Metabolic Resistance Training: Strategies to Optimize Fat Loss and Enhance Muscular Adaptations

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What Is Metabolic Resistance Training (MRT)?

- An exercise regimen designed to maximize calorie burn and increase metabolic rate
- Two components
  - Calories burned during exercise
  - Calories burned post-exercise
Calories Burned During Exercise

- Three possible substrates
  - Carbohydrate (glycogen, glucose)
  - Fat (adipocytes, intramuscular)
  - Protein
Glycolysis

- Glucose and glycogen enter the glycolytic pathway
- End product is ATP and pyruvate
  - Under anaerobic conditions, pyruvate ferments into lactate (fast glycolysis)
  - Under aerobic conditions, pyruvate is converted into Acetyl CoA and enters the Krebs Cycle (slow glycolysis)
Beta-Oxidation

- Fatty acids are cleaved from triglycerides and metabolized in the mitochondria.
- End product is acetyl CoA, which then enters Krebs Cycle.
Protein Oxidation

• Amino acids can be glucogenic, ketogenic, or both

• During exercise the branched chain amino acids (leucine, isoleucine, and valine) are primarily oxidized
The EPOC Advantage

E.P.O.C.

- What is it?
  - Excess Postexercise Oxygen Consumption
- What does it mean E.P.O.C.?
  - Oxygen consumed to bring physiological variables to resting level
MRT, EPOC and Metabolism

- Can last for 72 hours or more post-workout amounting to an additional ~300 calories burned (Heden et al., 2011)
- Intensity of effort has greatest impact on EPOC
  - Greater effort equals greater EPOC (La Forgia et al., 2006)
The Hormonal Influence on EPOC

• Catecholamines
  – Responsible for liberating free fatty acids from adipocytes
  – Highly correlated with both magnitude and duration of EPOC (Imamura et al., 2004)

• Growth hormone (GH) has both anabolic and catabolic properties.
  – Facilitates lipolysis from adipocytes
  – Makes adipocytes more sensitive to catecholamines
  – Post-exercise fat utilization directly related to training-induced GH levels (Moller et al., 1992; Pritzlaff et al., 2000)
MRT and Fat Loss

• Resistance training can have an even greater impact on fat burning than aerobic exercise (Scott et al. 2011)
Key Point!

• Focus on Calories Burned, Not Fat!!!
  – The human body is a very dynamic organism and continually adjusts its use of fat for fuel (Sonko et al., 2005).
  – Fat burning must be considered over the course of an entire day — not on an hour to hour basis — to get a meaningful perspective on its impact on body composition (Hansen et al, 2005).
  – If you burn more carbohydrate during a workout, you inevitably burn more fat in the post-exercise period.
Benefits for Hypertrophy?

- MRT can enhance lactate clearance and reduce H+ accumulation (Hill-Haas et al., 2007; Edge et al., 2006)
  - Better inroading of muscle fibers at a given submaximal training intensity
MRT Principles of Practice

1. Work all the major muscles each session!
2. Pack more exercise into less time!
3. Speed up the positive
4. Accentuate the negative!
5. Train at near maximal levels of effort!
MRT Principle #1

• Work all the major muscles each session!
  – Focus on large muscle groups using multi-joint movements
    • The metabolic cost of an exercise is directly related to the amount of muscle worked (Elliot et al. 1992)
    • Train three, non-consecutive days a week (i.e. Monday, Wednesday, Friday) to optimize metabolic stress while allowing for adequate recuperation.
MRT Principle #2

• Pack more exercise into less time!
  – High repetitions (15-20 reps per set) have been shown to promote greater total energy expenditure than higher intensity lifts (>70% 1RM) (Scott et al., 2011)
  – Limiting rest intervals between sets (< 30 seconds) significantly increases caloric expenditure (Haltom et al., 1999).
MRT Principle #3

• Speed up the positive!
  – Perform concentric lifts explosively without getting sloppy (~1 sec).
    • Allows the use of a higher intensity of load at a given RM
  – “Superslow" training suboptimal from a metabolic perspective (Hunter et al., 2003).
MRT Principle #4

