

Ultimate Calorie Burning Makeover (Session 604)
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Description: This engaging lecture will explain the components of metabolism and calorie burning, factors that affect resting metabolic rate, and the latest biomedical research understandings on exercise metabolism and energy expenditure. In addition, all participants will learn 10 documented ways to physiologically boost metabolism, and eight fabulous calorie-burning workouts.

I. Research Update

Does lifestyle make a difference in quality of life as we age? (European Journal of Epidemiology, 2022, 37:11-23)

- A. ‘Lifestyle risk factors including smoking, heavy alcohol drinking, lack of physical activity, overweight and obesity are associated with increased all-cause and cause-specific mortality, such as cardiovascular disease and cancer mortality.’

Do vigorous-intensity and moderate-intensity physical activities reduce mortality to the same extent? (British Medical Journal, 2020, Open Access (e000775))

- B. For the same total physical activity, both vigorous-intensity and moderate-intensity physical activities reduce all-cause mortality to the same extent.

What is the Newest form of metabolic conditioning? (Nutrition Reviews, 2004, 62(7), S82-S97)

- C. Non-exercise activity thermogenesis (NEAT). NEAT is the energy expended for everything we do that is not sleeping, eating or sports-like exercise. “Changes in NEAT accompany experimentally induced changes in energy balance and may be important in the physiology of weight change.” Can burn 269 to 477 kilocalories/day. NEAT activities are the best ‘evidence-based’ strategies to boost metabolism! Some articles refer to NEAT as ‘spontaneous physical activity’

II. Metabolism 101: Basics and terms

- A. Metabolism: sum total of living cell’s energy producing and utilizing reactions
- B. TDEE=Total daily energy expenditure; RMR=Resting metabolic rate (60%-70% or up to 75%)
AT=Activity thermogenesis; Structured exercise vs spontaneous physical activity (15%-30% TDEE)
- C. NEAT=Non-exercise activity thermogenesis, part of AT; sitting, standing & moving, shopping, etc.
- D. TEF=Thermic effect of food: digestion, absorption, transport, metabolism, and storage
- E. Thermogenesis=process body generates heat or energy
- F. Research on NEAT (Science, 2005, 307, 584-586): ‘Active couch potatoes’ expend 352 additional kcals/day (16 kg/yr) by moving 150min more on a daily basis than ‘non-active couch potatoes’
- G. Reading sources for NEAT: Move a Little, Lose a Lot and Get Up by James A. Levine, MD, PHD

III. What is the NEWEST research on how many STEPS per day is Healthiest? (Sports Medicine, 2022, 52, 89-99)

- A. The risk of death decreases proportionally with an increase in steps per day, suggesting that greater steps per day is better for health. Currently, the evidence for >12,000 to >15,000 steps per day appears to be an optimal goal to strive for. Research denotes that daily, sustained chair-dependency is associated with shorter life spans, metabolic diseases and cardiovascular disease.

- B. Mechanisms: sitting results in dramatic drops in lipoprotein lipase (captures fat from blood for fuel); leads to elevated levels of triglycerides; also lowers HDL-C; elevates risk to CVD
- C. Sit Less Move More: Take-Away Message to Clients for Burning Calories: Brisk is Better

Creating a **Metabolic Profile** for a Client: Action Plan to Combat Sedentary Behavior & Boost Metabolism

- E. Case study: Interventions at **work** to combat sedentary lifestyle: New Concept to Interventions: Habit Stacking (linking a habit to every-day activities) 1) stand up and walk around the office every 30 minutes, 2) stand up and move every time the client needs to get some water, 3) walk to the farthest bathroom in the worksite facility, 4) take a walk break with every coffee and tea break,

Case study: Interventions at **home** to combat sedentary lifestyle: 1) get up, walk in place during every commercial, 2) stand up and walk in place for the opening segment of each TV show, 3) at the end of reading 4,6 or 8 pages, get up and walk around the room or house. (Research shows walking in place burns about 4.5 kcal/min: if done for commercials in a ONE hour of TV watching on 5 times a week, this would be equal to 7 lbs of fat loss!

