Top 20 HIIT Work-outs to Maximize Fat Loss

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1

Outline

What is HIIT?

History of HIIT

1. Fartlek (Warm-up)

Review the research, training protocol, results, then do the work-out.

HIIT Work-Outs

2. Tremblay
3. Tabata
4. Olson
5. Shepard
6. Heydari
7. Gillen
8. Islam
9. Wythe
10. Baquet
11. Bangsbo
12. Perry
13. Little
14. Trapp
15. Zhang
16. Bagley
17. Hazell
18. Talanian
19. Chrois
20. Gibala

2

What is HIIT?

Incomplete recovery . . . physically, metabolically, & mentally.

Different work and rest ratios.

Using large muscle groups.

Vertical Movements

Equipment or no Equipment.

Physically & mentally demanding.

But . . . It's fun . . . Goes quick . . . Creative . . . Applied in any situation.

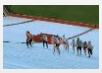
"Pain and suffering to enhance the human will"
(Juan Carlos Santana, 2010)

3

What is HIIT in Research?

4

What is HIIT in Real Life?



5

What is HIIT in Real Life?

6

HIIT Can Be Any Kind of Exercise

7

Fat Burning HIIT

Most HIIT studies show

1. HIIT protocol compared to Medium Intensity Continuous Training (MICT)
2. Increased use of fat to produce energy (ATP) for muscle contractions.
3. Decrease in skinfolds
4. Decrease in waist & hip circumferences
5. Decreased fat content through DEXA
6. Increase in enzymes that promote the use of fat to produce energy.
7. Improved VO2 ... and various metabolic improvements.
8. Better adherence ... compared to Medium Intensity Continuous Training (MICT)

Except . . . Tabata . . . he didn't look at it.

But Olson did.

8

History of HIIT

Hannes Kolehmainen - 1' d Medal 1912 middle distance runner. Interva

Swedish running coach G or his runners.

Fartlek = "speed play."

Continuous running with

Emil Zatopek - Gold Med 0,000m 1952 Helsinki Olympics.

Sprints with jog recoveries.

9

Fartlek Training

Walking warm-up . . . 3 min's.

Running work-out . . . 3 min's.

Coldplay – Clocks
Beds are Burning

Borg Scale

6
7 - Very, Very, Light
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19 - Very, Very Hard
20

10

Angelo Tremblay

Tremblay, Simoneau, & Bouchard (1994) Impact of Exercise Intensity on Body Fatness and Skeletal Muscle Metabolism. Metabolism 43(7): 814–818.

- Compared aerobic exercise & HIIT on fat loss & muscle metabolism.
- 2 Groups:

1) 20-week endurance training
   - cycling 4 or 5 x/week
   - 30 to 45 min
   - 60% - 85% of heart rate reserve.
2) 15-week HIIT
   - 10 – 15/15 – 30 sec intervals

   or
   - 4 - 5/60 - 90 sec intervals.
   - 60% - 70% of the max.
   - Recovery HR down to 120-130 bpm.

11

Tremblay

- Total energy cost:

Endurance	=	28,757.04 kcals
HIIT	=	13,829.17 kcals.
Difference	=	14,927.87 kcals.

- Decrease in sum of 6 skinfolds in HIIT program was NINE-Fold less than endurance group.
- MICT decrease - 79.2 – 74.7 mm (4.5 mm)
- HIIT decrease - 94.2 – 80.3 mm (13.9 mm).
- Significant increase in enzymes promoting fat being used as energy for muscle contraction.

12

Tremblay

Remarkable benefits considering total work time =

Protocol 1 = 2:30 – 7:00

Protocol 2 = 4:00 – 7:30

13

Tremblay Work-Out

Intensity = 60 – 70%

1. 4 intervals . . . 30 sec.
   Recovery . . . 30 sec.

Exercise:
4 – 6 Skips - Run back

2. 3 intervals . . . 75 sec.
   Recovery . . . 30 sec.

