• ULTRA – VIOLET end of the spectrum has:
  Blue-Violet wavelengths - 415 to 455 nm
  (believed to be the most harmful to the retina) AND
  Blue-Turquoise wavelengths (positive effects on the body – regulating sleep / wake cycle
VISUAL SYSTEM
MECHANISMS

WHEN LOOKING FROM FAR TO NEAR, 3 THINGS HAPPEN;

1. Pupil Constriction
2. EOM Convergence
3. Crystalline Lens Accommodative Response (Focusing)

These mechanisms can vary widely from person to person. And can vary widely in the efficiency with which the physiological events occur.
SCREEN USE STATISTICS
(The Vision Council.org)

• COMPUTER USE: Average of Survey Respondents Use Computer to:
  1. 75.6% research things
  2. 54.2% to shop online
  3. 36.2% to check social media
  4. 26.7% to play games

SMART PHONE USE: Average of Respondents Use Smart Phone to:
  1. 58.2% to get directions
  2. 56.6% to check social media
  3. 25.8% to play games
% OF ADULTS REPORTING SYMPTOMS AFTER 2 HOURS OF SCREEN USE

1. 32.6 % Report Eye Strain
2. 22.7 % Report Dry Eyes
3. 21.4 % Report Headache
4. 22.0 % Report Blurred Vision
5. 30.8 % Report Neck and Shoulder Pain
ATHLETES USE OF VARIOUS SCREENS -- PRE EVENT

• Very Exacting methods can be used to determine accommodative and convergence fatigue and inefficiency. Usually not done in conventional eye health and refractive exams.

• Rule of thumb re. sleep disruption – quit screen use up to 1 hour before sleep.

• And for now that may be the best rule of thumb for athletes in visually demanding sports – eg, baseball, hockey, tennis, etc.
670 athletes, a 24% increase on the 539 athletes that competed 2014 Sochi (44% increase in the number of female athletes)

- Alpine Skiing
- Biathlon
- Cross-Country Skiing
- Ice Sledge Hockey
- Snowboarding
- Wheelchair Curling
IPC Medical Committee

Dr. Cheri Blauwet (USA)
Chairperson
Dr. Jaap Stomphorst (NED)
Dr. Wayne Derman (RSA)
Dr. Nick Webborn (GBR)
Dr. James Kissick (CAN)
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Dr. Walt Thompson (USA)
Dr. Osnat Fliess-Douer (ISR)
Dr. David Legg (CAN)
Dr. Raymond So (HKG)
Jan. 17 (UPI) -- South and North Korea agreed to march together under a unified flag during the opening ceremony for the 2018 PyeongChang Winter Olympics [and Paralympics]. The countries’ delegations marched together at the opening ceremony of the 2000 Sydney Olympics. They have marched together 9 times including 2004 Athens and 2006 Turin Winter Olympics. The two Koreas last marched together in the Asian Winter Games of 2007.
The “Unifying Games”… or NOT!

On Tuesday 19 December, the IPC Governing Board decided to maintain the suspension of the Russian Paralympic Committee with an interim measure for Russian athletes to compete as neutrals in qualification events across four winter sports: alpine skiing, biathlon, cross-country skiing and snowboard.

**Anti-Doping Rule Violations:**
- 2009 (1) with 1 sanction (2 years ban)
- 2016 (13) with 10 sanctions (disqualification to 4 years ban)

**Lack of a Legacy Program:** Each Games is supposed to have a Legacy Program but it is often not fully realized (conveyor to Parthenon, accessibility to Forbidden City and Great Wall all dismantled when the Games were over).

**Call to Action** by Joint Commission Members: Join ACSM and IPC in a **Global Call to Action for Disability Inclusion** in all that we do, including grassroots physical activity and sports programs for people with disabilities.

