

# Metabolic Conditioning – The New Way to Train

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## Introduction

## NOTES

**As Exercise:** Defined as high work rate-type exercise workouts with little-to-no recovery intervals aiming to boost calories expended during and after the workout (EPOC).

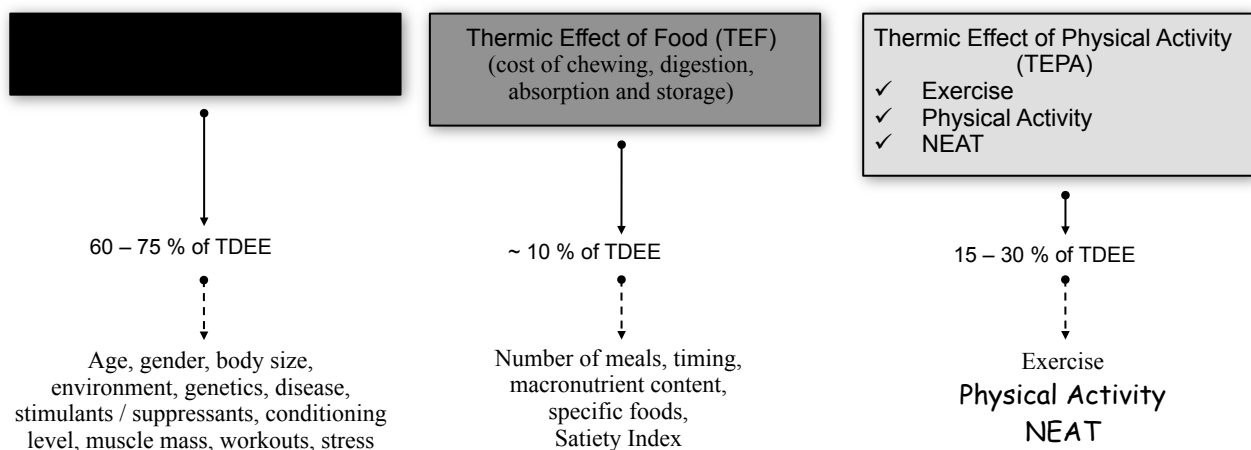
- Achieved through one or any combination of the following:
  - ✓ Load (force generated)
  - ✓ Volume (amount of work performed)
  - ✓ Power (rate of performing work)

3 Types of Responses:

### Client Concerns:

- Physiological harm:
  - ✓ Fatigue-technique relationship:
    - Isolated trauma from pattern overload - potentially stresses tissues and joints excessively, especially when the body is physically un- or underprepared.
    - *Example:* Rhabdomyolysis - condition of excessive muscle fiber breakdown, with fiber contents spilling into bloodstream and passing to kidneys - harmful and potential organ failure
  - ✓ Immune function responses
    - Low-to-moderate stress = immune-boosting effect
    - High-stress = immune-suppressant effect
  - ✓ Muscle soreness (DOMS) and exercise adherence
- Psychological and Emotional Impact on adherence.
  - ✓ Appropriate experience / DOMS?
  - ✓ **56.2 % of attrition** associated with intensities that are too hard.
  - ✓ Always weigh small initial gains vs. cognitive and emotional effect

## Total Daily Energy Expenditure (TDEE)



Resting Metabolic Rate (RMR)

Up- and Down-regulation:

- **Lean Body Mass** boosts RMR up to 7-8 %
  - ✓ Studies demonstrate 2 – 4½ lb. muscle mass gained (8-52 weeks)
  - ✓ RMR = ~ 1,200 – 1,500 kcal / day = additional 100 kcal/ day ... 10½ lb. (4.5 Kg) / year
    - *Attributed to cost of maintaining muscle mass, plus conditioning effects on metabolism*
- **EPOC** can increase RMR higher for a few hours (equivalent to 15 – 25 % of kcal of exercise)
  - ✓ Higher-intensity or fatigue-inducing bouts can increase EPOC up to 38 hours
- **Age** decreases RMR by ~ 2 % / decade (after late 20's – early 30's)
  - ✓ Generally due to reduced exercise volume/intensity and loss of muscle.
- **Diets / starvation** can suppress RMR by up to 20 %
  - ✓ Example: IF BMR = 1,500 kcal / day, 20 % reduction = 300 kcal/day ... 31 lbs. (14 Kg) / year