Exercise:
5 Squat Jacks to Knees … 6 Skips Fwd … Run Back

Metric – Breathing Underwater
Kongos – Come With Me Now
Avicii – Wake me up

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14

Izumi Tabata

Practical application – Japanese speed skating team.

Decrease training volume.

But maintain anaerobic capacity, VO2, skating speed … and medals.

20 secs at 100% max – 10 secs rest – repeat 4 mins.

V02max increased 7 ml/kg/min and anaerobic capacity increased 28%.

Remarkable benefits considering total work-out time is 4 minutes.

Can we do "Tabata" HIIT with our clients 5 days/week?

15

16

Michele Olson

Four minute Tabata routine of jump squats.

13.5 kcals/min

4 min x 13.5 = 54 kcals

EPOC 30 mins after work-out = 81 kcals

"Participants burned average of 135 calories in total (4-min workout + 30 min after.)"

17

Sam Shepard

Shepard, et al., (2015) Low-Volume, High-Intensity Interval Training in a Gym Setting Improves Cardio-Metabolic and Psychological Health, DOI: 10.1371/journal.pone.0139056

Shepard, et al., indicates – "In a controlled laboratory environment, HIIT has same cardio & metabolic benefits as continuous, low intensity training."

But . . . is it the same in a real-world environment?

Instructor-led, group-based, gym setting HIIT . . . compared to medium intensity continuous training.

18

Sam Shepard

90 physically inactive volunteers (42 yrs), HIIT or MICT group exercise classes.

HIIT – repeat sprints (15–60 seconds, >90% HR_{max}) with 45 – 120 seconds of active recovery cycling 18 - 25 min/session, 3 sessions/week).
More on next slide . . .

MICT - continuous cycling (70% HR_{max}, 30–45 min/session, 5 sessions/week).

10 weeks

19

Sam Shepard

Week			
1.	30 sec, 120 sec recovery; repeat 4x	20:00	Each work-out had 5 min w-up & 5 min cool-down (added to total time)
2.	15 sec, 45 sec recovery; repeat 8x	18:00	
3.	30 sec, 90 sec recovery; repeat 5x	20:00	90% HR_{max}
4.	60 sec, 60 sec recovery; repeat 5x	20:00	
5.	30 sec, 60 sec recovery; repeat 7x	20:30	
6.	15 sec, 45 sec recovery; repeat 12x	22:00	
7.	30 sec, 60 sec recovery; repeat 9x	23:30	
8.	60 sec, 60 sec recovery; repeat 7x	24:00	
9.	30 sec, 60 s recovery; repeat 6x followed by 15 s HIE, 45 s recovery; repeat 5x	24:00	
10.	60 sec, 60 sec recovery; repeat 5x followed by 15 s HIE, 45 s recovery; repeat 5x	25:00	

20

Sam Shepard

Adherence
Greater in HIIT group - 83% sessions attended . . . this is the case with most HIT programs.
MICT group – 61% sessions attended

Average weekly training time:
HIIT = 55 mins
MICT = 128 mins

Results – Both Groups Improved or Reduced:
- VO2max.
- Insulin sensitivity.
- Feelings of energy (subjective vitality)
- Feelings of health perception
- Reduced fat mass.
- MICT reduced systolic BP

21

Sam Shepard

"HIIT performed in a real-world gym setting improves cardio-metabolic risk factors and psychological health."

" . . . reduced time . . . and greater adherence, HIIT . . . viable and effective exercise . . ."

No Work-Out

22

Mehrdad Heydari

Heydari, Freund, and Boutcher, (2012), The effect of high-intensity intermittent exercise on body composition of overweight young males, J Obes. 2012;2012:480467. doi: 10.1155/2012/480467.

12-week high intensity intermittent exercise (HIIE) . . . young overweight males.
- total body fat
- abdominal fat
- trunk fat
- visceral fat mass (stored in abdominal cavity around internal organs - liver, pancreas and intestines)
- fat free mass

Exercise or control group (no exercise).

HIIE sprinting - 8 sec work, 12-sec active recovery for 20 mins

3x/week for 12 weeks.

