Exercise: Key Tactic for Work-Life Balance!

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Professor, University of Iowa
Myokines

Pro-inflammatory status
- IL-6, IL-15, ANGPTL4, Irisin, DNAB, Motorin
- Lipolysis, Browning response
  → Reduction of visceral fat, thermogenesis

Physical inactivity

Muscle contraction

Adipose tissue
- IGF-1, FGF2, Osteoglycin, FAM5C, SPARC, IL-7, IL-15, Irisin, Follistatin, Osteonectin
- Osteoclast differentiation osteoblast differentiation
  → Bone formation, mineralization (healing) ↑

Bone

Cardiovascular system
- Promotes endothelial function and neovascularization, cardioprotection
  → Cardiovascular disease ↓
    (atherosclerosis and control of blood pressure)
- FSTL1, Irisin, FGF21, musclin, and apelin

Liver
- Hepatic glucose production, immune cells ↑
  → Inflammation ↑, glucose metabolism ↑
- IL-6, IL-10

Brain
- Survival, growth, and maintenance of neuron ↑
  → Cognitive function ↑, Alzheimer's disease ↓, depression ↓
- BDNF, Irisin, CTSB

Pancreas
- Insulin secretion ↑, pancreatic beta-cell viability ↑
  → Insulin sensitivity ↑
- IL-6, ANGPTL4

Sarcopenia
- Fat accumulation
- Cardiovascular diseases
- Type 2 Diabetes
- Cancer
- Dementia
Muscle-Brain Crosstalk

Circulation
- Cathepsin B
- Irisin
- Lactate
- IL-6
- KYNA

Secretome
- BDNF
- CTSB
- IL-6
- VEGF

FNDC5
KATs
SPP1

PPAR5
PGC-1α
AMPK
ERRα
NRF1-2

Liver
- FGF21
- IGF-1
- BOHB

BDNF
FNDC5
PGC-1α

VEGF

Blood-brain barrier

Brain
- Angiogenesis
- Neurogenesis
- Cognition
- Sleep
- Mood

Skeletal muscle

Brain

Neuron

Glia cell

Angiogenesis
Neurogenesis
Cognition
Sleep
Mood

BDNF
FNDC5
PGC-1α

VEGF

Blood-brain barrier

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Angiogenesis
Neurogenesis
Cognition
Sleep
Mood
BDNF: Sprint Interval Exercise

Kujach S, et.al: Front Neurosci 2019
Stroop Test

Say the names of the colors you see, not the colors you read. Go down the list as fast as you can.

<table>
<thead>
<tr>
<th>Stroop Test</th>
<th>green</th>
<th>blue</th>
</tr>
</thead>
<tbody>
<tr>
<td>red</td>
<td>green</td>
<td>blue</td>
</tr>
<tr>
<td>orange</td>
<td>green</td>
<td>blue</td>
</tr>
<tr>
<td>red</td>
<td>orange</td>
<td>yellow</td>
</tr>
<tr>
<td>green</td>
<td>yellow</td>
<td>blue</td>
</tr>
<tr>
<td>orange</td>
<td>blue</td>
<td></td>
</tr>
<tr>
<td>blue</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Sprint-Interval Exercise Improves Cognition

Kujach S, et.al: Front Neurosci 2019
Exercise Offsets Genetic Risk

Choi KW, et.al: Depress Anxiety 2020; 37:106
Anxiety Symptoms (STAI-Y2)

Baseline Week 1 Week 4 Week 8

Control
P ≤ 0.001

Weight Training

Barbell squat; bench press; deadlift; shoulder raise; barbell rows; lunges; curls; abdominal crunches

Scientific Reports 2020; (2020) 10:17548
Exercise is Brain Healthy

- Cognition
- Memory
- Attenuates stress-related memory (PTSD)
- Depression: prevent and treat
- Acute and chronic pain
- Delays degeneration in diabetes, Alzheimer’s, and MS
Residents Lose Fitness

Internal Medicine; 3 Programs
(waist circumference; BMI; resting HR; VO₂ max)
Surgery Residents: more hours, higher BMI, lower VO₂ max