Watch the over 50 hours of television coverage on NBC.
General Bike Fit Objectives

• Ball of Foot :
  - Closer to the 5th

• Knee flexion : Between
  - Between 27° to 37°

• Saddle fore-aft
  - Knee over pedal spindle

• Shoulder θ: ~90°

• Elbow θ : > 15°

• Neutral Wrist Position

• General balance of cyclist on the bike
Saddle Adjustments

1. Tilt

2. Up/Down

3. Fore-Aft

Pelvis
Knee Flexion Angle ~30°

METHODS

• Measure: knee flexion

• Take measurement at BOTTOM of down-stroke***

• Potential changes
  – Seat ↑↓
  – Seat ↔
5 Primary Cleat Changes

1. Fore-Aft
2. Medial-Lateral
3. Wedging
4. Rotation
5. Leg Length

* Occasionally you may need to jump ahead in the process. If so, DO NOT forget to go back and address each step.
# Quick Fix Tips

<table>
<thead>
<tr>
<th>Painful Area</th>
<th>Possible Adjustment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Front of Knee</td>
<td>Saddle ↑ &amp; ← (backward)</td>
</tr>
<tr>
<td>Back of Knee</td>
<td>Saddle ↓ &amp; maybe → (forward)</td>
</tr>
<tr>
<td>Outside of Knee (lateral)</td>
<td>Foot out or away ←→ (cleat in)</td>
</tr>
<tr>
<td>Inside of Knee (medial)</td>
<td>Foot in or closer →← (cleat out)</td>
</tr>
<tr>
<td>Achilles</td>
<td>Foot forward (cleat back)</td>
</tr>
<tr>
<td>Arch</td>
<td>Foot backward</td>
</tr>
<tr>
<td>Pressure on bottom/outside of foot</td>
<td>Wedge to the inside (varus wedge)</td>
</tr>
</tbody>
</table>
What is a Compendium of Physical Activities?

- A list of values noting energy cost of various physical activities
- Currency = Metabolic Equivalent (MET)
- MET values are presented as multiples of resting metabolic rate
- Created for adults (1993)
- Youth-based version published later (2008)
Youth Compendium Workshop Participants 2012

- **Research Group** – Barbara Ainsworth, PhD, MPH (Arizona State University); David Bassett, PhD (University of Tennessee); David Berrigan, PhD (National Cancer Institute); Nancy Butte, PhD (Baylor College of Medicine); Scott Crouter, PhD (University of Tennessee); Janet Fulton, PhD (CDC); Steve Herrmann, PhD (Sanford Health Organization); Kate Heywood (Ridley), PhD (Flanders University, Australia); Robert McMurray, PhD (University of North Carolina); **Karin Pfeiffer**, PhD (Michigan State University); Stewart Trost, PhD (Queensland University of Technology); and Kathleen Watson, PhD (CDC)

- **Imputation** – Issa Zakeri, Zekarias Berhane, Alexander Long (Drexel)
- **FHI 360 Staff** – Todd Phillips, LaVerne Canady, Amanda Samuels, Adee Kennedy
- **Data and Bibliography** – Penny Randall-Levy, Kyle Sprow
What is a MET for Children?

Relationship Between Resting Metabolic Rate (RMR) and Age in Youth


\[ RMR = 3.6887 - 0.978 \ln(\text{age}) \]

\[ R^2 = 0.5781 \]
Youth Compendium Resources

- Youth Compendium of Physical Activities: Activity Codes and Metabolic Intensities – *Butte et al. 2017 MSSE (published ahead of print)*
- **Online Resource:** NCCOR Youth Compendium of Physical Activities 2017
  [nccor.org/youthcompendium](http://nccor.org/youthcompendium)
The Youth Compendium of Physical Activities provides a list of 196 common activities in which youth participate and the estimated energy cost associated with each activity. It can be used by a wide variety of people—including researchers, health care professionals, teachers and coaches, and fitness professionals—and in a variety of ways—including research, public health policy making, education, and interventions to encourage physical activity in youth.