HIIE work 80–90% of peak heart rate at a cadence between 120 and 130 rpm

Recovery - same resistance at 40 rpm

23

Mehrdad Heydari

Results for HIIE . . . 12 weeks

- Aerobic power improved 15%		
- Weight loss	-	reduced 3.3 lbs
- Total fat mass	-	reduced 4.4 lbs – DEXA & CT Scans
- Abdominal fat	-	reduced .22 lbs
- Trunk fat	-	reduced 3.3 lbs
- Visceral fat	-	reduced 17%
- Waist circumference	-	decreased by week six - 3.5 cm
- Fat free mass	-	increased .88 lbs for the legs
- Fat free mass	-	increased 1.5 lbs for the trunk.

No change in levels of insulin or blood lipids.

24

Mehrdad Heydari Work-Out

1. 8 sec squat jumps	4. 8 sec squat jumps	7. 8 sec squat jumps
12 sec recovery	12 sec recovery	12 sec recovery
2. 8 sec squat jumps	5. 8 sec squat jumps	8. 8 sec squat jumps
12 sec recovery	12 sec recovery	12 sec recovery
3. 8 sec squat jumps	6. 8 sec squat jumps	9. 8 sec squat jumps
12 sec recovery	12 sec recovery	12 sec recovery

80–90% of peak heart rate

Van Halen - Jump

Borg Scale
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25

Jenna Gillen

Gillen, et al., (2014) Three Minutes of All-Out Intermittent Exercise per Week Increases Skeletal Muscle Oxidative Capacity and Improves Cardiometabolic Health, November 3, http://doi.org/10.1371/journal.pone.0111489

Overweight/obese but otherwise healthy men and women (n = 7)

3x/week – 6 weeks - 18 training sessions – cycle ergometer

2 min warmup

3 x 20 sec "all-out" sprints with 2 min recovery

Results:

Peak oxygen uptake increased by 12%

Resting blood pressure decreased by 7%

Skeletal muscle oxidative capacity increased, but primarily in men.

26

Jenna Gillen Work-Out

3 x 20 sec "all-out" *sprints* with 2 min recovery

1. 20 sec Sprints Back & Forth, 10 Steps.
   2 min recovery . . . passive then active
2. 20 sec Sprints
   2 min recovery . . . passive then active.
3. 20 sec Sprints
   2 min recovery . . . passive then active.

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One Republic – Love Runs Out
Lonely Boy – Black Keys

27

Hashim Islam

Islam H, Townsend LK, Hazell TJ (2017) Modified sprint interval training protocols. Part I. Physiological responses. *Appl Physiol Nutr Metab.* Dec;1-8.

9 active men, 3 "all out" sprint interval training sessions:

4 × 30-sec intervals, 4-min recovery between work intervals

8 × 15-sec intervals, 120-sec recovery between work intervals

24 × 5-sec intervals, 40-sec recovery between work intervals

Results:

- Exercise energy expenditure was greater with 24 × 5-sec bouts, 40-sec recovery.
- Post-exercise energy expenditure (EPOC) was greater with 8 × 15-sec bouts, 120-sec recovery.
- Post-exercise fat oxidation was similar with 8 × 15-sec bouts, 120-sec recovery and 4 × 30-sec bouts, 4 min recovery.

24 × 5-sec, 40-sec recovery and 8 × 15-sec, 120-sec recovery had better results.

Shorter sprint intervals increase exercise energy expenditure, though longer intervals promote greater post exercise fat utilization.

28

Hashim Islam Work-Out

5 x 5-sec bouts, 40-sec recovery.