Thermic Effect of Food (TEF)

- **Eating** increases metabolism slightly (peaks within 60 minutes after eating).
  - ✓ Foods raise the TEF at different rates:
    - Fats = TEF of ~ 3 %.
    - Carbohydrates = TEF of ~ 7 % (fibrous vegetables up to ~ 20 %).
    - Protein = TEF of ~ 30 %
      - Due to lack of protein storage sites in body (99 % stored as living tissue) or conversion cost to glucose / fats
- **Frequency of Food Intake** influences metabolism - irregular meal frequency (Farshchi, *et al.*, 2004) increases potential for obesity and lowers TEF.
  - ✓ TEF is not different between 3 and 5 isocaloric meals / day (mixed results on fewer, larger meals vs. more frequent, smaller meals)
- **Effects of Specific Foods:**
  - ✓ *Thermogenic herbs and spices* (e.g., chilli peppers (~20%), horseradish, mustard, cinnamon, fennel seed, garlic, ginger, ginseng, guarana, and turmeric).
  - ✓ *Water* (Boschmann, *et al.*, 2003) consumption of 17 oz. (500 ml) of cold water (6° C / 43° F) increases TEF by 30 % for 10 min to 40 min post-prandial (1.5 L / day = 17,400 kcal)
    - Due to thermoregulation plus osmosensitive-structures preventing blood dilution (cost to maintain osmotic pressure). ... ~ 5 lb. (2½ Kg) / year

Effect of TEPA

- Does traditional exercise programming really contribute to **INITIAL** weight loss?

Measure	Men	Women
Average weight	194.7 lb. (88.5 Kg)	164.7 lb. (74.9 Kg).
Daily Caloric Intake	2,504	1,771
Weekly Caloric Intake	17,528	12,397
Weekly Kcal (Health)	1,000 kcal	1,000 kcal
Weekly Kcal (Weight Loss)	2,000 kcal	2,000 kcal
3 x 30 min @ 5 mph	1,207 kcal (6.9 %)	1,021 kcal (8.2 %)
4 x 30 min Higher-intensity Circuit (80:20 work-recovery)	1,728 kcal (9.9 %) (432 kcal / session)	1,440 kcal (11.6%) (360 kcal / session)



What we Know and Should Consider

NOTES

- #1 reason people (20 - 55-year old) exercise = weight loss
- But ...consider the contribution of exercise initially.
  - ✓ Should we emphasize weight loss initially given poor tolerance for volume, intensity and discomfort?

... Explore PA and NEAT.

**What does research tell us?**

- Study: Mortality data over a 12-year period (N = 17,013)
  - ✓ Even in physically-active individuals – strong correlation between sitting and mortality risk.
  - ✓ Physical activity does not cancel all ill effects of being sedentary.
  - ✓ *Sedentary effects:*
    - Reduced HDL levels = increased CVD risk.
    - Decreased muscle LPL activity = elevated blood TG = increased CVD risk.

- Study: Non-exercisers (Low BMI vs. High BMI)

- ✓ Low BMI group average 150 min more movement / day.
- ✓ Averaged 352 kcal more / day =

... 36.7 lbs. (16.7 Kg) / year

Metabolic Profile

Time of Day	Activity	Suggested Activity
0:00 – 6:30 am	Sleep	✓
6:30 – 7:30 am	Prepare for Work	(10 min walk, exercises?)
7:30 – 8:15 am	Commute (drive)	✓
8:30 – 12:00 pm	Seated – computer	Breaks, bathrooms, walk to coworkers
12:00 – 1:00 pm	Lunch - seated	Options ?
1:00 – 5:00 pm	Seated – computer	Breaks, bathrooms, walk to coworkers
5:00 – 6:00 pm	Commute (drive)	✓
6:00 – 7:30 pm	Misc	Options ?
7:30 – 10:30 pm	Sit – TV / read	Options (commercials, etc.)
10:30 – 11:00 pm	Prepare for bed	✓
11:00 – 12:00 am	Sleep	✓
Be creative and find simple, implementable solutions ..		

