The Science and Application of HIIT Training

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GLOBAL HEALTH IS SUFFERING DUE TO LACK OF ACTIVITY AND OPTIMAL EXERCISE PRESCRIPTIONS
PHYSICAL ACTIVITY AND FITNESS CAN REDUCE THE RISK OF DISEASE AND IMPROVE SATISFACTION WITH DAILY LIFE
AMERICAN COLLEGE OF SPORTS MEDICINE EXERCISE GUIDELINES

<table>
<thead>
<tr>
<th>Exercise Level</th>
<th>Duration</th>
<th>Frequency</th>
<th>Exercises</th>
<th>Frequency</th>
<th>DURATION</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate</td>
<td>30 - 50 min</td>
<td>3 - 4 days/week</td>
<td>8 - 10</td>
<td>2 days/week</td>
<td>60 min</td>
<td>1 day/week</td>
</tr>
<tr>
<td>Vigorous</td>
<td>20 - 60 min</td>
<td>3 days/week</td>
<td></td>
<td></td>
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</tr>
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</table>
THERE IS AN OBVIOUS GAP IN THE CURRENT LITERATURE WITH RESPECT TO INTENSITY IN REDUCING DISEASE AND ENHANCING FITNESS.
WHAT
Definition:
Repeated bouts of short to moderate duration exercise completed at an intensity that is greater than the anaerobic threshold (Laursen & Jenkins 2002).

Efforts interspersed with brief periods of partial recovery, either low to moderate intensity activity or passive rest.
Purpose:
To perform significantly more total exercise time at a higher intensity than can be achieved using a continuous, steady state exercise (SSE) protocol.

Therefore, HIIE is considered a time-efficient training strategy to induce rapid adaptations in skeletal muscle and exercise performance that are comparable to traditional continuous endurance training (Gibala et al. 2006)
LES MILLS vs LES MILLS GRIT PLYO

- BODYATTACK
- BODYCOMBAT
- BODYPUMP
- RPM
- LES MILLS GRIT PLYO

WHY
WHAT
WHO
HOW
WHEN/WHAT/HOW?
RPM & SPRINT

The diagram shows the heart rate (bpm) over time, with different colored lines representing different intensity levels:
- 90-100% max
- 80-90% max
- 70-80% max
- 60-70% max
- 50-60% max

The x-axis represents time, and the y-axis represents heart rate (bpm). The graph provides a visual representation of heart rate variability during sprinting activities.
GET FIT WITH HIIT

PROTOCOL

RESULTS

ADHERENCE

INJURY

Gottschall, et al. 2014
GROUP
FIT
CONTROL (N=42)

GROUP
HIIT
EXPERIMENT (N=42)

PROTOCOL

3  2  1
2  2  2  2  1
RESULTS

VO2: 6.4%

BODY FAT: 2.0%

TRIGLYCERIDE: 16.9%
<table>
<thead>
<tr>
<th></th>
<th>FIT</th>
<th>HDL (mg/dL)</th>
<th>TRI (mg/dL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRIT</td>
<td>0.3</td>
<td>2.3</td>
<td>-3.3</td>
</tr>
<tr>
<td>difference</td>
<td>2.0</td>
<td></td>
<td>-16.9</td>
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</tbody>
</table>

blood sample
body composition

<table>
<thead>
<tr>
<th></th>
<th>FIT</th>
<th>mass (kg)</th>
<th>body fat %</th>
</tr>
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<tbody>
<tr>
<td>FIT</td>
<td></td>
<td>-0.4</td>
<td>-0.7</td>
</tr>
<tr>
<td>GRIT</td>
<td></td>
<td>-1.3</td>
<td>-2.0</td>
</tr>
<tr>
<td>difference</td>
<td></td>
<td>-0.8</td>
<td>-1.3</td>
</tr>
<tr>
<td></td>
<td>FIT</td>
<td>GRIT</td>
<td>difference</td>
</tr>
<tr>
<td>-------</td>
<td>-----</td>
<td>------</td>
<td>------------</td>
</tr>
<tr>
<td>leg (kg)</td>
<td>4.5</td>
<td>12.1</td>
<td>7.6</td>
</tr>
<tr>
<td>back (kg)</td>
<td>6.5</td>
<td>16.3</td>
<td>9.8</td>
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**strength**
fitness