- F. Source for ideas for moving and to boost metabolism: getfit.unm.edu Metabolic booster ideas: walk during your lunch hr, walk instead of drive whenever you can, take a family walk after dinner, mow the lawn with a push mower, walk your dog often, replace Sunday drive with a Sunday walk, park safely in the back of the parking lot, work and walk around the house, take your dog to the park, wash the car by hand, run or walk fast when doing errands, pace the sidelines at your kid's games, walk the airport while awaiting your flight, walk to a coworkers desk instead of emailing or calling, make time in your day just for moving, bike with family and friends, if you find it difficult to be active after work, try it before work, take a walk break with a coffee break, perform gardening and/or home repairs, avoid sitting for more than 30 min at a time, move around more at the grocery market, play with your kids 30 minutes a day, dance to music, walk briskly in the mall, take the long way to the water cooler, take the stairs; walk the escalator

G. **Walking Styles that Boost Metabolism**

Len's Favorite innovative Walking styles that boost metabolism and burn calories: 30-Three (30 seconds brisk, then 3 min comfortable), 30-30 (30 seconds brisk, then 30 seconds comfortable), Fartlek Walking (constantly 'vary' walking speeds), Tempo Walking (comfortable but maximum walking speed), Groucho Walking

Jim Levine (Move a little, lose a lot!), Len Kravitz (Move a little faster, lose a lot more!). Have you done Kravitz Sitting and Standing?

WAIT: What is the effect of resistance training on metabolic rate: multi-set resistance training 2-3 times a week boosts metabolism on average of 7-9% (which is approximately 100 Kcals/day)

- H. Education Break: What is the most accurate equation to estimate RMR: Mifflin-St. Jeor (1990).

Men: $9.99 \times Wt(kg) + 6.25 \times Ht(cm) - 4.92 \times age + 5$

Women: $9.99 \times Wt(kg) + 6.25 \times Ht(cm) - 4.92 \times age - 161$: Note RMR is solved in Kcal/day

There are many Mifflin-St. Jeor calculators on the WEB. Just use your favorite WEB Search engine

- K. Issues with energy balance: very complex interaction of diet, exercise, NEAT, TEF, RMR

VII. Metabolic adaptations

- A. Where is fat completely oxidized in cells? Mitochondrion (think of it as a fat burning fireplace)
- B. Cardiovascular and HIIT training: mitochondria get 35% bigger and can reproduce up 15-50% more
- C. Metabolic model diagram: In this model calcium-calmodulin kinase (CaMK) and adenosine monophosphate kinase (AMPK) are signaling pathways that activate peroxisome proliferator-activated receptor-g coactivator-1 α (PGC-1 α). PGC-1 α is like a “master switch” that is believed to be involved in promoting the development of the skeletal muscle function (increase in fat oxidation, increase in GLUT4 and glycogen, increase in mitochondrial density, increase in slow-twitch muscle fibers oxidative capacity).
High-volume training appears more likely to operate through the CaMK and HIIT is AMPK pathway.

Cardiorespiratory Metabolic Programs

1) HVIT: High Volume Interval Training (Perry et al., 2008)

Protocol: Subjects completed 10 exercise intervals lasting 4 minutes interspersed with 2-minute rest intervals (option; no exercise or self-selected light exercise).

Intensity: The subjects in this study were at 95% of their actual heart rate max during the 4-minute intervals, which would be analogous to a 17-18 on the RPE scale. (Reminder, modify intensity appropriately for clients.)

Duration: This total workout takes close to one hour to complete.

2) SIT: Sprint Interval Training (Burgomaster et al. 2008)

Protocol: Subjects did 4-6 sprint intervals lasting 30 seconds interspersed with 4.5 min self-selected pace recovery

Intensity: The subjects in this study performed at an all-out effort, which would suggest about a 18-20 RPE rating. Reminder, this workout involves a very forceful effort bout which can easily be modified to a much less vigorous exertion for clients not prepared for that rigorous of a stimulus. Self-selected 4.5 minute recovery 8-9 RPE

Duration: This total workout takes 20 to 30 minutes for the 4-6 sprint intervals, respectively.

3) HIIT with Variable Recovery (Seiler & Hetlelid, 2005).

