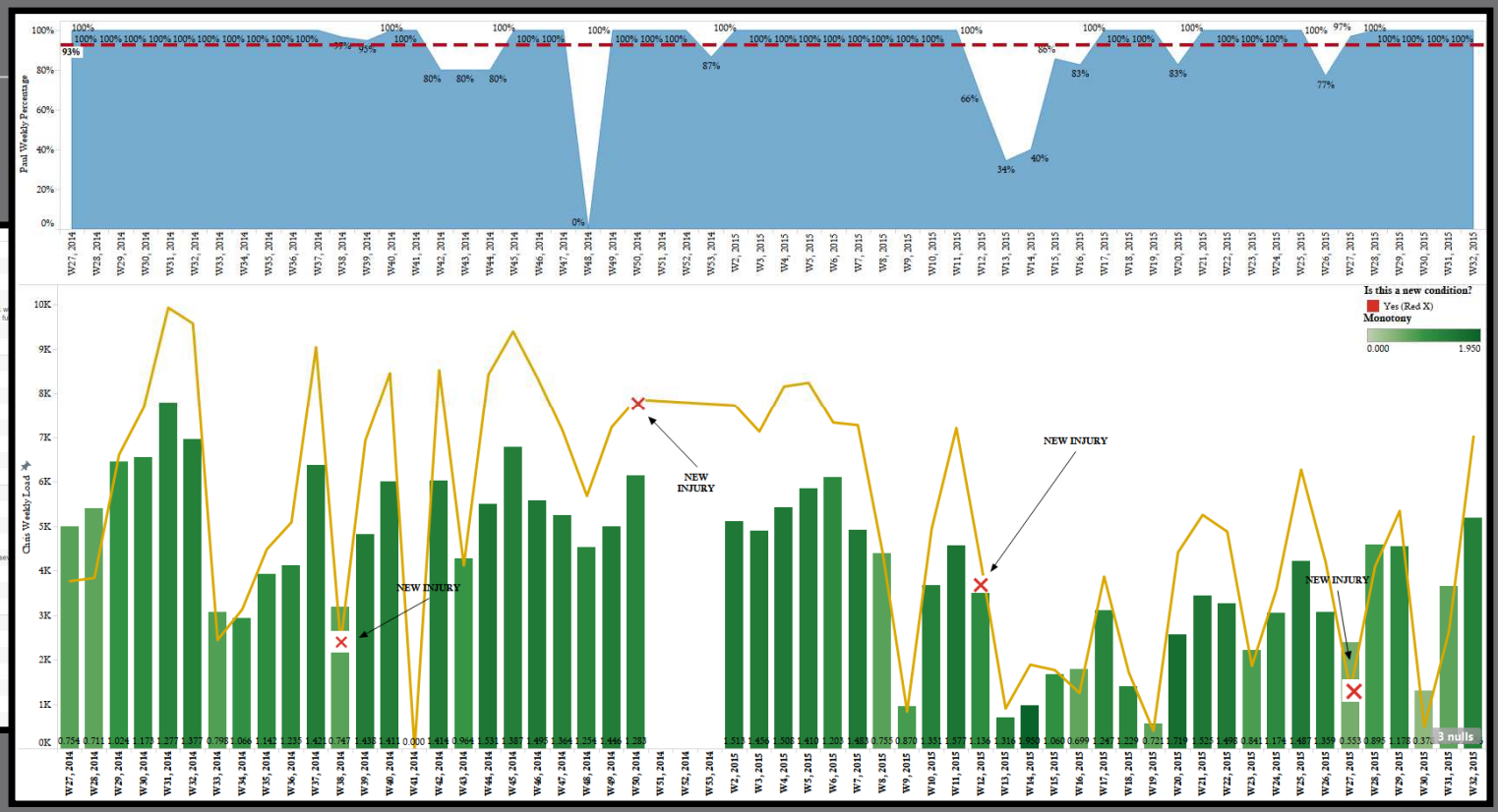
Additional Information

- Return on Investment:
  - >2:1 based on on-site Tx cost vs. outside referral billed against their workers comp (direct W/C cost only)
  - >8:1 based on NSC formula for total comp-related costs (direct + indirect where indirect = 3x direct; Total W/C = direct x 4)
- Program Expansion:

  3 months into 1 yr. regional pilot with mobile L/ATC traveling between 10 stores; potential to expand to 8 more regions, reaching 2,500 store employees

TRAINING MONITORING FOR INJURY PREVENTION

Obsdate	Month, Day, ..	Name	
2014 W39	September 22, 2014	Cleared for Practice or competition?	Yes (100%)
		Injury occurred in	Practice
		Mechanism of Injury	Non-Contact acute
		Plan Comments	1) rest for 4 additional days (for total of 7) 2) ice 3x daily 3) light soft tissue work w resumption of activity 5) begin return to training with slow movements first, then fu
		Type of Injury	strain/muscle rupture/tear
		Yes (Red X)	Yes
2014 W53	December 29, 2014	Cleared for Practice or competition?	Modified
		Injured body part	wrist
		Injury occurred in	Practice
		Mechanism of Injury	Overuse
		Plan Comments	MRI to be performed Friday, management plan to follow
		Treatment Time (min)	30
		Type of Injury	stress fracture (overuse)
		Yes (Red X)	Yes
2015 W12	March 21, 2015	Injured body part	abdomen
		Injury occurred in	Practice
		Insurance Claim Filed	No
		Mechanism of Injury	Non-Contact acute
		Plan Comments	Naprosyn 500 mg po BID,m anual therapy, and diagnosti US on site to assess se
		Treatment Time (min)	20
		Type of Injury	sprain (injuryof joint &/or ligaments)
		Yes (Red X)	Yes
2015 W27	July 1, 2015	A&PCLEARSPRT	No (0%)
		Injured body part	wrist
		Injury occurred in	Practice
		Mechanism of Injury	Non-Contact acute
		Plan Comments	referral to hand specialist Larsen MD
		Treatment Time (min)	60
		Type of Injury	contusion/haematoma/bruise



