Compliance and Adherence During a 16-week High-Intensity Interval Training Program for Individuals with Paraplegia

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Abstract

Background
The Centers for Disease Control and Prevention (CDC) recommend ≥75 minutes of vigorous-intensity aerobic physical activity for individuals with spinal cord injury (SCI) per week to improve cardiometabolic outcomes. High-intensity interval training (HIIT) involves multiple short bursts of intense activity followed by recovery over a shortened duration, and has shown similar outcomes to longer duration, moderate-intensity activity for the able-bodied population. HIIT at-home may be a feasible program for individuals with paraplegia caused by SCI.

Objective
Implement at-home HIIT programming and assess compliance and adherence virtually for individuals with paraplegia.

Design
An at-home 16-week HIIT program using an arm cycle with mobile applications for data tracking and performance feedback.

Methods
An arm cycle, hydraulic table and heart rate monitor were delivered to participant’s home. Maximal exercise testing carried out on site at Mayo Clinic determined individualized targeted HR. HIIT programming was set at 3x/week for 24 minutes. 6x1-minute high-intensity intervals at 70% heart rate reserve (HRR) each followed by a 2-minute recovery interval (30% HRR).

Results
Average adherence for participants was 87% (range 38-100%). All participants were compliant in achieving 70% HRR within the training sessions at an average rate of 80%. Recovery targets were achieved 35% of the time.

Conclusions
HIIT was easily monitored by the study team. Participants achieved high adherence and compliance during the 16-week program likely due to reduced barriers including adaptive equipment provided in-home, motivational follow-along recordings and real time feedback from mobile applications.

Study Design: 16-week, in home program. Participants: Individuals with SCI below the 6th thoracic vertebrae and manual wheelchair users.

Home Setup

Exercise Prescription

The top dashed line represents the prescribed high-intensity target of 85% HRR, with the middle-dashed line representing the acceptable high-intensity threshold of 70% HRR, and bottom dashed line represents the recovery target of 30% HRR. Red/blue bold lines and gray error bars represent mean and standard deviation, respectively. (M = male, F = female, HRR = heart rate reserve)

Individial Compliance Data

<table>
<thead>
<tr>
<th>Participant</th>
<th>Attendance/Adherence</th>
<th>Intervals above 80%HRR, n (%)</th>
<th>Intervals above 70%HRR, n (%)</th>
<th>Intervals below 30%HRR, n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>100%</td>
<td>55 (50.0%)</td>
<td>252 (87.5%)</td>
<td>209 (71.4%)</td>
</tr>
<tr>
<td>P2</td>
<td>100%</td>
<td>253 (87.9%)</td>
<td>286 (99.3%)</td>
<td>87 (30.2%)</td>
</tr>
<tr>
<td>P3</td>
<td>96%</td>
<td>217 (78.6%)</td>
<td>269 (97.5%)</td>
<td>209 (71.4%)</td>
</tr>
<tr>
<td>P4</td>
<td>100%</td>
<td>177 (61.5%)</td>
<td>267 (97.2%)</td>
<td>55 (19.1%)</td>
</tr>
<tr>
<td>P5</td>
<td>81%</td>
<td>165 (70.5%)</td>
<td>205 (77.4%)</td>
<td>84 (35.9%)</td>
</tr>
<tr>
<td>P6</td>
<td>81%</td>
<td>26 (9.0%)</td>
<td>123 (42.7%)</td>
<td>130 (53.0%)</td>
</tr>
<tr>
<td>P7</td>
<td>100%</td>
<td>256 (89.4%)</td>
<td>284 (97.7%)</td>
<td>130 (53.0%)</td>
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<tr>
<td>P8</td>
<td>38%</td>
<td>33 (30.6%)</td>
<td>52 (48.2%)</td>
<td>31 (28.7%)</td>
</tr>
</tbody>
</table>

Mean ± SD 87 ± 20% 57 ± 28% 80 ± 21% 35 ± 23%

Most participants had high adherence to exercise. Several participants demonstrated increased ability to achieve their high-intensity HR target after the first few intervals and all participants were able to achieve 70% HRR or above the last half of the six high-intensity intervals. Conversely, participants were not able to lower their HR consistently following high-intensity bouts during the two-minute recovery.

Discussion

It is unclear whether recovery influences the achievement of subsequent high-intensity bouts. More work pertaining to interval timing, resulting in desired HRR is necessary to determine if HIIT is an effective and appropriate mode of exercise for individuals with SCI below T6.

Conclusions

The HIIT program was easily implemented at-home for our study population of individuals with SCI below the T6 level. Participants achieved high attendance and compliance within the 16-week program. HIIT is an independent, feasible long-term program for individuals with SCI below T6.

References


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