The Youth Compendium provides energy cost values for:

- Sedentary activities, such as lying down or watching TV
- Standing, doing household chores, and playing active video games
- Playing and participating in games and sports activities
- Walking and running

The youth MET ($MET_y$) values in the Youth Compendium were derived from literature reviews, data analysis, and imputation (Butte et al., 2017).
The efficacy of custom foot orthoses in the protection from non-contact injuries of the anterior cruciate ligament of the knee.

Tim Dutra, DPM, MS
Biomechanics Faculty, California School of Podiatric Medicine @ Samuel Merritt University
Podiatric Consultant, Intercollegiate Athletics, University of California
Clinical Director, Healthy Athlete Fit Feet Program, Special Olympics Northern California
ACL Injuries: how can we help prevent them?

Non-contact anterior cruciate ligament (ACL) rupture in sports is a serious and prevalent injury in young athletes. It is estimated that 80,000 to more than 250,000 ACL injuries occur each year, more than half occurring in athletes 15–25 years old.
Study design

- establish a direct relationship between a foot orthotic and decreased ACL strain
- Pilot study with 15 females with flat feet
- Using stability court shoe
- Using semi-flexible polypropylene custom foot orthotic in court shoe
Internal tibial rotation, relative internal rotation (with respect to the femur), and kinetics will be calculated using motion of body landmarks from the three-dimensional motion-capture software.

Five trials of cross-over acute turn maneuvers and five trials of single-legged jump will be captured during running will be recorded per direction (left, right) per condition (original insole, custom foot orthotic).

Repeated measures ANOVA will be used with an alpha level of 0.05 to determine whether there is a statistically significant difference between original insole and custom foot orthotic for each measure.
visits 1 & 2:
The Neurocom Smart EquiTest Balance Manager (Natus Balance & Mobility) platform will be used to administer the Sensory Organization Test (SOT). The participant stands on a platform, wearing a safety harness vest, eyes open or closed, either with the platform or visual surround stationary or sway-referenced (can pitch forward or backward as the participant naturally sways and pressure moves either forward or backward). The SOT will evaluate how well a participant uses three related sensory systems: somatosensory, vision, and vestibular. For the motion analysis during locomotion, hypoallergenic two-sided adhesive tape will be used to affix twenty-two (22) reflective markers to typically boney landmarks on the participant’s hips, legs and feet, bilaterally (Appendix J.10). The three-dimension locations of the reflective markers will be tracked by the nine-camera Qualisys (Gothenburg, Sweden) Oqus 300 motion capture system. The MARC walkway is instrumented with four AMTI (Newton, MA) tri-axial force platforms (force plates) to measure foot-floor forces. Body motion data will be used to calculate pelvis absolute angles, and relative joint angles for the hips, knees and ankles. Foot-floor forces data will be incorporated with inverse dynamics to calculate net joint moments of force and joint rotational powers via Visual3D software using the Helen Hayes marker set, the standard for clinical gait analysis.
Key Historical Points

• Berlin 2016
  – SRC – Sport Related Concussion
  – Concussion symptoms may be immediate or evolve over time
  – Extended concussion symptoms must not be explained by drug, alcohol, medication use, other injuries or other co-morbidities such as psychological conditions or coexisting medical conditions
Symptom Categorization

• UPMC categorization organization – one of the most influential centers in the U.S.
• UPMC
  – Vestibular
  – Ocular
  – Cervicogenic (often co-morbid with psychological component)
  – Anxiety/Mood (can be alone or co-morbid)
  – Cognitive/Fatigue
  – PTM (Post Traumatic Migraine)
UPMC Modified Symptom Categorization Treatment

- Anxiety/Mood
- Stress – see onset as quickly as 2 weeks and worsens with rest – highly underreported
  - Immediate consideration of referral
    - Continued symptom inventory
    - Cannot turn off thoughts
    - Increased symptoms if think of symptoms
    - Refusal to attend social activities
    - Continued parental questioning of symptoms
    - Sleep problems are often co-morbid
UPMC Modified Symptom Categorization Treatment