How do we Boost Metabolism with Exercise?

**Induce stress = Neuro-endocrine Responses**

- Manipulate program variables to keep shock (stress) upon body's systems – increases hormonal responses = stimulates protein synthesis
  - ✓ Variables: Load (intensity), volume (sets x reps, time), frequency, interval-repetition, tempo (TUT), and recovery-intervals
  - ✓ Also consider age, gender training status and dietary intake on these responses.



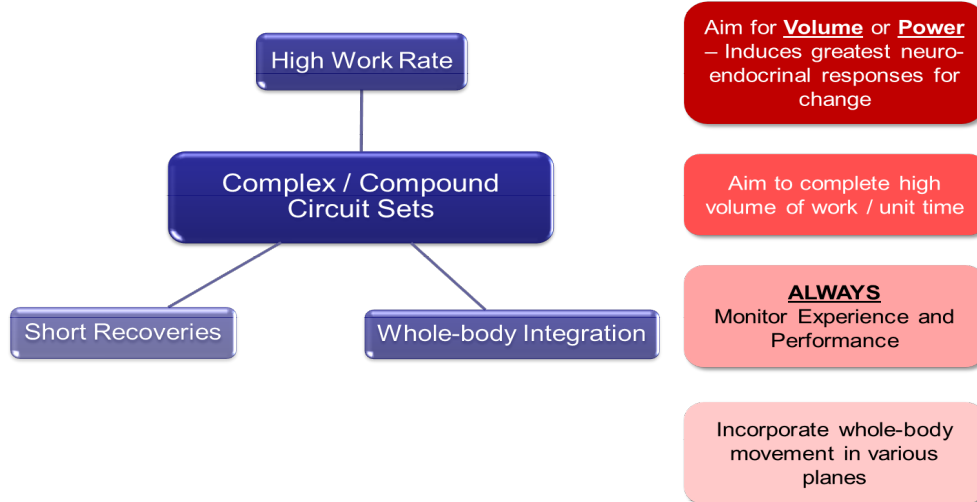
# Resistance Training Strategies

## NOTES

Overall Goal - increase volume / work-rate performed with reduced recovery intervals

### 1. Undulating / Non-linear periodizations: (aka Muscle Confusion)

- Strategy:
  - ✓ Alternate between endurance, hypertrophy, strength and power in **NO ORDER**
  - ✓ Vary programming variables on a frequent basis (i.e., between-week, within week, within session, within exercise).



### 2. 2-by-2 Variable Format:

- **Goal:** Increase work rate / unit time.
- **Format:** Multiple sets/exercise (e.g., 4-5) - unilateral training with no recovery between sets.
  - ✓ **Option 1:** Fixed reps – between 6 and 12 reps (reduce load over sets).
  - ✓ **Option 2:** Fixed load – reduce reps over sets.
  - ✓ Example: Alternating leg press or single-leg squats

### 3. Drop-down Format: (e.g., HIT)

- **Goal:** Maximize overload for **hypertrophy**
  - ✓ Adjust load accordingly keep rep-range between 6 and 12.
  - ✓ Drop-down resistance to complete more reps before taking a recovery period.
- **Sequence:**
  - ✓ **1<sup>st</sup> part of set:** To POF - Type II(b) fatigue.
  - ✓ **2<sup>nd</sup> part of set:** Remove 10 – 15 % weight – continue immediately to POF - type II(a) fatigue.
  - ✓ **3<sup>rd</sup> part of set:** Remove 10 – 15 % weight – continue immediately to POF - type I fatigue.
- Follows motor unit and muscle fiber recruitment pattern (Type I – type IIa – type IIb)
  - ✓ Sequence creates overload on all fibers – all have potential for growth by 20 – 45 %, up to 70 % - greatest growth rates in type II fibers.
  - ✓ Allows specific fiber type recovery while other fibers are being trained – allows more work / unit of time in the workout.