• Accentuate the negative!
  – Eccentric component found to be particularly beneficial in increasing EPOC
    • Using a 1 second up, 3 seconds down tempo increased post-exercise metabolic rate for 72 hours as opposed to only 15 hours for a 1:1 tempo (Dolezal et al., 2000)
    • Theorized that increased muscle damage associated with eccentric training requires greater energy consumption for post-exercise repair
MRT Principle #5

• Train at near maximal levels of effort!
  – Higher intensity of effort increases both calories burned during (Scott et al., 2011) and after (La Forgia et al., 2006) workout.
MRT Performance Strategies

- CIRCUIT TRAINING
- SUPERSETS
- COMBO TRAINING
Circuit Training Basics

• Defined as a series of exercises performed in succession with as little rest as possible.
  – The energy cost of a circuit training session has been estimated to be approximately 7 kcal/kg/hr (Wilmore et al., 1978).
  – Circuit training has greater effects on the magnitude and duration of EPOC than traditional forms of strength training (Murphy and Schwarzkopf, 1992).
Circuit Training: Key Point

• Limiting rest between sets more important for fat loss than amount of load
  
  – Circuit-style training at 50% of 1RM using 30 seconds rest between sets had greater effect on EPOC than a traditional training protocol using 80% 1RM with 120 seconds rest (Murphy and Schwarzkopf, 1992)
Circuit Training Specifics

- Set up exercise stations to work muscles in a push/pull fashion
- Start with upper body and proceed to the lower body
- Move from one exercise to the next with minimal rest (ideally < 10 seconds).
- Perform three circuits in total.
Circuit Training Video Example
## Sample Circuit Routine

<table>
<thead>
<tr>
<th>Exercise</th>
<th>Reps</th>
<th>Rest Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>DB Shoulder Press</td>
<td>~20</td>
<td>Minimal</td>
</tr>
<tr>
<td>Lat Pulldown</td>
<td>~20</td>
<td>Minimal</td>
</tr>
<tr>
<td>Close Grip Cable Row</td>
<td>~20</td>
<td>Minimal</td>
</tr>
<tr>
<td>Close Grip BB Incline Press</td>
<td>~20</td>
<td>Minimal</td>
</tr>
<tr>
<td>Wide Grip BB Row</td>
<td>~20</td>
<td>Minimal</td>
</tr>
<tr>
<td>DB Incline Press</td>
<td>~20</td>
<td>Minimal</td>
</tr>
<tr>
<td>Bulgarian Split Squat</td>
<td>~20</td>
<td>Minimal</td>
</tr>
<tr>
<td>Romanian Deadlift</td>
<td>~20</td>
<td>Minimal</td>
</tr>
<tr>
<td>Alternating Lateral Lunge</td>
<td>~20</td>
<td>Minimal</td>
</tr>
<tr>
<td>Hamstring Curl</td>
<td>~20</td>
<td>Minimal</td>
</tr>
</tbody>
</table>
Superset Basics

- Defined as two exercises performed one after the other without rest
  - Increases training density
  - Subjects performing supersets showed significantly greater energy expenditure compared with a traditional strength training protocol (Kelleher et al., 2010)

- Agonist/antagonist supersets
  - Shown to increase EPOC and result in greater total energy expenditure when compared to traditional strength training protocols (Kelleher et al., 2010).
  - Reciprocal innervation heightens force output
Superset Specifics

• Set up agonist/antagonist stations so that you are able to move quickly between exercises.
• Perform a set of the first exercise and then go directly to the second movement.
• Rest for approximately 30 seconds, and then perform two additional supersets.
• Once you finish, expeditiously proceed to the next agonist/antagonist pairing and so on until all muscle groups have been worked.
Superset Training Video Example
Combo Training (a.k.a. Supercircuit)

• Combination of resistance training and aerobic exercise

• Metabolic effects not well studied but preliminary evidence shows greater fat loss benefits compared to circuit training (Monteiro et al., 2008)

• Sound theoretical basis
  – Increased training density
Combo Training Specifics

• Perform a set of an exercise, follow it immediately with a short bout of moderate-intensity aerobics, and then repeat for another couple of sets.

• Once you perform three sets of an exercise, move to the next exercise as quickly as possible.
Combo Training Video Example
References

References (con’t)


Question/Answer

Thank you for coming!

I can be reached through my blog:

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