Population Specific Odds for Injury

Metric	Cut Score Value	Mean	Odds Ratio	Lower 90% (CI)	Upper 90% (CI)
P 6-12 Week Minutes	6080	4361	6.5	1.6	26.7
P 6 Load	29091	21794	3.7	1.1	12.6
P 6-12 Load	39110	23521	6.6	1.0	42.5
Weekly Monotony	1.494	1.155	3.1	0.9	10.1
Weekly Load	4212	3763	3.6	0.9	13.9
P 6 Strain	25854	29065	4.7	0.8	27.8
Weekly Minutes	880	725	2.6	0.8	8.7
Weekly Strain	7518	5043	2.3	0.7	7.8
P 6 Monotony	1.110	1.138	3.8	0.7	22.5
P 6 Minutes	5440	4148	2.0	0.5	7.9
P 6-12 Monotony	1.420	1.131	2.0	0.5	7.7
P 6-12 Strain	44554	30111	2.0	0.3	12.0

Youth Olympic Games Injury Monitoring

Table 1 Time loss injury characteristics (location, type, cause) stratified by sport

	Athletics (n=17)	Boxing (n=4)	Basketball (n=4)	Gymnastics (n=4)	Rowing (n=4)	Rugby (n=24)	Swimming (n=8)	All (n=94)
Number of injuries	2	1	1	1	1	7	1	14
Injury location								
Ankle	-	-	1	-	-	2	-	3
Foot/toe	1	-	-	-	-	-	-	1
Groin	-	-	-	-	-	-	1	1
Head	-	1	-	-	-	1	-	2
bone injuries)								
Lesion of meniscus or cartilage	-	-	-	-	-	2	-	2
Sprain (dislocation, subluxation, ligamentous rupture)	-	-	1	-	1	4	-	6
Strain (muscle rupture, tear)	1	-	-	-	-	-	1	2

Table 3: Injury, Illness, and Number of Medical Encounters at Youth Olympic Level Mass Sporting Events

Event	Injury (per 1000 athletes)	Illness (per 1000 athletes)	Medical Encounters (per athlete)
2010 Summer YOG Singapore (IOC)[12]	-	-	0.29
2012 Winter YOG- Innsbruck (IOC)[16]	108.7	84.2	-
2013 European Youth Olympic Festival[15]	91.1	20.2	-
2014 Summer YOG-Nanjing (IOC)[13]	207.1	-	0.27
2014 Summer YOG-Nanjing (USA only)	425.5^	212.7	3.7
^= combines Team USA injury and complaint data to be consistent with previous definitions of injury			

NANJING 2014 YOUTH OLYMPIC GAMES

YOG DNA

BASELINE MSK US EVALUATION OF ELITE SWIMMERS SHOULDERS

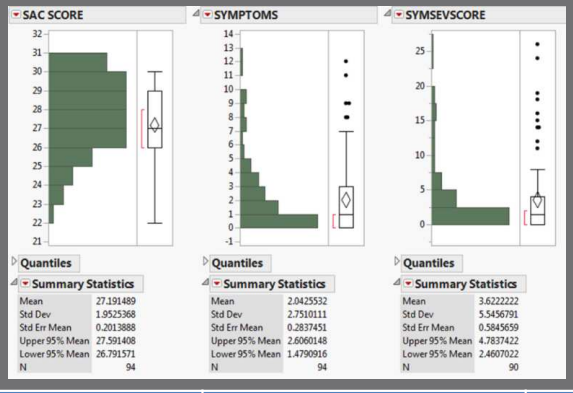
Previous studies by the USOC and USA Swimming have shown that elite swimmers have a high number of asymptomatic positive shoulder imaging findings. In fact, over several years of ultrasound screening of elite swimmers, 100% of elite swimmers have at least one "abnormal" finding.

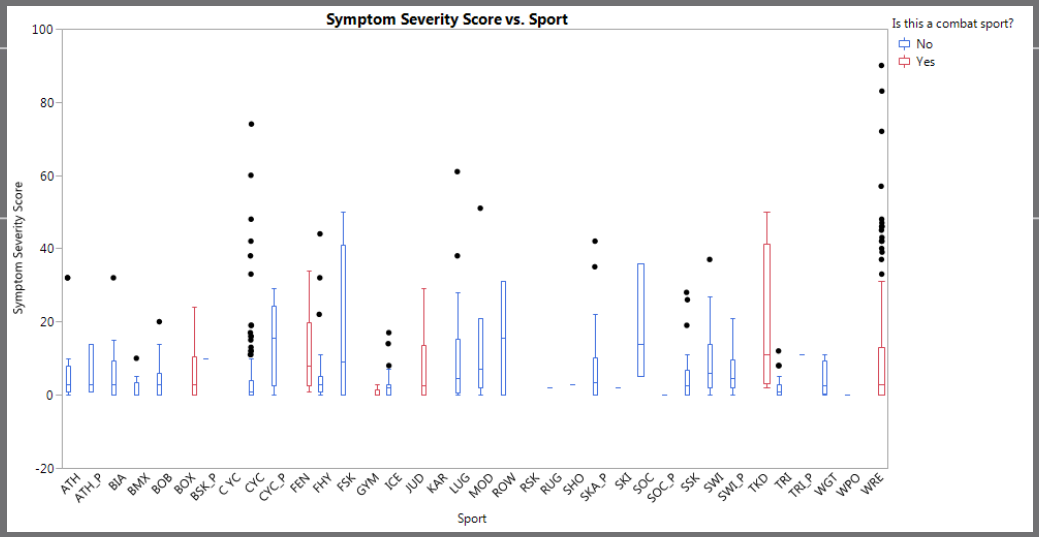
Baseline imaging helps create a better understanding of what defines "normal" anatomy in an elite swimmer and allows for creation of future normative databases. When reviewing the data below, it is important to remember that none of the athletes screened had symptomatic shoulders at the time of screening and the results are not indicative of pathology.