1. Jump Squats — 5-seconds, 40 second recovery
2. Tuck Jumps — 5-seconds, 40 second recovery
3. Jump Squats — 5-seconds, 40 second recovery
4. Tuck Jumps — 5-seconds, 40 second recovery
5. Jump Squats — 5-seconds, 40 second recovery

Dreams - Cranberries

3 x 15-sec bouts, 120-sec recovery

Bear Crawl Fwd-Bkwd — 15 seconds, 120 second recovery

Arm Chops w/Squat Jumps — 15 seconds, 120 second recovery

Agility Fast Feet 4 x 4 Touch — 15 seconds, 120 second recovery

Bad Moon Rising - Creedence

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29

Whyte, Gill, & Cathcart

Whyte, Gill, & Cathcart (2010), Effect of 2 weeks of sprint interval training on health-related outcomes in sedentary overweight/obese men. Metabolism, 59(10):1421-8.

10 overweight/obese sedentary men.

2-week HIIT, 6 sessions, 4 to 6 – 30 sec Wingate sprints, 4.5-min recovery.

Results:

- VO2max and Wingate power increased.
- Insulin sensitivity & resting fat oxidation rate higher (24 hrs post-work-out)
- Systolic blood pressure and resting carbohydrate oxidation were lower (24 hrs post-work-out).
- Waist and hip circumferences decrease.

30

Whyte, Gill, & Cathcart

Whyte, Gill, & Cathcart (2010), Effect of 2 weeks of sprint interval training on health-related outcomes in sedentary overweight/obese men. Metabolism, 59(10):1421-8.

"Practical" application:

6 exercise sessions

4 to 6 intervals

30 sec Wingate anaerobic sprints

4.5 minute recovery

No work-out

31

Baquet, et al.

Baquet, et al., (2010) Continuous vs. interval aerobic training in 8- to 11 year-old children, J Strength Cond Res, 24(5):1381-8.

63 kids, 8 – 11 yrs old, 7 weeks, 3x/week

3 groups: 1) Continuous, 2) HIIT, and 3) Control.

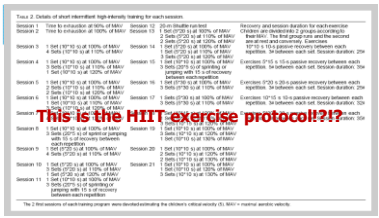
Continuous group:

Sequences:

- 4 sets of 6 min — 1 set of 15 min
- 3 sets of 8 min — 1 set of 18 min
- 2 sets of 10 min — 1 set of 20 min
- 2 sets of 12 min

80 – 85% of max aerobic velocity.

32



This is the HIIT exercise protocol!?!?

33

Baquet, et al.

HIIT group:

10 x 10 sec/10 sec passive recovery
5 x 20 sec/20 sec passive recovery
5 x 30 sec/30 sec passive recovery
10 x 15 sec/10 sec passive recovery
10 x 10 sec/10 sec passive recovery

100 – 190% of max aerobic velocity.

190% of max . . . YIKES?

Results

- Both groups increased peak VO_2 and max aerobic velocity.
- Authors suggest continuous running is boring for kids, fitness pro's consider a variety of training programs for children.

34

Baquet, et al.

Practical Application.

8 – 11 yr old kids don't like continuous exercise . . . HIIT!!

Benefits

HIIT intervals keeps it interesting for kids.

Increased peak VO_2 and max aerobic velocity in young kids.

No Work-Out

35

Gunnarsson and Bangsbo

Gunnarsson and Bangsbo (2012) The 10-20-30 training concept improves performance and health profile in moderately trained runners. *Journal of Applied of Physiology*. 113(1):16-24.

18 moderately trained subjects (12 men and 6 women)

1) 10 – 20 – 30 Group – Running on Treadmill
2) Control Group – Running on Treadmill

10-20-30 group – 3x/week, 7 weeks.

- 1.2 km warm-up low intensity
- 3 – 4 intervals with 2 min's rest between
- 5 - 1 min intervals
- Each interval =
  - 30 sec @ 30% max
  - 20 sec @ 60% max
  - 10 sec @ 90–100% max . . . repeat for 5 min's

Control - regular endurance training, 40 min, 3 days/week, 7 weeks.