<table>
<thead>
<tr>
<th>Exercise Habit</th>
<th>Prior to Residency, n (%)</th>
<th>During Residency, n (%)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Almost never or less than once a week</td>
<td>11 (9)</td>
<td>45 (36)</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Once a week</td>
<td>18 (15)</td>
<td>29 (24)</td>
<td></td>
</tr>
<tr>
<td>2 or 3 times a week</td>
<td>50 (41)</td>
<td>42 (35)</td>
<td></td>
</tr>
<tr>
<td>Almost every day</td>
<td>42 (34)</td>
<td>5 (4)</td>
<td></td>
</tr>
</tbody>
</table>

Fitness -- Chronological Age

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>No.</th>
<th>Mean Difference</th>
<th>SD</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Residents</td>
<td>125</td>
<td>5.6</td>
<td>11.12</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>Sex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>82</td>
<td>6.8</td>
<td>12.24</td>
<td>.07</td>
</tr>
<tr>
<td>Female</td>
<td>43</td>
<td>3.4</td>
<td>8.24</td>
<td></td>
</tr>
</tbody>
</table>

Residents: Wellness is Lacking

*Family Medicine R1s*

![Figure 1: Frequency of Daily Wellness Behaviors](chart)

*Lebensohn P, et.al: Fam Med 2013; 45:541*
My Story
Apple Cider Century
Overcoming Barriers
Weather
Weather Tactics

- The Bike
  - Commuter features
  - Slicks, treads, fat bikes, and studs
  - Fenders
  - Bar mitts

- Clothing
  - Layers
  - Specialized cold gear
  - Chemical hot packs
Flood of 2008
More Floods
Sweat

- You won’t really sweat
- Pack clothes
- Backup set in office/locker
Pain
Pain

- My muscles hurt
- My joints ache
- I don’t like to feel short of breath
- I’m too heavy
Exercise-Induced Hypoalgesia

HIIT
Pain and HIIT

- 30 healthy, but sedentary, young adults
- Interviews: “I couldn’t do it” “It sounds awful”
- Exercise sessions: Moderate, sustainable cycling vs HIIT
- During: Subjects gasped “not having fun”
- Afterwards: “Not so bad!” Rated HIIT the most pleasant regimen
- Long-range: Most incorporated HIIT into exercise and reported feeling more engaged and motivated during HIIT

Stork MJ, et.al: Psychol Sport Exer 2020; 51:101788
Time
Building Healthy Habits

- Tie a new habit to an existing habit
- Start small
- Do it every day
- Make it easy (clear obstacles)
- Reward yourself

Parker-Pope T: NYT Feb 18, 2020
Good Habits Require Patience

What I thought would make me productive: Hard Work.

What actually does:
- Exercise
- Healthy eating
- Sleep
- Time off
- Hard work
Work
Gregory Schmidt – Ride

6:21 PM on Thursday, January 2, 2020

Really January??

24.99 mi 1:39:40 1,132 ft

108 W

Estimated Avg Power

648 kJ

Energy Output

Speed

Avg 15.0 mph

Max 34.9 mph

Elapsed Time 1:39:40

Segments

Learn more about segments
Social Networks

- Strava
- Cycling clubs (BIC)
- Local bike shops
- Weekly rides
- Specialty rides
- Alcohol-fueled rides
- Charity rides
- Peloton (and similar)
Wellness:
Nurturing Relationships
Time in Nature
The Wild Turkeys
“Nature is not only nice to have, but it’s a have-to-have for physical health and cognitive functioning”
– Richard Louv, who coined the term “Nature Deficit Disorder”
It’s scenic. You’re not supposed to drive here at 60 miles an hour. To do the scenery half justice, people should drive at 20 or under; to do it full justice, they should get out and walk.” – Peter Norbeck, founder, Custer State Park
Cross Capable
Muscle-Brain Crosstalk

Circulation
- Cathepsin B
- Irisin
- Lactate
- IL-6
- KYNA

Secretome
- BDNF
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- VEGF
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- SPP1

PPARδ
- AMPK
- ERRα
- NRF1-2

PGC-1α

Liver
- BOHB

Brain
- Angiogenesis
- Neurogenesis
- Cognition
- Sleep
- Mood

Blood-brain barrier
- NKar1
- MCTs

BDNF
- FNDC5
- PGC-1α
- VEGF

Glia cell
Neuron

Skeletal muscle
Building Healthy Habits

- Tie a new habit to an existing habit
- Start small
- Do it every day
- Make it easy (clear obstacles)
- Reward yourself
- Music
- Leverage social networks