Anatomy	Number of Positive Findings/ Total # Shoulders	Percentage With Positive Imaging Findings
Bicep Tendon	32 out of 36	89%
Suprapinatus	36 out of 36	100%
Infraspinatus	29 out of 36	81%
Subscapularis	33 out of 36	92%
Bursal	17 out of 36	47%
AC Joint	29 out of 36	81%
Posterior Recess	21 out of 36	58%
Lateral Subacromial Impingement	15 out of 36	42%
Anterior Subcoracoid Impingement	4 out of 36	11%

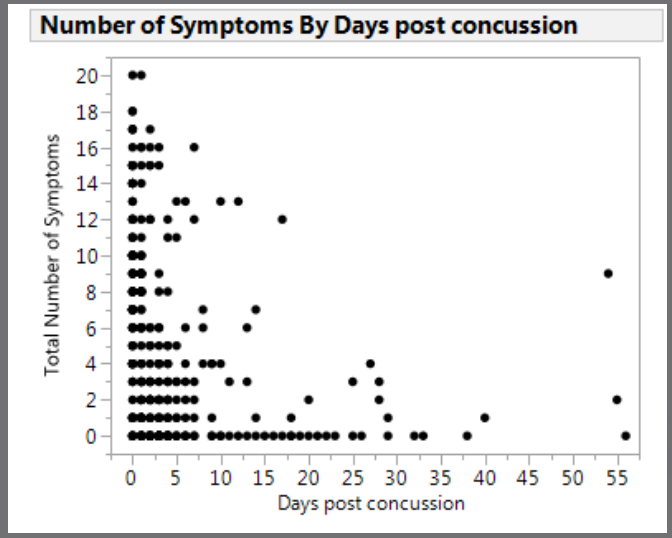
CONCUSSION RESEARCH

Baseline SCAT 3 Scores





SAC Score	Symptoms	Symptom Severity Score
27.2 (95% CI 26.8-27.6)	2.0 (95%CI 1.5-2.6)	3.6 (95% CI 2.5-4.8)



UNITED STATES OLYMPIC COMMITTEE

OVERTRAINING SYNDROME

"RUNNING ON EMPTY" • OUTSIDE MAGAZINE • JULY 2015

A "sport-specific" decrease in performance together with disturbances in mood state. This underperformance persists despite a period of recovery lasting several weeks or months.

A mysterious training condition that "afflicts endurance athletes training at the outer edges of human performance"

"It was like my body was just shut down" – Mike Wolfe, ultrarunner

Presented by Kelly Lange DC CCSP / President – ACA Sports Council / JCSMS • Anaheim • February 2016

OTS - SYMPTOMS

"OTS is one of the scariest things I've ever seen in my 30 plus years of working with athletes," says David Nieman, former vice president of the American College of Sports Medicine. "To watch someone go from that degree of proficiency to a shell of their former self is unbelievably painful and frustrating."

- Anemia
- Generalized fatigue
- Hypothyroidism
- Hyperthyroidism
- Loss of appetite
- Heart arrhythmia
- Headaches
- Chronic dehydration
- Hypoglycemia
- Sudden weight loss
- Listlessness
- Lymphedema
- Muscle pains
- Decrease libido
- Brain fog
- numbness
- Stale legs
- Insomnia
- Anxiety
- Respiratory illness
- depression

* lack of ability

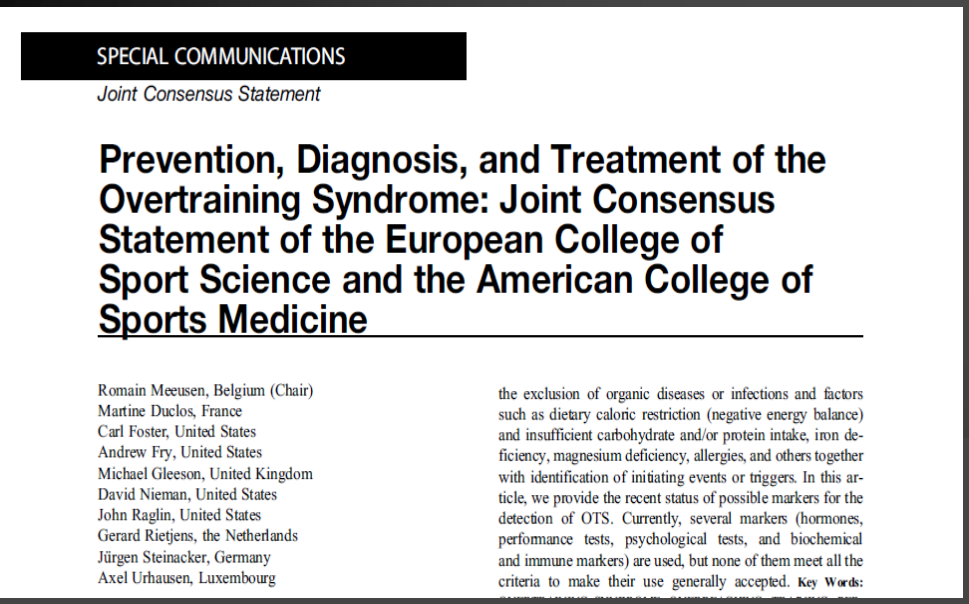
* "sudden, almost overnight disappearance of runners elite endurance talent"

OTS – PATHOPHYSIOLOGY & TESTING

- Multi-factorial
- High percentage (85%) starts with infection
- Glycogen depletion
- Overactive parasympathetic response
- Testing includes
  - Blood work
  - Brain scans
  - Heart screenings
  - Cortisol checks
  - Etc.