- Anxiety/Mood
- VOMS nil or mildly provocative – if vestibular overlay, usually normal, treat vestibular signs first
- Often see in presence of baseline or superior ImPACT scores but high symptom complaints
- Formal neuropsychological testing may be critical to eliminate true neuropathology and should be administered, if appropriate, in tandem with effort testing.
UPMC Modified Symptom Categorization Treatment

• Treatment
  – Therapy (Cognitive Behavioral Therapy, Psychotherapy)
  – Exposure
  – Exertion

  – Behavior Regulation – diet, exercise, hydration, stress
  – Medications
    • SSRIs
    • Benzos

R. Robert Franks, D.O., FAOASM
Director Sports Concussion Institute
Rothman Institute
Associate Professor, Thomas Jefferson University
Clinical Associate Professor, Rowan-SOM
Atypical Abdominal Pain
In A Runner

Nathan Fitton DO, CAQ-SM
Assistant Professor/Team Physician Michigan State University
JCSMS Lightning Round, 2018
22 year-old female patient presented to the sports medicine clinic with exertional abdominal pain

- It started suddenly while running over 6 years ago
  - There was no inciting event, trauma, or previous issue

- She reported that the sharp pain was about the size of her fingertip. It only occurred with running and was localized to her right upper quadrant

- It would start within a few minutes of running and became so debilitating that she would have to stop

- The pain would cease within a few minutes of stopping running

**Previous Evaluation**

- Blood work, Xray, CT, umbilical hernia repair, OMT, PT, US, bracing and 2 local steroid injections
Patient Evaluation

- **Vitals:** BP 115/73, Pulse 66, Temp 97.0, BMI 21.7
- **Gen:** NAD, well appearing
- **HEENT:** AT/NC
- **Abdominal:** Soft, non-tender, non-distended, no rebound, no guarding, no palpable defect or bulge, no overlying skin changes.
  - When pain occurred it was mid-clavicular line distal to costal margin
- **MSK:** Trunk ROM full and pain free. B/L UE and LE strength 5/5
- **Neuro:** B/L UE and LE reflexes equal and appropriate
- **Osteopathic:** Short right leg, right high iliac crest, right high ASIS. Rib motion normal and symmetric.

**Differential Diagnosis**

- Costochondritis
- Rib Dysfunction
- Anterior Cutaneous Nerve Entrapment Syndrome
- GERD
- Chronic Abdominal Pain
- Poor Running Form
- Somatic Dysfunction
- Exercise Associated Intestinal Ischemia
Final Diagnosis

- Anterior Cutaneous Nerve Entrapment Syndrome: Superficial branches of the intercostal thoracic nerves become entrapped as they penetrate the rectus abdominis muscle
  - Pain at lateral border of rectus abdominis muscle
  - Intense pain is size of fingertip
  - Worse with exertion/valsalva
  - Greater than 50% pain reduction after injection
- Other potential findings
  - Abnormal skin sensation to touch/cold
  - Positive Carnett Sign
    - Site of pain is identified with finger tip
    - Supine patient lifts head or legs
    - Pain increases in intensity
      - Extra-abdominal source pain increases
      - Intra-abdominal source pain decreases
Treatment

- Initial visit: Kinesio-tape and acupuncture needles to site of pain, then trial this treatment with multiple runs over the next few days.
- After 1 week: Patient reported “significant improvement”. She was able to run seven times, all to completion. Three of the outings she was pain free, the first time this had occurred in over 6 years. Subsequent follow up patient has remained pain free.
- This diagnosis is entirely clinical. A positive Carnett Sign is very suggestive of ACNES, when combined with focal location and relief after steroid injection with anesthetic is nearly diagnostic.
- Previous studies have looked at US guided injections and surgery but through literary search this is the only documented case of ACNES being treated with acupuncture. We used the application of ah-shi, or tender point acupuncture, to identify treatment locations.
- In addition to this case we have successfully treated another individual with ACNES with the same protocol.
- Very high morbidity but very low mortality.
Exercise makes you smart.

