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The Timeline of Post Exertional Malaise in Myalgic Encephalomyelitis/Chronic Fatigue Syndrome

A thesis presented in partial fulfilment of the requirements for the degree of

Master
of
Sport and Exercise
in Exercise Prescription and Training

at Massey University, Manawatu, New Zealand

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2018
ABSTRACT

PURPOSE: To investigate the timeline of post-exertional malaise (PEM) using objective and subjective measures in Myalgic encephalomyelitis/chronic fatigue syndrome (ME/CFS). The primary aim was to determine whether PEM extends beyond 24-hours, and if a 48-hour or 72-hour repeated exercise protocol would provide additional information as a diagnostic tool. The secondary aim was to analyse subjective patterns of fatigue during PEM.

METHODS: Sixteen ME/CFS and 16 age and gender matched controls participated in the study. Participants were randomly assigned to either a 48-hour or 72-hour repeated cardiopulmonary exercise test protocol on a cycle ergometer. Objective measures were recorded at anaerobic threshold (AT), respiratory exchange ratio (RER) and maximal exercise. All ME/CFS participants recorded their subjective fatigue 7-days prior to and 10-days post exercise utilising the daily diary of fatigue.

RESULTS: Results from the 48-hour and 72-hour protocol indicated no decline in functional capacity in any group across days. There was a significant increase in workload and %VO2max at AT within the 72-hour ME/CFS group only. Subjective timelines of fatigue showed significant differences between the 48-hour and 72-hour protocol, with the 48-hour ME/CFS group taking significantly longer to recover (mean 11 days) than the 72-hour ME/CFS group (mean 5 days). Conversely, both control groups were recovered in less than a day. However, there was high variation across measures of subjective fatigue among ME/CFS participants.

CONCLUSIONS: The results of this study further support the use of 24-hour repeated protocols to determine functional decline during PEM. Results also provide new information regarding a potential improvement in function 72-hours after an initial exercise bout in ME/CFS. Subjective results indicate no identifiable pattern in relation to subjective fatigue during PEM. Future research should focus on a larger clinical trial to further understand the implications and consistency of the data from this study.
ACKNOWLEDGEMENTS

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<table>
<thead>
<tr>
<th>A</th>
<th>AT</th>
<th>Anaerobic threshold</th>
</tr>
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<tbody>
<tr>
<td>B</td>
<td>BMI</td>
<td>Body mass index</td>
</tr>
<tr>
<td></td>
<td>bpm</td>
<td>Beats per minute</td>
</tr>
<tr>
<td></td>
<td>BP</td>
<td>Blood pressure</td>
</tr>
<tr>
<td>C</td>
<td>CBT</td>
<td>Cognitive behavioural therapy</td>
</tr>
<tr>
<td></td>
<td>cm</td>
<td>Centimetres</td>
</tr>
<tr>
<td></td>
<td>CO₂</td>
<td>Carbon Dioxide</td>
</tr>
<tr>
<td></td>
<td>CFS</td>
<td>Chronic Fatigue Syndrome</td>
</tr>
<tr>
<td></td>
<td>CCC</td>
<td>Canadian consensus criteria</td>
</tr>
<tr>
<td></td>
<td>CTRL</td>
<td>Controls</td>
</tr>
<tr>
<td>G</td>
<td>GET</td>
<td>Graded exercise therapy</td>
</tr>
<tr>
<td>H</td>
<td>HR</td>
<td>Heart rate</td>
</tr>
<tr>
<td></td>
<td>HR&lt;sub&gt;max&lt;/sub&gt;</td>
<td>Heart rate max</td>
</tr>
<tr>
<td>I</td>
<td>ICC</td>
<td>International consensus criteria</td>
</tr>
<tr>
<td>K</td>
<td>Kg</td>
<td>Kilograms</td>
</tr>
</tbody>
</table>
M
m Metres
ME Myalgic Encephalomyelitis
ml.kg.min\(^{-1}\) Millilitres per kilogram per minute
MS Multiple Sclerosis
mmHg Millimetres of mercury

P
PEM Post-exertional malaise

R
RER Respiratory exchange ratio
RPM Revolutions per minute
RPE Rating of perceived exertion

S
SD Standard deviation

V
\(V_E\) Minute ventilation
\(\text{VO}_2\) Oxygen consumption
\(\text{VO}_2\text{max}\) Maximal oxygen uptake
VT Ventilatory Threshold

W
W Watts