DIAGNOSIS OF EXCLUSION

RESEARCH



SPECIAL COMMUNICATIONS

Joint Consensus Statement

Prevention, Diagnosis, and Treatment of the Overtraining Syndrome: Joint Consensus Statement of the European College of Sport Science and the American College of Sports Medicine

Romain Meeusen, Belgium (Chair)
Martine Duclos, France
Carl Foster, United States
Andrew Fry, United States
Michael Gleeson, United Kingdom
David Nieman, United States
John Raglin, United States
Gerard Rietjens, the Netherlands
Jürgen Steinacker, Germany
Axel Urhausen, Luxembourg

the exclusion of organic diseases or infections and factors such as dietary caloric restriction (negative energy balance) and insufficient carbohydrate and/or protein intake, iron deficiency, magnesium deficiency, allergies, and others together with identification of initiating events or triggers. In this article, we provide the recent status of possible markers for the detection of OTS. Currently, several markers (hormones, performance tests, psychological tests, and biochemical and immune markers) are used, but none of them meet all the criteria to make their use generally accepted. **Key Words:**

0195-9131/13/4501-0186/0
MEDICINE & SCIENCE IN SPORTS & EXERCISE®

DOI: 10.1249/MSS.0b013e318279a10a

- Earliest mention in 1909 book *Exercise in Education and Medicine*
- Timothy Noakes wrote about it in *The Lore of Running*, 1985
- 2012 in *Sports Health*
- Dr. Tracy Hoeg, physiotherapist & ultrarunner, working on original research at this time with poster due out in Feb 2016

- Most of the available data is **anectodal**

OTS – WHY ULTRARUNNERS?

- Many athletes experience overtraining – but they RECOVER with downtime & emerging ultrarunning world leaves little time for recovery
- No coaches or teams – lack of infrastructure
- No governing body
- Not much science
- No SOP – for how to train or how to treat them
- Tough to research – evidence is mostly anectodal
- They may look "normal" with testing/examination
- No consensus on the defining markers
- Psychological & physical stress of endurance sports

Alex Kor, DPM, MS
Johns Hopkins Department of Orthopaedic Surgery
Johns Hopkins Bayview Medical Center
President, American Academy of Podiatric Sports Med.
Diplomate, American Board of Podiatric Surgery

JCSMS Lightning Round: 5 Minutes/ 5 Slides
Anaheim. CA

“Tennis Injuries of the Lower Extremity: Changes in the Game”

JOHNS HOPKINS MEDICINE

“Tennis Injuries of the Lower Extremity: Changes in the Game”

JOHNS HOPKINS MEDICINE

1. According to a paper in the British Journal of Sports Medicine in 2006, ankle sprains accounted for 20- 25 % of all acute injuries on a tennis court.
2. According to a May 2014 article in Clin J Sports Med, the most commonly injured body regions were the lower extremities (42.2%) and upper extremities (26.7%). Sprains or strains (44.1%) were the most common type of injury. The number of tennis-related injuries decreased by 41.4% during the years 1990 to 2011, and the tennis-related injury rates decreased by more than 45% during the study period.

“Tennis Injuries of the Lower Extremity: Changes in the Game”

JOHNS HOPKINS MEDICINE

These injuries to Serena Williams, Kim Clijsters and David Nalbandian are even less common.

As a tennis playing podiatrist, I have noticed changes to the game of tennis in the last 5 – 10 years that may affect these statistics.

1. “Tennis players are bigger, stronger, and more athletic.” from WSA, 2006, 12 4:12-14.
2. “..The strategy of the game has changed. Less serve and volley play and longer rallies involving more side-side movement of players..” from personal communication with Allan Grossman, DPM , USTA Sports Science Committee.

“Tennis Injuries of the Lower Extremity: Changes in the Game”

JOHNS HOPKINS MEDICINE

3. According to Grossman, 70 – 80 % of the baseline strokes are forehands and fewer than 30 % are backhands.

4. Perhaps, the biggest change in the last 5 – 10 years is the use of sliding on a hard court. Traditionally, sliding on clay courts has been commonplace. But as the game has become more athletic, faster, quicker, the tennis player has less reaction time to get to the ball and hit the shot. Thus, the use of sliding on hard courts is now a necessary skill at the elite level.

“Tennis Injuries of the Lower Extremity: Changes in the Game”

JOHNS HOPKINS MEDICINE

Question for discussion/ research: Will these recent changes to the game affect the incidence and variety of lower extremity injuries?

One can hypothesize that:

#1. The trend in less injuries will likely change.

#2. Due the increased emphasis on side to side play, there will be an increase in more soft tissue overuse conditions.

#3. The effect of sliding on a hard court will likely cause more acute injuries and may be dependent on the advances of shoegear technology (which has not been as innovative as the running shoegear technology).

This year you will proudly see KT Tape on our 2016 Olympians

Most people first noticed colored kinesiology tape during the 2008 Olympics.