Ted Forcum, DC, DACBSP  
American Chiropractic Association Council on Sports and Physical Fitness

Jon Metzler, Ph.D., CMPC  
Association for Applied Sport Psychology
Learning is when neurons get wired

- Learning is a change in the neuron-patterns of the brain.
  
  (Ratey, 2002, Goldberg, 2009)

- The human brain has 100 billion neurons.
  
  (It does grow thousands of new cells daily)

- These 100 billion neurons are capable of making
  \[40,000,000,000,000,000\]
  (Forty quadrillion connections)

  (John Ratey, Users Guide to the Brain, 2001)

The brain needs to function effectively:
1. Exercise
2. Sleep
3. Oxygen
4. Hydration
5. Food (glucose)
We need to learn new things!

• Skills we’re already good at don’t make us much smarter: we don’t pay much attention to them.

• New, cognitively demanding activities like the martial arts or learning a foreign language are more likely to boost processing speed, strengthen synapses, and expand or create functional networks

(Yaakov Stern of Columbia University.)
Exercise and Cognitive Enhancement

- Exercise is the single most important thing a person can do to improve their learning. (John Ratey, 2008, Spark, The Revolutionary New Science of Exercise and the Brain)

Exercise Produces BDNF

- Improves brain health
- **Enhances the wiring of neurons**
- Is a stress inoculator
- Makes the brain cells more resilient
- “In particular BDNF seems to be important for long term memories” (Ratey, 2008)
The Brain and Learning

• Natural selection resulted in a human brain that could solve problems of survival in outdoor, unstable environments while in almost constant motion.

( Dr. John Medina, Developmental Molecular Biologist, University of Washington and Author of Brain Rules)
Moving Together Toward Improved Health: Exercise Oncology

Kathryn Schmitz, PhD, MPH, FACSM, FTOS
Professor, Public Health Sciences
President Elect, ACSM

Fitness Model and Cancer Survivor Michael Markiewicz
The Impact of Cancer in the U.S. and Worldwide

• USA
  – 2\textsuperscript{nd} leading cause of death
  – 1.7 million new cancer cases
  – 595,690 deaths per year
  – 15 million survivors (4% of US population)

• Worldwide
  – 14.1 million new cancer cases
  – 8.2 million cancer deaths
  – 32.6 million survivors
Physical Activity after Cancer Diagnosis: During Treatment and Recovery

• Prior State:
  – Rest, take it easy, don’t push yourself

• Current State:
  – 150 minutes aerobic activity per week
  – 2-3 times weekly strength training
  – Flexibility on days when other activities are performed (daily)
ACSM Multidisciplinary Roundtable on Exercise Oncology

• Partnering organizations
  – APTA, AAPMR, ASCO, ACLM, ACS, CDC, NCI, CARP, CSEP, MacMillan, Royal Dutch Society of Physical Therapy, German Union for Health Exercise and Ex Therapy, ESSA

• Goals
  – Update exercise guidelines for cancer
  – Start process toward making exercise standard of care in oncology
Collective Impact Options: Let Us Move the Future of Health Together
Why we need.....

Elizabeth Joy, MD, MPH, FACSM
Immediate Past President,
American College of Sports Medicine

18.2% of US adults meet recommended levels of aerobic and strength training
By the numbers......

• Lead by the American College of Sports Medicine
• 10th Anniversary 2017-18
• 42 national centers
• >130 registered EIM on Campus locations across the US, and 15 international EIM on Campus locations
• >1400 EIM certified health and fitness professionals
• 8th Annual EIM World Congress, Minneapolis, MN 2018
• More than $1 million in funding over 10 years
The future of....