36

Gunnarsson and Bangsbo

Major findings:

10-20-30 group . . . 7 weeks

1500 m - decreased - 21 sec
5 km - decreased - 48 sec

VO2max - improved - 4%

Control – no improvements.

10-20-30 group
- total cholesterol and LDL cholesterol lower.
- systolic BP lower.

Control – no difference

37

Gunnarsson and Bangsbo

30 sec – *30%* - Skip Fwd Back

20 sec - *60%* - Squat Jacks

10 sec - *90-100%* - Tuck Jumps

Repeat for 5 mins (Maybe 1 or 2!?)

Land of Confusion
Take a Picture

Borg Scale

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38

Christopher Perry

Perry, Heigenhauser, Bonen, Spiet. High-intensity aerobic interval training increases fat and carbohydrate metabolic capacities in human skeletal muscle, *Appl Physiol Nutr Metab*, 33(6):1112, 2008.

6 weeks of HIIT – Untrained men & women.

10 x 4 min intervals at 90% VO2 peak, 2 min rest, 3 days/week.

VO2 peak is the highest value of VO2 attained on test.

39

Christopher Perry

Major adaptations during exercise:

- Reduced break down of glycogen (more fat being used)
- Reduced lactate accumulation
- Increased fat oxidation at 60% of pre-training VO2 peak.
- Training power output increased by 21% and VO2 peak increased by 9%.

This study demonstrated that 6 weeks of HIIT (3 days/week) can increase whole-body and skeletal muscle fat and carbohydrate use in untrained subjects.

40

Christopher Perry

Practical application –

10 x 4 min intervals at 90% VO2 peak. Could say 90% of max.

2 min rest.

Increased fat oxidation . . . FAT, FAT, FAT!!
- 40 min work . . . This is a lot.
- 18 min rest.
- Can our clients adapt to 58 min of interval training?

41

Christopher Perry Work-Out

Intensity = 90%

1 - 2 intervals, 4 min.

"Recovery" = 2 min.

Exercises, 30 sec x 8 . . . With a partner.
1. 30 sec Dry Skating
2. 30 sec Plank Arm Wrestle W/Shuffle
3. 30 sec 4 Side Shuffles with Squat Jump
4. 30 sec Alternate Crawl Under

. . . Repeat

Thunderstuck

Borg Scale

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42

Jonathan Little

Little, et al. (2009) A practical model of low-volume high-intensity interval training induces mitochondrial biogenesis in human skeletal muscle: potential mechanisms. *J Physiol* 588(Pt 6): 1011-22.

- Seven men , 6 training sessions, 8-12 x 60 sec intervals at approximately 100% of peak power with 75 sec of active recovery.
- Training increased exercise capacity on cycling time trials.
- Low volume interval training is a stimulus for increasing muscle mitochondrial capacity and improving exercise performance.

43

Jonathan Little

- Low volume, but very high intensity . . . 8-12 x 60 sec intervals . . . 100%.
- Peak anaerobic power is the power you produce just before collapsing … usually on a cycle ergometer.
- Is it possible to work at 100% for 60 seconds?

44

Jonathan Little

Practical application

Benefits - increased exercise capacity on cycling time trials and increased muscle mitochondrial capacity.

Not very exciting benefits . . . except increased mitochondrial capacity means we improving our ability to produce energy . . . burn more calories … CHO and Fat.

But increased exercise capacity may be important to clients –

10 min of work
11:15 min of rest
21:15 min total.

45

Jonathan Little Work-Out

Intensity = 100%

3 intervals - 60 sec.
Recovery - 75 sec.

Exercise . . . Need a partner.

60 sec – 4 Side Shuffles, 5 Standing Arm Push-Pulls, 4 Side Shuffles, 5 Standing Arm Push-Pulls

75 sec active recovery

She Sells Sanctuary – The Cult
Pumped Up Kicks

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46

Trapp, et al., (2008)

E G Trapp, D J Chisholm, , J Freund- and S H Boutcher, The effects of high-intensity intermittent exercise training on fat loss and fasting insulin levels of young women, *International Journal of Obesity* (2008) **32**, 684–691

Effects of a 15-week high-intensity intermittent exercise (HIIE) on subcutaneous and trunk fat and insulin resistance of young women.