Protocol: The subjects did 4-minute bouts of exercise (can do on any mode) at near maximal intensity with alternating recovery intervals of 1, 2 and 4 minutes

Intensity: Near-maximal interval hard to very hard, or 17-18 on the RPE scale. The recovery is self-selected

4) Combination HIIT & CV Conditioning (Adapted from Lausen, 2010).

Interval: 30 sec of sprinting on any mode; Rest period of 120 sec. Work/Rest ratio 1-to-4. Duration for up 8 min.

Next, complete 20-30 minutes of slow cycle at 50-65% HRmax (on any mode). Modify by completing on multiple modes (cycling, elliptical training, running, rowing, stair stepping, etc)

5) Long Duration Interval Cycling Plus Running (Sandbakk et al, 2012)

Protocol: The subjects did two 10-minute intervals at cycle race pace with 5 to 7-min recovery; After completion of two intervals subjects did a 20 to 30 min low intensity treadmill run

Intensity: The near-maximal interval was hard to very hard, or around 17-18 on the RPE scale. The recovery interval is self-selected intensity. **Duration:** This total duration can vary to individual goals

6) HILL TRAINING HIIT (Adapted from Seiler & Hetlelid 2005)

Warm-up: 10min of light jogging

Interval: Set treadmill incline at 5%-8% grade and speed at 3 mph. During each interval increase speed to 5 mph to 6.5 mph, while keeping grade at 5%-8%. The length of the interval should be 1min.

Relief Interval: Self-selected speed. Do not adjust incline.

Work/Relief Ratio: 1-to-2 ratio. The work interval is min and the relief interval is 2min

Frequency: 3-6 intervals. Comments: This is a hill running interval session. Modify incline, running speed, interval length, and relief interval.

7. High volume continuous circuit resistance training protocol. Can circuit training, by itself, elicit a cardiovascular training affect?

11 college males who had completed an 11-week resistance training program

RM (and exercise order) in leg press, bench press, lat pull, arm curl, seated press, triceps push-down, upright row, leg extension, seated row

Max VO₂ treadmill test

Protocol

A. 1 sec. out & 1 sec. in tempo; 2-5 sec rest between sets

B. All exercise at 40% of 1 RM; 10 reps per exercise

C. 5 circuits: collected HR and VO₂ on each circuit

This is a 20min Circuit workout and the participants were at 50% of their VO₂max during most of the workout.

Design suggestions: Alternate upper and lower-body exercises and use more multi-joint exercises

8) Step-Wise 30/30 HIIT Training (Moriarty et al. 2017)

Warm-up: 5-10 min of light intensity exercise; Mode: Treadmill with no grade

Work: 30 seconds at 90% VO₂max (RPE =Very Hard); Relief Interval: 30 seconds at 35-40% VO₂max (Walk, RPE=Light); Work/Rest Ratio: 1 to 1 ratio.

After each interval increase treadmill grade 1% and keep for work and relief interval

Can complete on any mode that you can increase the workload

9) Short Sprint HIIT Training from Australia (Boutcher 2011)

Warm-up: 5min of light exercise; **Workout:** 8 seconds sprint followed by 12 seconds recovery (20-30 rpm) on cycle; light resistance on cycle; progressed to 20 minutes and then started adding load in 0.5 kg increments.

Maintained 20 min duration and completed 3times/week.

10) VIIT (Variable Intensity Interval Training)

Warm-up: 5-10 minute light exercise

4-8 Continuous endurance intervals

Each work bout is 4min followed by a 4min low-intensity rest bout (self-selected intensity)

Each successive bout is at a faster pace:

Example: 1) 6mph followed by 4min rest, 2) 6.3 mph followed by 4min rest, 3) 6.6 mph followed by 4min rest, 4)

7.0 mph followed by 4min rest, 5) 7.3 mph followed by 4min rest

11) The Triple 'Six-Minute' Workout

Warm-up: 5-10 minute of light jogging, elliptical training or any CV mode

Workout is three 6min bouts with a 2min active relief between bouts

1st bout is a Maximal sustainable pace

2ⁿ bout is a moderate (somewhat hard) intensity

3rd bout is a Maximal sustainable pace

Thank you for coming to this session!