POPULATION HEALTH MANDATE

TRIPLE AIM
(BETTER CARE, BETTER OUTCOMES, LOWER COST)

HIGH QUALITY, INCONTROVERTIBLE EVIDENCE
Adherence to Physical activity (>150 min MVPA/week) was associated with a

40% lower development of heart disease
20% reduction in high cholesterol
>50% reduction in the risk of developing diabetes

Pronk N. Pop Health Management 2010
Linking Healthcare and Health & Fitness

HEALTHCARE

Step 1
Physical Activity Assessment (PAVS)

Step 2
Physical Activity Advice (Start, Increase, Maintain, Modify)

Step 3
Physical Activity Rx

Step 4
Physical Activity Referral* (Person, Place, Program, Self-Directed)

HEALTH & FITNESS

Step 3
Health & Fitness Referral (Person, Place, Program, Self-Directed)

Step 2
Health & Fitness Employment (Personal Training, Community Fitness; health coaching)

Step 1
Health & Fitness Workforce Development (EIM on Campus)

* Referral could be within healthcare (PT, RD, Cardiac Rehab, MFA; or external to community resource)
At Intermountain Healthcare

**Exercise is Medicine**

**PA Assessment** → **PA Advice** → **PA Prescription and Personalized Action Plan** → **PA Referral**

*Functional Fitness Assessment*

*You Can Learn to Move More*

*Make a Plan.* Planning out the details will help you succeed.

*Act and Track.* Try out your step for a defined period.

*Reflect and Adjust.* You can learn from whatever happens. There is no failure if you keep learning. Adjust your plan and keep going.
A Threat to Public Health – Unapproved Drugs in Dietary Supplements

Matthew Fedoruk, Ph.D.
Senior Managing Director, Science & Research
What are Dietary Supplements?

• The law defines dietary supplements in part as products taken by mouth that contain a "dietary ingredient." Dietary ingredients include vitamins, minerals, amino acids, and herbs or botanicals, as well as other substances that can be used to supplement the diet.

• Products containing hidden drugs are also sometimes falsely marketed as dietary supplements, putting consumers at health risk.
Selective Androgen Receptor Modulators (SARMS) in Dietary Supplements

• SARMs are nonsteroidal drugs in clinical trials to treat acute and chronic muscle wasting and breast cancer. None have been FDA approved.
• SARMs are listed as prohibited at all times on the World Anti-Doping Agency (WADA) Prohibited List and other sports bodies.
• SARMs are being sought out as performance and image-enhancing substances; as alternatives to anabolic steroids.
• Unlike anabolic steroids, SARMs are not listed under the Controlled Substances Act.
• SARMs are not legal or approved ingredients for dietary supplements products, but may be easy purchased.
• The composition and purity of such products is not known.
QUESTION

What types and quantity of ingredients are found in products sold through the internet and advertised to contain SARMs?
Findings & Conclusions

• Chemical analyses of 44 products sold via the internet as SARMs revealed that:
  – Only 52% contained selective androgen receptor modulators; and, another 39% contained another unapproved drug.
  – In addition, 25% of products contained substances not listed on the label;
  – 9% did not contain an active substance; and
  – 59% contained substance amounts that differed from the label.

Conclusions In this limited investigation, most products contained unapproved drugs and substances. Only 52% contained SARMs and many were inaccurately labeled.

Relevance Increased awareness of health risks posed by using dietary supplements containing unapproved drugs will help protect consumers and athletes.
NHL Second Six
50 Years
“It was just magical. When I got to St. Louis in November, the rink had been redone. The Salamons had done everything to get people to come to the games. The team started to come together and it was kind of like the fans were willing the players into doing well. The players were humble and they were happy to be here. So it was just a love affair between the fans and the players. It was a great time to be a Blue.”

Red Berenson
The Blues at 50, St. Louis Post-Dispatch
September 25, 2016, Page 14

BARCLAY PLAGER
BIG BROTHER OF THE THREE PLAGER BOYS

As youths, they took turns beating up each other. The Plagers ran wild across St. Louis, scaring up their own town.