There’s an App For That....

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Disclosures

• None
Primary Care Sports Medicine

- Imaging
- Sideline
- Clinical
- Training Room
Anatomy Apps

- Can be useful in demonstrating pathology in reference to anatomy
Movement-based tech

- **Wearable fitness monitors**
Wearable Fitness Monitors

Validated for:

- HR measurement

- HRV tracking

- Sleep duration

- Step counting

Not accurate for:

- Energy expenditure
Whoop

- Has been used in past with Duke athletics
- Daily questionnaire
- Sleep hygiene
- HRV
Sleep monitoring

Whoop

Autosleep
Accurate for sleep duration monitoring and general sleep staging, not to level of polysomnogram
Catapult

- GPS
- Direction
- Accelerometer
- Track load and movement intensity
- Can be used to prescribe activity/recovery balance
Force Plate Analysis

• Jump mechanics analysis
• Baseline force obtained in preseason
• Compare to fatigued state later in season
Force Plate Analysis

- Helps grade fatigue and load
- Daily report sent to medical staff to help inform decision making
Heart Rhythm Monitoring

Not perfect.....

• “The presented data from this pilot study suggests that caution should be noted before using the Apple Watch 4 wearable wrist monitor to monitor heart rate in patients with cardiac arrhythmias such as atrial fibrillation.”

Apple Watch and Coronary Ischemia

Nutrition

• Numerous nutrition-tracking apps available
• Increased changes in
  – Action
  – Consciousness of change
  – Self-education about nutrition and physical activity

Nutrition Apps and Weight Loss

• App-based interventions can improve physical activity and sedentary behaviors.

• Multi-faceted approach > app-alone intervention

Community.myfitnesspal.com
Physical Activity Apps

- Numerous options
- Very few are evidence-based
- Doesn’t help users reach ACSM physical-activity guidelines
Physical Activity Apps

- Small-to-moderate positive effect on physical activity measures
- Increase of roughly 1800 steps per day
- Higher effectiveness with texting and personalization measures
Shortcomings of Activity Monitors

“Other than for measures of steps in adults with no limitations in mobility, discretion should be used when considering the use of Fitbit devices as an outcome measurement tool in research or to inform health care decisions, as there are seemingly a limited number of situations where the device is likely to provide accurate measurement.”
Using retrospective smartwatch data, we show that 63% of the COVID-19 cases could have been detected before symptom onset in real time via a two-tiered warning system based on the occurrence of extreme elevations in resting heart rate relative to the individual baseline.
Technology Use in COVID

• Kinexon SafeTag
• Symptom-monitoring apps
• Contact-tracing apps
Technology Use in COVID

Feasibility of continuous fever monitoring using wearable devices

Benjamin L. Smarr, Kirstin Aschbacher, Sarah M. Fisher, Anoushka Chowdhary, Stephan Dilchert, Karena Puldon, Adam Rao, Frederick M. Hecht & Ashley E. Mason

- Majority of COVID+ patients in study exhibited increased temp prior to diagnosis
- Changes in HRV, HR, and RR
- Utilized by NBA in the bubble
Concussion Tech

- Sway, C3 Logix
Concussion Tech

- Many, many options
- Btracts
- Tekscan
- ImPACT
- Wii, Kinect V2–BESS/mBESS
- ACT Testing
EYE-SYNC

• Measures ocular reactions in concussion (and other conditions)

• Objective measurement vs. subjective physical exam

<table>
<thead>
<tr>
<th>ASSESSMENT</th>
<th>DIRECTION</th>
<th>DURATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>01. Smooth Pursuit</td>
<td>Clockwise, counterclockwise</td>
<td>&lt;60 seconds</td>
</tr>
<tr>
<td>02. Saccade</td>
<td>Horizontal and vertical</td>
<td>&lt;60 seconds</td>
</tr>
<tr>
<td>03. Vestibulo-Ocular Reflex (VOR)</td>
<td>Horizontal and vertical</td>
<td>&lt;60 seconds</td>
</tr>
<tr>
<td>04. Vestibulo-Ocular Reflex Cancellation (VORx)</td>
<td>Horizontal</td>
<td>&lt;60 seconds</td>
</tr>
<tr>
<td>05. Full Battery (all of the above)</td>
<td>Clockwise, horizontal</td>
<td>2-5 minutes</td>
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Eye Tracking Technology in Concussion

RightEye

EyeBOX

• Eye tracking technology to aid in concussion diagnosis and recovery
Reflex

• Measures pupillary eye reflex
• Measures:
  – Latency
  – Constriction rate
  – Dilation rate
Concussion Tech

• Baseline King-Devick performance was 2.8s slower on tablet than on paper cards

• 2.3s = reliable change index for King-Devick
Concussion Tech

• Technology doesn’t unequivocally improve assessment

• Concussion technology modalities are “very useful, but not stand-alone tools in concussion identification.”

Portable US

- Lower image quality vs. console
- High portability
- Great for training room, sideline, basic clinical procedures
Conclusions…

In the land of the blind, the one-eyed man is king.

-Desiderius Erasmus