Ted Forcum, DC, DACBSP on behalf of KT Tape

HOW IS KT TAPE DIFFERENT THEN OTHER KINESIOLOGY TAPES

10" pre-cut and Edema Pre-cut

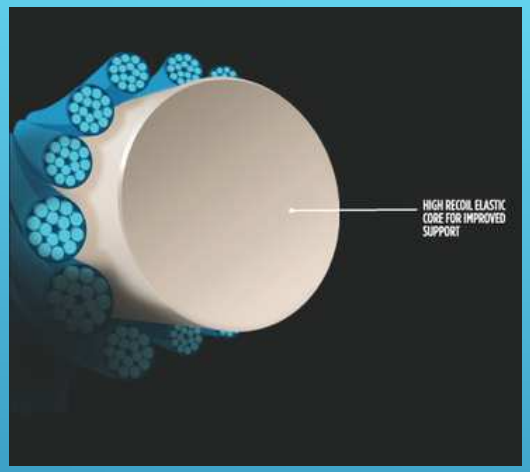
- time is money
- easy

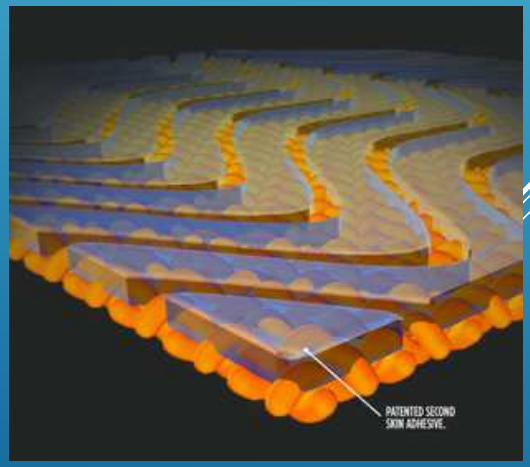
Synthetic vs Cotton

- Lasts longer
- Reduced drag in water
- Reduced weight with sweat
- Reduced drag with clothing
- Reflective safety

KT TAPE's unique Matrix Mesh also allows for moisture release which is critical for comfort and wear-ability. The more porous the tape's weave, the better it releases moisture caused by sweating or being worn in the water. The design provides more breathability and release of moisture so that it is comfortable to wear for up to five days at a time without itching, irritation or reactions with the skin.

KT TAPE is made up of reinforced 100% cotton sheathes (ORIGINAL) or specially engineered, ultra-durable synthetic fabric (PRO) designed to provide durability and increased strength. These materials provide uni-directional elasticity- allowing the tape to stretch in length but preventing the tape from stretching in width. These fibers are made to provide stable support without restricting motion.





PLACEBO?

Man Ther. 2015 Feb;20(1):130-3. doi: 10.1016 J.math. 2014.07.013. Epub 2014 Aug 6. **Kinesiology tape does not facilitate muscle performance: A deceptive controlled trial.** Poon KY[1], Li SM[1], Roper MG[1], Wong MK[1], Wong O[2], Cheung RT[3].

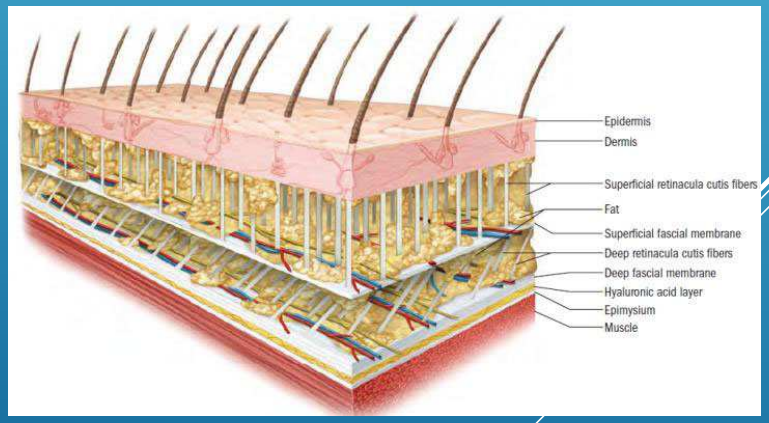
Tape applied to quadriceps of healthy blindfolded subjects

Healthy subjects are not going to be made more healthy unless that are placed in unhealthy or fatigued situation.

NSAIDS will not make a pain free person feel less pain.