FIT

GRIT

difference

$VO_2$ (ml/kg/min)

0.7

6.4

5.7
compliance rate was **97.7%**

less than 30 workouts missed for the 84 participants in 2772 sessions
PARTICIPANTS RATED THE TRAINING SESSIONS AS A POSITIVE EXPERIENCE

SATISFACTION WITH CHALLENGING INTENSITY
<table>
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<th>Difference</th>
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<td>$VO_2$ (ml/kg/min)</td>
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<td>4.1</td>
<td>3.6</td>
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fitness

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While these minimum guidelines are clearly described, there are currently no maximum guidelines, particularly with respect to high-intensity time and frequency, for the prevention of overtraining or functional overreaching.

maximum 90-100%

mins = OR

??? per wk
Overtraining syndrome (OTS) and functional overreaching (OR) are results of a combination between excessive load and inadequate recovery, which lead to symptoms related to stress and decrements in performance.

Insufficient evidence is available to determine whether a dose-response relationship exists between the quantity of high intensity interval training and functional overreaching for active adults.
BACKGROUND: Cortisol is a stress hormone produced in the adrenal gland (above kidney). It can help control blood sugar levels, regulate metabolism, reduce inflammation, and assist with memory formulation.

Short term elevation of cortisol with high intensity exercise can be beneficial to help the body repair, adapt, and grow stronger.

Long term elevation of cortisol with too much high intensity exercise can cause fatigue, joint pain, and mood disturbance.
Healthy response to a high intensity protocol with cortisol measured before exercise, after exercise, and after recovery.

Unhealthy response with elevated resting cortisol and reduced elevation after exercise indicating greater lifestyle stress or overtraining.
There is an optimal time per week of high intensity (90-100% maximum heart rate) training that will lead to greater variation in the production of stress hormones and reduced self-reporting of stress related feelings.
METHODS: participant characteristics

- **years**: 35.19 ± 9.52 years
- **kg**: 68.64 ± 12.84 kg
- **hours**: 9.01 ± 2.52 hours
- **meter**: 1.68 ± 0.09 meter
METHODS: Three weeks of typical training

<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exercise</td>
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<td>Exercise</td>
<td>Rest</td>
<td>Exercise</td>
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Polar A370, H10

- **Maximum**: 90-100%
- **Hard**: 80-90%
- **Moderate**: 70-80%
- **Light**: 60-70%

**kcal macro**

MyFitnessPal

**total mood**

POMS 40

**time quality**

Polar A370
METHODS: Two-bout, high intensity protocol with saliva collections.
RESULTS: The greatest hormonal response was measured in the participants who completed 30-40 minutes of high intensity training per week.
* indicates a significant difference from 30-40 min above 90%; p < 0.05
RESULTS: The greatest hormonal response was measured in the participants who completed 30-40 minutes of high intensity training per week.
RESULTS: Sleep quality was greatest for the participants who completed 30-40 minutes of high intensity training per week.
RESULTS: Total Mood Disturbance was minimal in the participants who completed 30-40 minutes of high intensity training per week.
RESULTS: Moderate negative correlation ($R = -0.404, p < 0.05$) between baseline cortisol and kilocalorie balance; greater cortisol when in energy deficit.

![Graph showing the relationship between baseline cortisol and kilocalorie balance](image-url)
CONCLUSION

Our data demonstrate that 30-40 minutes of high-intensity (90-100% maximum heart rate) training per week is a suggested range of cumulative time in order to prevent symptoms related to overreaching.

maximum 90-100%

+ mins

30-40 per wk

= maximum fitness & wellness
INTENSITY AWARENESS

When/What/How?

Recommended:
- 90-100%: 30-40 minutes in red zone per week
- 80-90%
- 70-80%: 150-200 minutes
- 60-70%
- Below 60%

5 - 9%
EXERCISE PRESCRIPTION

When/What/How?