CrossFit, Chiropractic, & The Brain

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Who am I?
- Masters in Sports Health Science
- Doctor of Chiropractic
- Fellow of the American Board and Brain Injury and Rehabilitation
- Diplomate of the American Chiropractic Neurology Board
- Certified Chiropractic Sports Physician
- Passion for mTBI and other vestibular disorders

The Nature of High Intensity Functional Training

Benefits
Risks
Assessments
Treatment Options
Proposal of Health

https://youtu.be/0G4GMaxHt9Q

Accolades
- My amazingly beautiful wife, Christie, for her loving and unconditional support
- Dr. Carrick for his mentorship and excellence in bettering the profession
- Dr. Nate Keiser for his mentorship, guidance, and introductions to the world of Crossfit
- Dr. Keith Rau for his mentorship, guidance, encouragement, and friendship
No Disclosures
No financial ties to Crossfit or any other gym or training facility

Goals
Increase knowledge of HIIT/CrossFit

What is it?
What are the risks?
What are the benefits?
Who is it good for?
Why is it good for brain and nervous system?

What is HIIT?
Periodic High Intensity
80-95% of MHR
Rest 40-50% of MHR
Cycle: 5-8 minutes in length
Each cycle performed for 20-60 minutes
CrossFit

"Constantly varied functional movements performed at a relatively high intensity. All CrossFit workouts are based on functional movements. These movements reflect the best aspects of gymnastics, weightlifting, running, rowing, and more."

**Crossfit Incorporates:**
- Strength/Weight Training
- Gymnastics
- Functional Movements
- Running
- Rowing
- Etc.

**Difference Between CrossFit and HIIT**

**HIIT**
- Structured Rest
- Intensity Based on HR

**CrossFit**
- Programmed Rest or no rest
- Intensity Based on Willingness
Common Crossfit Movements

Strength/Lifting with Barbell or Kettle Bell
- Cleans
- Snatch
- Deadlift
- Overhead press/jerk
- Kettle Bell Swings

Common Crossfit Movements

Gymnastics
- Handstand walk/push-ups
- Pull-Ups
- Push-Ups
- Sit-ups
- Gymnastic rings
- Rope Climbs

Common Crossfit Movements

Conditioning
- Running
- Rowing
- Biking
- Sled Push
- Tire Flip

Common CrossFit Movements

CrossFit movements may be performed in a specific sequence for a specific period of time or for a set number of rounds.

The workouts are varied each day and may have a set format to be used as benchmark workouts.
For men, the mean Grace time was 3:23, with a standard deviation of 1:34. This means in a normal distribution, we’d expect 68% of CrossFit Open men to fall within the range of 1:49-4:57.

For women, the mean Grace time was 3:56, with a standard deviation of 1:38. This means in a normal distribution, we’d expect 68% of CrossFit Open women to fall within the range of 2:18-5:34.

Murph
In honor of Navy Lieutenant Michael Murphy

Murph
40-70 Minutes Intermediate
30-40 Minutes Advanced
30 Minutes or less Elite
Benefits of CrossFit

Musculoskeletal
CrossFitters show more body symmetry and lower body endurance when compared to weightlifters in functional movements.

Cardiovascular
Greater influence on cardiopulmonary biomarkers like VO2 Max and decrease in body fat percentage regardless of gender or physical fitness, when compared to MICT.

Psychological
More enjoyable when compared to moderate intensity continuous training (MICT).

Neurological
Benefits of Crossfit

Neurological

Increased BDNF to stimulate neurogenesis, neuroplasticity, microglial cell survival, and cell differentiation in the hippocampus

“...A beneficial influence of CrossFit training on the subject’s body composition, anaerobic capacity, and cardiovascular fitness as well as an increase in BDNF makes it possible to assume this type of training could have a very high application value, especially in a therapeutic process leading to an improvement in the patient’s well-being.”

- Journal of Physiology and Pharmacology

Risks of Crossfit: Too Much, Too Fast

Injury

More Common in Men

Most Common Regions:
- Shoulder
- Low back
- Knee

Most Common Type
- Inflammatory
- Sprain/Strain
**Assessments**

Posture – Static and under load
Reflexes – MSR hypo or hyper?
Upper/Lower Crossed Syndromes

**Functional Movements**

- Tight/overactive/facilitated
  - Suboccipital muscles
  - Upper Trapezius
  - Levator Scapulae
  - Pectoralis major and minor
  - SCM
  - Latissimus Dorsi
  - Subscapularis
  - Rectus Capitus
  - Scalenes

- Weak/underactive/inhibited
  - Deep neck flexors
  - Lower/middle Trapezius
  - Serratus Anterior
  - Rhomboids
  - Teres minor/Infraspinatus
  - Posterior Deltoid
  - Longus Capitus/Colli

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**Upper-Crossed Syndrome**

- Tight/overactive/facilitated
  - Rectus femoris
  - Iliopsoas
  - Superficial spinal erectors
  - Adductors
  (May also see tight hamstrings and Quadratus Lumborum)

- Weak/underactive/inhibited
  - Abdominal muscles – rectus may be overactive but transverse and oblique abdominals are weak.
  - Glute max/med/min
  - Multifidus
  - Biceps femoris
  - Deep erector spinae