3 groups: HIIE (*n*=15), steady-state exercise (*n*=15) or control (*n*=15).

HIIE protocol – 8-sec all out sprinting and 12-sec of pedaling slowly (20- 30 rpm's) for a maximum of 60 repeats a session = 20-mins

Subjects started with as little as 5 min in the conditioning phase and gradually increased work time to 20 min.

- SSE training - 5-min warm-up then exercised at 60% VO2peak
- Subjects started exercising for 10–20 min.
- Duration of the exercise was gradually increased to a maximum of 40-min of exercise per session.

47

Trapp, et al., (2008)

- Both groups significant improved cardiovascular fitness.
- Only HIIE had a significant reduction in:
  - total body mass
  - fat mass
  - trunk fat
  - fasting plasma insulin levels.
- There was significant fat loss in legs compared to arms in the HIIE group only.
- Lean, compared to overweight women, lost less fat after HIIE.

Same protocol as Heydari, Freund, and Boutcher, (2012) and similar results.

- No work-out.

48

Zhang, et al., (2017)

Zhang, et al., (2017), Comparable Effects of High-Intensity Interval Training and Prolonged Continuous Exercise Training on Abdominal Visceral Fat Reduction in Obese Young Women, Journal of Diabetes Research, 2017:5071740. doi: 10.1155/2017/5071740. Epub 2017 Jan 1.

- HIT, MICT, or no training for 12 weeks.
- HIT - 4-minute cycling at 90% VO2max, 3-min passive recovery until 300 kJ of work was achieved.

HIT exercise times:
- Weeks 1 – 4 = 29.4-min
- Weeks 5 – 8 = 37.8-min
- Weeks 9 – 12 = 34.4-min

- MICT cycle ergometer at an intensity of 60% VO2max until 300 kJ of work was achieved.

MICT exercise times:

-Weeks 1 - 4 = 51.2-min
-Weeks 5 – 8 = 74.4-min
-Weeks 9 – 12 = 62.6-min.

49

Zhang, et al., (2017)

Results

HIIT and MICT had the same reductions in:
- abdominal visceral fat area (–9.1 cm)
- abdominal subcutaneous fat area (–35 cm), and
- combined abdominal visceral and abdominal subcutaneous (–44.7 cm).

- fat percentage (–2.5%)
- total fat mass (–2.8 kg)
- fat mass of the android (trunk & upper body) (–0.3 kg)
- gynoid (hips, buttocks, thighs) (–0.5 kg)
- trunk (–1.6 kg).

50

Zhang, et al., (2017)

Average Time of Training

- MICT = 62.73-min
- HIIT = 33.86-min
- Difference of 28.87-min

MICT had no advantage compared with HIIT in the reduction of abdominal visceral fat reduction.

Authors conclude:

"HIIT appears to be the predominant strategy for controlling obesity because of its time efficiency.

No work-out

51

Bagley

Bagley, et al., (2015) Sex differences in the effects of 12 weeks sprint interval training on body fat mass and the rates of fatty acid oxidation and VO2max during exercise, BMJ Open Sport Exerc Med 2016;2:e000056.doi: 10.1136/bmjsem-2015-000056.

Effect of very short duration, very high intensity sprint interval training on body fat mass, VO2max and Fatty Acid Oxidation, and sex differences.

- 24 men and 17 women, age: 39 years; body mass index 24.6.
- 4 bouts of 20 sec max effort sprints (175% of that attained on a VO2max test) with 2 min active recovery.
- Each session lasted less than 10 min with 80-sec total training time.
- 3 times/week, 12 weeks.

Results:
- Fat mass decreased by 1.0 kg, men lost significantly more fat than women.
- VO2max increased by 9%, women improved VO2max significantly more than men.
- Fatty acid oxidation (using fat for muscle contractions) improved by 13%
- low-density lipoprotein decreased by 8% and the HDL-Total Cholesterol ratio improved by 6%. No Work-Out

52

Hazell, et al.

