Exercise Training Intensity based on a Maximal Exercise Test is Associated with Greater Gains in Functional Capacity during Cardiac Rehabilitation

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Background

• Exercise capacity is inversely associated with clinical outcomes in patients with cardiovascular disease (CVD)
  • Each 1 MET increase in exercise capacity is associated with a 15% decrease in all-cause mortality. (Keteyian, et al. 2008)
  • Patients exercising below 3.5 metabolic equivalents of task (METs) upon completion of cardiac rehabilitation (CR) represent a higher risk group with 1 and 3 year event rates of ≥7% and ≥18%, respectively (Brawner, et al. 2016)

• Improvements in exercise capacity are, in part, based on exercise intensity
Background

• Despite the recommendations to perform maximal exercise testing to guide exercise intensity in patients enrolled in CR, controversy still remains regarding practicality and necessity for such testing. (ACSM 2010; Balady, et al. 2007)

• Because of this, many programs utilize ratings of perceived exertion (RPE) alone
Exercise Testing in Patients With Heart Disease Who Participate in Exercise Training

POINT: High Quality or Just Average—The Need for Exercise Testing Before Cardiac Rehabilitation

Larry F. Hamm, PhD, ACSM-PD¹

COUNTERPOINT: All Patients Do Not Need an Exercise Test Before Starting Cardiac Rehabilitation

Timothy R. McConnell, PhD, ACSM-PD¹
Purpose

• Compare the change in exercise training workload (METs) during CR.
  • RPE alone versus target heart rate range (computed based on completion of a symptom limited exercise test)
Methods

• Patients participating in the Henry Ford Hospital CR program between 2013-2015 who completed ≥9 sessions

• 2 groups- Exercise guided by:
  • Target heart rate range from an exercise test
    • Set at 60-80% heart rate reserve
  • RPE alone
    • No exercise test
    • 11-14 on 6-20 Borg scale
Methods

• Absolute and % change in METs were calculated and used to define submaximal exercise training workload
  • Treadmill workloads at the start and exit from CR
    • Start: average of METs on sessions 2 and 3
    • Exit: average of METs on last 2 sessions

• Multiple linear regression was used to calculate change in METs adjusted for:
  • Age
  • Sex
  • METs at the start of CR
  • Number of CR visits
# Demographics

<table>
<thead>
<tr>
<th></th>
<th>Total (n= 809)</th>
<th>THRR (n= 308)</th>
<th>RPE only (n= 501)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>64 (48, 76)</td>
<td>65 (49, 77)</td>
<td>61 (47, 74)*</td>
</tr>
<tr>
<td>Women</td>
<td>35%</td>
<td>33%</td>
<td>36%</td>
</tr>
<tr>
<td>Primary Diagnosis</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CABG</td>
<td>18%</td>
<td>20%</td>
<td>39%</td>
</tr>
<tr>
<td>MI (no CABG)</td>
<td>38%</td>
<td>37%</td>
<td>39%</td>
</tr>
<tr>
<td>PCI (no MI or CABG)</td>
<td>14%</td>
<td>13%</td>
<td>15%</td>
</tr>
<tr>
<td>Valve only</td>
<td>7%</td>
<td>7%</td>
<td>7%</td>
</tr>
<tr>
<td>Heart failure only</td>
<td>15%</td>
<td>15%</td>
<td>15%</td>
</tr>
<tr>
<td>Medical therapy</td>
<td>9%</td>
<td>9%</td>
<td>9%</td>
</tr>
<tr>
<td>Total Visits</td>
<td>24 (12, 36)</td>
<td>24 (12, 36)</td>
<td>24(12,36)</td>
</tr>
<tr>
<td>Start METs</td>
<td>2.5 (1.8, 3.9)</td>
<td>2.4 (1.8, 3.4)</td>
<td>2.9 (2.1, 4.3)</td>
</tr>
</tbody>
</table>

Data are median (10th, 90th percentile) or % of group

*P<.05, THRR vs. RPE only
Results

MET training level upon entry and exit (unadjusted)

- **RPE (n=501)**
  - Entry: 2.5
  - Exit: 3.7

- **THRR (n=308)**
  - Entry: 3.1
  - Exit: 4.9

*P<0.05 within group
Results

Change in MET Training Level during CR

- RPE (n=501)
- THRR (n=308)

*p<0.05 (within group)
**p<0.001 (between groups)

Adjusted for age, sex, METs at the start of CR, Number of CR visits
Clinical Implications

• Higher exercise training workloads upon completion of CR associated with lower risk for all-cause mortality (Brawner, et al. 2016)

• Our data suggests that exercise intensity guided by THRR is associated with greater exercise training workloads
  • This requires a symptom-limited exercise test
    • There are challenges with getting an exercise test ordered for a CR patient

• No need to delay CR start to obtain exercise test
  • For each day after D/C a patient doesn’t begin rehab, there is a ~1% decrease in participation (Pack, et al. 2013)
Limitations

• Future work is needed to confirm these findings in other centers and other populations
• Retrospective study
• Other important co-variates may need to be considered in adjusted analysis
Conclusion

• Submaximal exercise training workloads significantly improved in both the THRR and RPE groups

• Improvement in exercise training was 55% greater among CR patients who guided exercise training using a target heart rate range derived from a symptom limited exercise test
Thank you for attending.

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