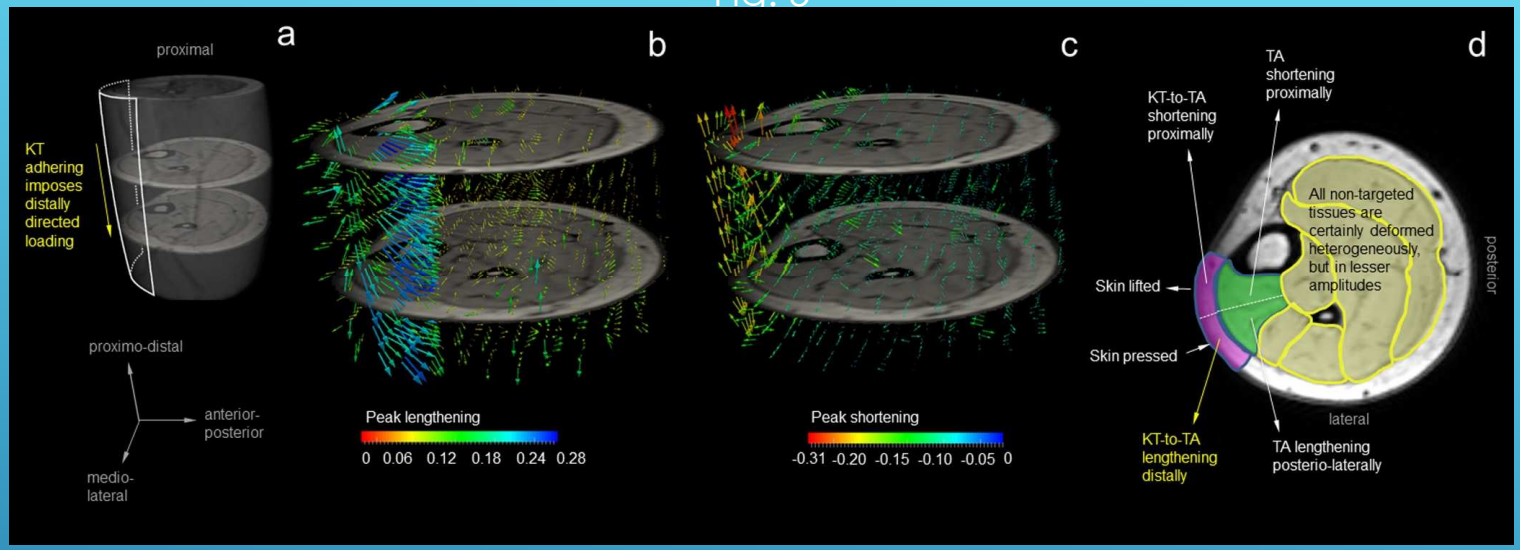
HOW DO IT WORK?

- Designed to provide stable support without restricting motion.
- Greater than 90% of nerve endings in Superfical Fascia Layer.
  - Sensory and mechanoreception
    - Siegfried Mense, MD
- Theoretically, increasing input to gamma motor neurons could reverse sensory or pain inhibited this weakness. Sensory input to these neurons from the skin could indirectly increase afferent feedback.



J Sci Med Sport. 2013 Jan;16(1):45-8. doi: 10.1016/j.jsams.2012.04.007. Epub 2012 Jun 6. **Tactile stimulation with kinesiology tape alleviates muscle weakness attributable to attenuation of Ia afferents.** Konishi Y[1].

Fig. 5



J Biomech. 2015 Dec 16;48(16):4262-70. doi: 10.1016/j.jbiomech.2015.10.036. Epub 2015 Oct 30. **MRI analyses show that kinesio taping affects much more than just the targeted superficial tissues and causes heterogeneous deformations within the whole limb.** Pamuk U[1], Yucesoy CA[2].

MRI images show deformations (up to 51.5% length change) in other directions. Non-targeted tissues also show sizable heterogeneous deformations, but in smaller amplitudes. Inter-subject variability is notable.

Journal of Biomechanics 2015 48, 4262-4270DOI: (10.1016/j.jbiomech.2015.10.036)

RECENT STUDIES

- Improves time to failure of the lumbar extensor muscles.
- Improved balance after applied for 48 hrs.
- Improvements retained even after the tape had been removed for 72 hours
- Improved hamstring length over static stretch and PNF peaking at 2.76 days.
- Improving proprioception and thus improving joint stability.
- Better tolerated than an NSAIDs.
- Improve the dynamic balance.
- Preservation of runner stride length in a fatigued state.
- Decreases fatigue-induced joint repositioning error.
- RA Hand muscle strength increased significantly.
- Improved clinical measures in PFPS
- **NO NEGATIVE OUTCOMES!**