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**Lower-Crossed Syndrome**

- Tight/overactive/facilitated
  - Rectus femoris
  - Iliopsoas
  - Superficial spinal erectors
  - Adductors
  (May also see tight hamstrings and Quadratus Lumborum)

- Weak/underactive/inhibited
  - Abdominal muscles – rectus may be overactive but transverse and oblique abdominals are weak.
  - Glute max/med/min
  - Multifidus
  - Biceps femoris
  - Deep erector spinae

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**Advice for Patients**

- Tailor advice based on each patient
- Progress slowly and scale as needed
- Avoid weekend warrior syndrome
- Find box with reputable coaches
- Build fitness base vs. “Go for it”
- Recommend recovery periods
**Treatment/Training Options**

Core strengthening
- Dead bug
- IsoClam

Core bracing

Shoulder/thoracic mobility
- Tennis/lacrosse ball trigger point therapy with active ROM therapy

Hip hinge mobility
- IT band foam roll and stretch psoas
- Squat kinematics
- Squat facing wall with feet close to wall – touching the wall, NOT allowed

**Recognize upper and lower crossed syndromes as discussed earlier**

**Stretch tight muscles**
- Foam roll
- PNF/PIR

**Strengthen weak muscles**
- Isometric holds – no longer than 8 seconds

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**Is CrossFit is good for the Brain and Body?**

**Posterior Chain and the Brain**
- Extensor vs. Flexor

**Crossfit and the Cerebellum**
- Fastigial Nucleus

**Brain Activation**
- Constantly varied
- Complex Movements
- Change in blood flow
- Body awareness

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**Is Crossfit is good for the Brain and Body?**

**Posterior Chain**

- “The degree of muscle activation (force and EMG) was directly proportional to the amplitude of the brain signal determined by fMRI in the entire brain and in a number of motor function-related cortical fields. This includes primary motor, sensory regions, supplementary motor area, premotor, prefrontal, parietal and cingulate cortices, and cerebellum” – The more muscle force generated, results in a stronger signal seen through fMRI.

- Likewise activation of the extensor musculature will reciprocally inhibit the flexor dominance that many adults exhibit in their current lives, seen through upper crossed and lower crossed syndromes.
Is CrossFit good for the Brain and Body?

**Posterior Chain**
- Extensor musculature becomes facilitated in development
- Extensor musculature atrophies in neurocognitive decline
- It is not unreasonable to ascertain that if the goal is to avoid neurocognitive decline, or better yet, to increase neuromotor function, eliciting strong extensor muscular contractions in a functional manner will increase the function of the areas of the brain associated with that extensor muscle control.

Is CrossFit good for the Brain and Body?

**Cerebellum**
- Cerebellar activation, specifically the Fastigial Nucleus, controls axial, proximal, and extensor motor muscle control, as well as coding where the head and body are in space. This is important as it is the computing of this information that determines spatial and body awareness. Control of these functions occur via the vestibulospinal and reticulospinal pathways, as well as connections to the primary motor cortex via the ventrolateral nucleus of the thalamus.
- Non-motor projections are also sent to brainstem structures such as the medullary/pontine reticular formations, the gigantocellular nucleus (NGC), the paramedian reticular nucleus (PRR), the nucleus of the solitary tract (NTS), and the nucleus ambiguous providing regulation of reflexive physiological functions such as cardiorespiratory regulation at rest and exercise, feeding control, defecation control, micturition control, immune control.

Why Do People Love CrossFit?

**Proposal:**
- Excitation of extensor muscle groups inhibits the activation of flexor muscle groups leading to less musculoskeletal pain and dysfunction.
- Complex/novel/new activities cause excitation of the cerebellum, primary motor cortex, and premotor cortex. The "constantly varied" aspect of CrossFit means that each day brings a novel experience to these areas resulting in a constant new afferent barrage and therefore continuous output to the before mentioned systems.
**Why Do People Love CrossFit?**

**Proposal:**

- Activation of proximal and posterior antigravity musculature, in a novel manner, excites the cerebellum and provides coordination of:
  - Frontal motor patterns
  - Axial and proximal muscle control
  - Head, eye, and body spatial awareness
  - Emotional responses
  - Cardiorespiratory reflexes
  - Immune responses

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**References**

7. Hill, J. (2006). **Activation of proximal and posterior antigravity musculature, in a novel manner, excites the cerebellum and provides coordination of:**
   - Frontal motor patterns
   - Axial and proximal muscle control
   - Head, eye, and body spatial awareness
   - Emotional responses
   - Cardiorespiratory reflexes
   - Immune responses

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**Why Do People Love CrossFit?**

**Proposal:**

My conclusion as to why so many people love CrossFit and feel better while sticking to a regular CrossFit program, is that the constantly varied, aka novel, posterior and proximal muscle group activation provides a more appropriate body schema (neurological body awareness). This promotes a healthier emotional state, better cardiovascular and respiratory health, and better hormone regulation. The result is positive anatomical, physiological, and psychological effects for overall better health.

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**FINISHED A CROSSFIT WORKOUT**

**DIDN’T DIE**