Hazell, et al., 2014, Running sprint interval training induces fat loss in women. *Appl Physiol Nutr Metab.* Aug;39(8):944-50.

15 recreationally active women, 22.9 yrs.

6 weeks of sprint interval training

4 to 6, 30 sec "all-out" sprints on treadmill

4 min of rest between sprints

3 x/week

53

Hazell, et al.

Sprint Interval Training

Decreased:
- body fat 8.0% (BOD POD)
- waist circumference 3.5%.

Increased:
- Fat-free mass 1.3%
- Max oxygen consumption 8.7%
- Peak running speed 4.8%

Time-efficient training for decreasing body fat . . . increasing aerobic

54

Talanian

Talanian, J.L., et al. (2007) Two weeks of high-intensity aerobic interval training increases the capacity for fat oxidation during exercise in women. *Journal of Applied Physiology, 102* (4), 1439 – 47.

8 women

7 HIIT sessions/2 weeks, 10 – 4 min intervals at 90% V02, 2 min rest.

Total exercise time = 58 min

"Marked increases in whole body and skeletal muscle capacity for fatty acid oxidation during exercise."

No work-out

55

Chrois, K.M., et al., (2019) Mitochondrial adaptations to high intensity interval training in older females and males. European Journal of Sport Science. 19:1-11.

Effects of HIIT on mitochondrial respiratory capacity and mitochondrial content in older females and males.

22 older sedentary males and females did 6 weeks of HIIT 3 days/week.

HIIT protocol: 5, 1-minute at maximum intensity cycling with 90-seconds recovery.

Results:

- **VO_2max increased both sexes.**
- **Body fat decreased in both sexes.**
- **Increased mitochondrial content.**

No Work-out

56

Gibala, et al. (2012)

Gibala, et al., (2012). Physiological adaptations to low-volume, high-intensity interval training in health and disease, *J Physiol,* 590(5): 1077-84

HIIT an effective alternate to traditional endurance training … superior changes in physiological, performance, and health-related markers in both healthy individuals and diseased populations.

HIIT shown to improve CV fitness in people with coronary artery disease, congestive heart failure, middle age adults with metabolic syndrome, and obese individuals.

HIIT is important from a public health perspective, given that 'lack of time' is the most commonly cited barrier to exercise.

Increase in cardiovascular fitness after HIIT in many cases was superior to Medium Intensity Continuous Training (MICT).

57

Gibala, et al. (2012)

Recent work has shown as few as 6-sessions of Wingate-based HIIT with constant-load over 2 weeks improves insulin sensitivity in previously sedentary, overweight individuals.

Benefits of HIIT show the weekly training time is much lower than "common" public health guidelines - 150 min of moderate to vigorous exercise per week to promote h ealth.

58

59

Mike Bracko

drbrackofitness@aol.com

drbrackosfitness.com

60

Thank you for being in this session!

61

Jan Helgerud

Helgerud, et al., (2007) Aerobic high-intensity intervals improve VO2max more than moderate training. *Med Sci Sports Exerc,* 39(4):665-71.

40 men, 4 groups:

1. **45 min long slow distance (LSD) (70% HRmax)**
2. **24.25 min lactate threshold run (85% HRmax)**
3. **47 reps of 15 sec running – 15 sec rest. 90-95% HRmax**
4. **4 reps of 4 min running – 3 min active res. 90-95% HRmax**

Results:

15 x 15 and 4 x 3 increased VO2max more compared with LSD and lactate-threshold.

62

Jan Helgerud

Practical application

47 reps/ 15 x 15 = 23.5 min.

4 x 4 min of interval running, 3 min rest = 28 min.

Benefits -

- **15 x 15 = ↑ V02 5.5%**
- **4 x 4 = ↑ V02 7.2%**
- **Remarkable benefits in V02 for 23.5 – 28 min of work.**

- **No Work-Out**

63