1	=	Healthy subjects. Balance not improved	J Strength Cond Res. 2015 Dec 21. [Epub ahead of print] Kinesiology tape or compression sleeve applied to the thigh does not improve balance or muscle activation before or following fatigue. Cavanaugh T[1], Quigley PJ, Hodgson D, Reid JC, Behm DG.
2	+	4 strips applied. The KT improved balance after it had been applied for 48 hours when compared with the pretest and with the control group. One of the most clinically important findings is that balance improvements were retained even after the tape had been removed for 72 hours.	J Athl Train. 2016 Jan 11. [Epub ahead of print] Extended Use of Kinesiology Tape and Balance in Participants With Chronic Ankle Instability. Jackson K[1], Simon J[2], Docherty CL[3].
3	+	30 Healthy subjects. Improved hamstring length over static stretch and PNF. Kinesiology tape offered advantages over a longer duration, peaking at 2.76 days.	Int J Sports Phys Ther. 2015 Dec;10(7):984-91. TEMPORAL PATTERN OF KINESIOLOGY TAPE EFFICACY ON HAMSTRING EXTENSIBILITY. Farquharson C[1], Greig M[1].
4	=	healthy, trained adolescent males, KT was not associated with increased forearm SkBF	J Athl Train. 2015 Oct;50(10):1069-75. doi: 10.4085/1062-6050-50.9.08. Epub 2015 Oct 7. Forearm Skin Blood Flow After Kinesiology Taping in Healthy Soccer Players: An Exploratory Investigation. Woodward KA[1], Unnithan V[1], Hopkins ND[2].
5	=	N=30. Placebo tape was used.	Arch Phys Med Rehabil. 2015 Dec;96(12):2169-75. doi: 10.1016/j.apmr.2015.06.022. Epub 2015 Sep 7. Effect of Kinesiology Tape on Measurements of Balance in Subjects With Chronic Ankle Instability: A Randomized Controlled Trial. de-la-Torre-Domingo C[1], Alguacil-Diego IM[2], Molina-Rueda F[3], López-Román A[1], Fernández-Carnero J[4].
6	+	Reduced perceived exertion. Poor study	J Strength Cond Res. 2015 Sep;29(9):2608-12. doi: 10.1519/JSC.0000000000000901. The Effect of Rocktape on Rating of Perceived Exertion and Cycling Efficiency. Miller MG[1], Michael TJ, Nicholson KS, Petro RV, Hanson NJ, Prater DR.
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9	+/=	N=81. PCT seems to be better tolerated than an NSAID, although the difference did not reach significance.	Clin J Sport Med. 2016 Jan;26(1):24-32. doi: 10.1097/JSM.0000000000000187. Short-Term Effectiveness of Precut Kinesiology Tape Versus an NSAID as Adjuvant Treatment to Exercise for Subacromial Impingement: A Randomized Controlled Trial. Devereaux M[1], Velanoski KO, Pennings A, Elmaraghy A.
10	+	Kinesiology tape can improve the dynamic balance of young male soocer players with FAI.	Technol Health Care. 2015;23(3):333-41. doi: 10.3233/THC-150902. Immediate effects of ankle balance taping with kinesiology tape on the dynamic balance of young players with functional ankle instability. Lee BG[1], Lee JH[2].
11	+	N=29. significant difference in the change of Muscle Function Scale (MFS) scores N=5 Healthy = no change	PM R. 2015 May;7(5):494-8. doi: 10.1016/j.pmrj.2014.11.010. Epub 2014 Dec 12. The immediate effect of kinesiology taping on muscular imbalance in the lateral flexors of the neck in infants: a randomized masked study. Ohman A[1].
12	+	N=42 Healthy subjects. Tape over the anterior lower limbs demonstrated short-term preservation of runner step length and stride length in a fatigued state.	J Chiropr Med. 2014 Dec;13(4):221-9. doi: 10.1016/j.jcm.2014.09.003. The ergogenic effect of elastic therapeutic tape on stride and step length in fatigued runners. Ward J[1], Sorrels K[2], Coats J[3], Pourmoghaddam A[4], Moskop J[4], Lueckert K[4], Glass A[4].
13	+/=	N=12 Tape provided significant proprioceptive enhancement at the knee joint after uphill walking in *healthy* women with poor proprioceptive ability.	J Sci Med Sport. 2015 Nov;18(6):709-13. doi: 10.1016/j.jsams.2014.09.004. Epub 2014 Sep 16. A pilot study of the effect of Kinesiology tape on knee proprioception after physical activity in healthy women. Hosp S[1], Bottoni G[2], Heinrich D[3], Kofler P[2], Hasler M[3], Nachbauer W[4].
14	+	N=14. Kinesiology taping *with stretch* significantly increased the PML and significantly decreased the supine measurement of RSP and TSD; kinesiology taping without stretch did not increase the PML significantly and did not decrease the supine measurement of RSP and TSD.	Physiother Theory Pract. 2015 Feb;31(2):120-5. doi: 10.3109/09593985.2014.960054. Epub 2014 Sep 29. The mechanical effect of kinesiology tape on rounded shoulder posture in seated male workers: a single-blinded randomized controlled pilot study. Han JT[1], Lee JH, Yoon CH.
15	=	Healthy Subjects N=30.	Man Ther. 2015 Feb;20(1):130-3. doi: 10.1016/j.math.2014.07.013. Epub 2014 Aug 6. Kinesiology tape does not facilitate muscle performance: A deceptive controlled trial. Poon KY[1], Li SM[1], Roper MG[1], Wong MK[1], Wong O[2], Cheung RT[1].
16	+	Healthy Subjects N=30. Quadriceps fatigue increases the repositioning error of the knee joint, whereas application of kinesiology tape decreases fatigue-induced joint repositioning error.	J Phys Ther Sci. 2014 Jun;26(6):921-3. doi: 10.1589/jpts.26.921. Epub 2014 Jun 30. Effects of kinesiology taping on repositioning error of the knee joint after quadriceps muscle fatigue. Han JT[1], Lee JH[2].161
17	+	N=16. Posterior Pelvic Tilt PPTT may temporarily decrease anterior pelvic tilt and active straight leg raising score in women with sacroiliac joint pain who habitually wear high-heeled shoes.	J Manipulative Physiol Ther. 2014 May;37(4):260-8. doi: 10.1016/j.jmpt.2014.01.005. Epub 2014 Apr 26. Effect of posterior pelvic tilt taping in women with sacroiliac joint pain during active straight leg raising who habitually wore high-heeled shoes: a preliminary study. Lee JH[1], Yoo WG[2], Kim MH[3], Oh JS[3], Lee KS[4], Han JT[5].
18	+/=	N=20 Taping improved clinical measures in PFPS patients. KT and McConnell	Phys Ther Sport. 2013 Nov;14(4):199-206. doi: 10.1016/j.ptsp.2012.09.006. Epub 2013 Apr 1. The effects of two therapeutic patellofemoral taping techniques on strength, endurance, and pain responses. Osorio JA[1], Vairo GL, Rozea GD, Bosha PJ, Millard RL, Aukerman DF, Sebastianelli WJ.
19	+	Tactile stimulation in the form of Kinesiology tape inhibits the decline of both strength and electromyography. Alpha motor neuron activity attenuated by prolonged vibration would thus be partially rescued by tactile stimulation. These results indirectly suggest that stimulation of skin around the knee could counter quadriceps femoris weakness due to attenuated Ia afferent activity. Prolonged vibration stimulation to normal individuals could lead to muscle weakness attributable to attenuation of afferent feedback. This weakness is	J Sci Med Sport. 2013 Jan;16(1):45-8. doi: 10.1016/j.jsams.2012.04.007. Epub 2012 Jun 6. Tactile stimulation with kinesiology tape alleviates muscle weakness attributable to attenuation of Ia afferents. Konishi Y[1].