### 4. Power Circuit Format:

- Whole-body integration, high-volume workouts.
- Explosive concentric phase, slowed eccentric phase
- Example:
  - ✓ 5 x Power Clean
  - ✓ 5 x Hang Snatch
  - ✓ 5 x Push-Press
  - ✓ 5 x Low-Pulls
  - ✓ 5 x Front Jump Squats

1. **Complex / Compound Series Formats:** - can be very challenging

- Complete entire exercise sequence before taking rest interval:
- Use 30/35 – 60 % of body weight for load.
- ✓ *Example: **Complex Sets*** – strength coaches working with athletes (grew out of super-setting / compounds sets).
  - 2 – 3 sets x 5 – 6 reps; 45 – 90 sec recovery.
  - 4 – 6 multi-joint exercises.
    - Olympic Squat
    - Push Press
    - Dead lift
    - Front Squat
    - Low pull
- ✓ *Example: **Hybrid Sets – Simple-to-complex*** (focus upon one major body part):
  - Use 20 – 60 % of body weight
  - 2 – 3 sets x 5 reps; 30 – 60 sec recovery between sets:
    - Bb Half Shoulder Press
    - Bb Full Shoulder Press
    - Bb Upright Row to Shoulder Press
    - Bb Hang Clean to Shoulder Press
    - Bb Power Clean to Shoulder Press
- ✓ *Example: **Hybrid Sets – Multi-planar*** (focus upon one major body part):
  - 2 – 3 sets x 4 reps; 30 – 60 sec recovery between sets:
    - Db Standing Bilateral Shoulder Press
    - Db Standing Bilateral Front Step Incline Press
    - Db Standing Bilateral Rear Overhead Press
    - Db Standing Unilateral Frontal Plane Press (each)
    - Db Standing Unilateral Transverse Plane Press (each)
  - Vary between static or dynamic BOS.
- ✓ *Example: **Whole-body Hybrid Sets*** (constant external load)
  - 2 – 3 sets, 60 – 90 sec recovery
    - Db Push-up x 10
    - Db Row from Push-up Position x 5 per arm
    - Front Plank 30 seconds
    - Db Single-left Romanian Dead Lift x 10 per leg
    - Db Standing Shoulder Press x 10 per arm
    - Db Biceps Curl x 10
    - Db Rear Lunge with Trunk Rotation x 10 per side
  - Option: Perform one of each in series and complete # repetitions for set.

**NEVER FORGET ONE UNDERLYING PRINCIPLE – IS THIS APPROPRIATE !!!**

*Always follow a linear plan prior to implementing non-linear plans !!*

**Aerobic Training Strategies**

Overall Goal - after establishing aerobic base (VT1) - increase intensity of work to boost caloric burn and EPOC

1. **Aerobic Interval Format:**

- Moderate-duration bouts of slightly-higher intensities of aerobic work, followed by a lower-intensity active recovery.
- ✓ Example: ≥ 3 min work interval + active recovery (1:2 to a 10:1 work-to recovery intervals)
- ✓ Shorter bouts allow greater volume of higher-intensity work.

2. **Split routine Format:**

- Multiple shorter cardio sessions with ≥ 5 minute recovery between two – double EPOC

1. **Anaerobic Intervals / Supramaximal Interval Training** Format – Tabata-style / La Forgia)

NOTES

- Short-bouts (e.g., 20 seconds of near maximal efforts) with very short recovery intervals.

“Recognize that energy depletion is inevitable - always train energy systems effectively ...”  
> 10 % Decrement in Performance = Garbage Reps !!!

2. **Pyramids / Step-wise Format:**

- Intervals building by 10 % every 4 - 5 minutes
- Equal to ~ 10 bpm (1 RPE) increase / stage

3. **Multi-mode cardio Format:**

- Vary mode, intensity and duration per modality
- Target 20 – 60 minutes of total volume

1. **Blended / Multi-Mode Circuit Format:**

- Any resistance format: 5 – 10 minutes.
- Any cardio format (aerobic): 3+ minutes.
  - ✓ Aerobic is optimal for adequate anaerobic pathway recovery (fatigued during resistance).
  - ✓ Split routine cardio = multiple EPOCs

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