Improving Special Olympics' athletes fitness and health

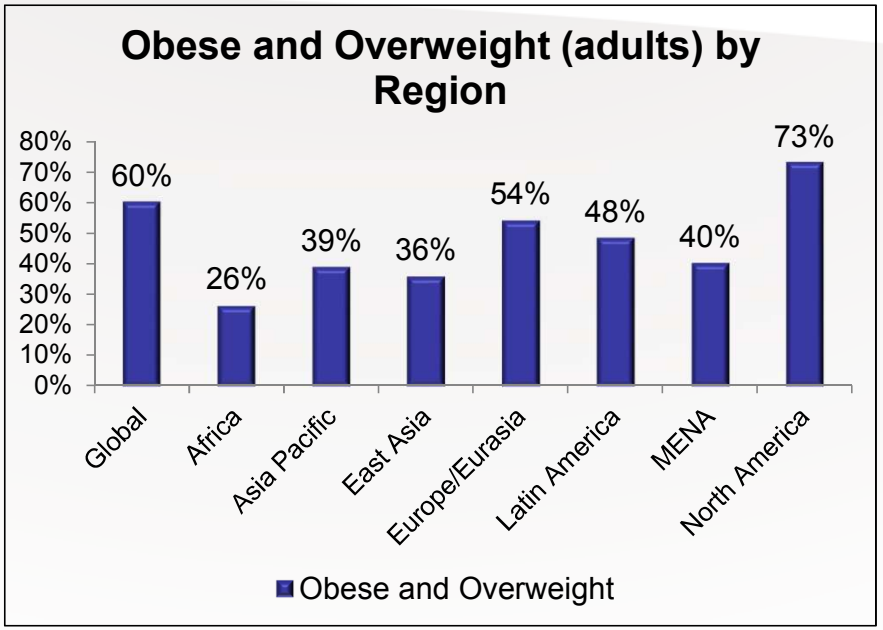
Special Olympics

SO Athlete Wellness Statistics

Globally, on average, on a team of 10 Special Olympics athletes:

5 have significant problems with flexibility

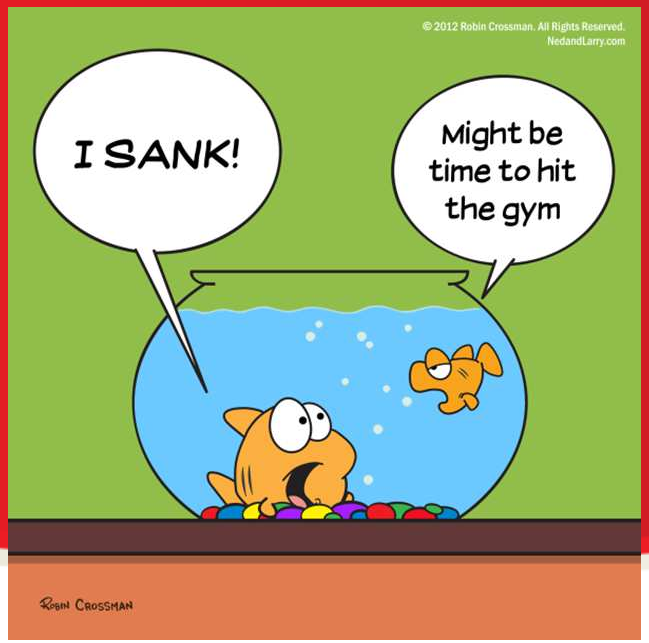
4 have significant problems with balance, placing them at risk for injuries



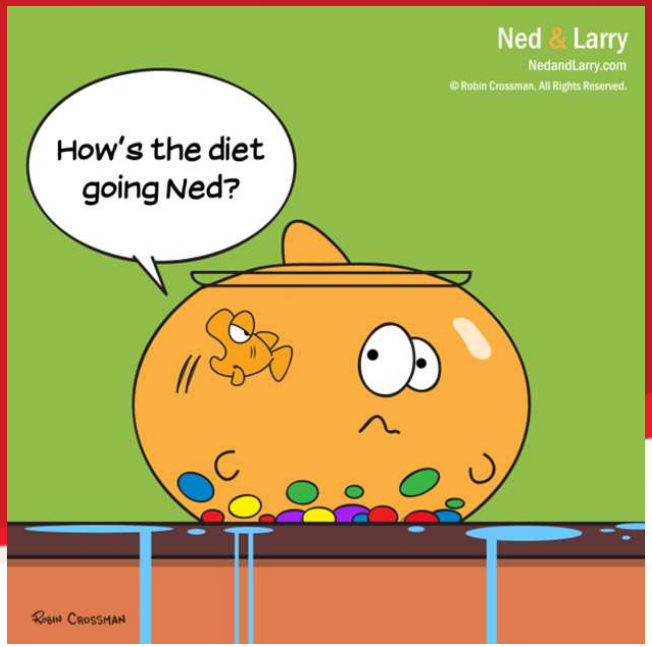
Resource: SOI Healthy Athletes Program data 2007-2015
healthdata@specialolympics.org

Wellness

Physical Activity



Healthy Eating



Special Olympics

Next Steps

Engage Coaches

Engage Families

Work with Young Athletes (ages 2-8 years old)

Develop Wellness App

Establish partnerships with sport and fitness organizations

Special Olympics

Call to Action

Special Olympics and JCSMS Jointly

Tackling Athlete Health and Fitness

Special Olympics