

# Statement about ME/CFS\* and Exercise

Prepared for Health Care Providers, Welfare Assessors, and Insurance Assessors  
by Dr Lynette Hodges, 2<sup>nd</sup> September 2021

\* Myalgic Encephalomyelitis /Chronic Fatigue Syndrome

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## INTRODUCTION

There is good evidence in the scientific literature for a positive relationship between exercise and the management and prevention of disease, as well as for reducing risk factors for chronic conditions. However, individuals with ME/CFS have consistently reported symptom exacerbation (post-exertional malaise, PEM) following exercise. PEM is a cardinal symptom for ME/CFS and often presents with a delay between the triggering exercise and the resulting symptom. This effect is not seen in other conditions.

Over the last six years Dr Hodges has been involved in research within New Zealand, and internationally, to examine the effects of exercise on the physiological system in individuals with ME/CFS.

## OVERVIEW

Hodges' findings from repeat cardiopulmonary exercise testing (CPET) studies validate patient reports of deterioration following exercise<sup>1 2 3</sup>. These findings have been replicated by others<sup>4 5</sup>.

Until recently, Graded Exercise Therapy (GET) was recommended for ME/CFS. However, this advice was based on studies that: one, did not select participants according to current diagnostic criteria; two, did not require presence of PEM; and three, were poorly designed and rated 'low to very low' quality evidence by NICE<sup>6</sup>. Most patients either report no effect or negative effects from GET<sup>7 8</sup>.

Previous recommendations for GET for people with ME/CFS have been reversed by:

- National Institute for Health and Care Excellence (NICE) (UK) draft guidance<sup>9</sup>
- Centre for Disease Control and Prevention (CDC) (US)<sup>10</sup>

Based on what is currently known about the abnormal physiological response to exertion in ME/CFS, it is not appropriate to prescribe GET. Advice on managing activity in people with ME should be based on the following considerations:

- Activities of daily living may already reach the individual's tolerable exertion level or may in fact exceed it.
- Patients may wish to consider monitoring and recording heart rate and blood pressure regularly whilst completing simple tasks, along with keeping a record of symptoms of PEM, to better understand their limits.
- Any treatment that triggers PEM should be avoided.
- While some mildly affected individuals may be able to complete exercise, they should still avoid triggering PEM. CPET can differentiate the people that may be able to exercise, compared to those that perhaps cannot exercise due to cardiovascular impairment. However, in the case of ME/CFS it is important to note that CPET in routine clinical practice is not recommended, due to the risk of elevated ME/CFS symptoms. CPET is especially unsuitable for more severe patients.

## EXPLANATION OF CARDIOPULMONARY EXERCISE TESTING

In the fields of exercise science and medicine, cardiopulmonary exercise testing (CPET) is considered the gold standard for measuring and evaluating functional capacity. Position statements and/or guidelines for the performance of this testing are available from the American College of Sports Medicine, American Heart Association, and American Thoracic society amongst others. All endorse this method of testing and acknowledge peak oxygen consumption, only available with CPET, as the most accurate measurement of functional capacity.

Cardiorespiratory fitness is related to the ability to perform large-muscular, dynamic, moderate to high intensity exercise for prolonged periods. Performance depends on the functional state of the respiratory, cardiovascular, and musculoskeletal systems. A low level of cardiorespiratory fitness is associated with increased risk from premature death from all causes, but specifically from cardiovascular disease.

CPET measurements include peak oxygen consumption, carbon dioxide production, minute ventilation along with heart rate, blood pressure and workload at ventilatory threshold, which cannot be manipulated by test subjects adjusting their level of effort.

The following measures are provided by CPET:

- Peak oxygen uptake is accepted as the criterion measure but is limited by heart rate and stroke volume.
- Anaerobic threshold can be determined using the V-slope method.
- The American College of Sports Medicine has a criteria to assess maximal exercise performance. A peak RER (Respiratory Exchange Ratio)  $\geq 1.10$  is considered an indication of excellent patient effort.
- RPE (Rating of Perceived Exertion) is a valuable indicator for monitoring an individual's subjective level of exertion. Borgs RPE scale (6-20) was developed to allow the exercising individual to subjectively rate his or her feelings during exercise, and takes into account personal fitness level, environmental conditions and general fatigue. During exercise testing, the RPE can be used as an indication of impending fatigue. Most individuals reach their subjective limit of fatigue at an RPE of 17 to 19 (very, very hard) on the Borg scale. RPE is used to monitor progress towards maximal exertion during exercise testing.

For ME/CFS, repeat CPET testing is required as the aim is to establish the effect of exercise (day 1) on future function (day 2).

## RESULTS OF EXERCISE TESTING STUDIES IN ME/CFS

### Two-day repeat CPET

Dr Hodges initial research examined repeated cardiopulmonary exercise tests (CPET) separated by 24 hours in individuals with ME/CFS. Individuals performed a cycle ergometer exercise test on a Lode with a 15 W/min ramping protocol. Expired gases were collected for determination of oxygen consumption, carbon dioxide production and pulmonary ventilation using an online metabolic analyser. Heart rate was monitored using a Polar heart rate monitor. Blood pressure was measured at rest and during the exercise test using a manual sphygmomanometer. Appropriate measures were taken, to calibrate and test the accuracy and reliability of the testing equipment on all testing days.

The study examining two-day repeated cardiopulmonary exercise testing (Hodges et al., 2018)<sup>1</sup> demonstrated that (refer Table 1: CPET testing data):

- There was a difference in both peak  $\text{VO}_2$  and workload in those with ME/CFS compared to healthy controls.
- Individuals with ME/CFS saw a reduction in workload at peak exercise and at the anaerobic threshold between day one and day two's exercise test, despite a similar reading in  $\text{VO}_2$  peak across both days. These findings were recently backed up by Lim et al, 2020<sup>4</sup>, who conducted a meta-analysis of two day repeat CPET testing in ME/CFS and healthy controls.
- A reduction in power output on day two of the repeat test 24 hours following initial testing can be one of the defining findings in those with ME/CFS.
- Peak heart rate is reduced to 80-85% of age-predicted maximal heart rate in individuals with ME/CFS

### Conclusion:

Exercise such as performed during CPET by people with ME/CFS on day 1 leads to reduced physical function on day 2.

Table 1: CPET testing data

	Hodges et al., 2018		Lim et al., 2020	
	ME/CFS	Healthy control	ME/CFS	Healthy control
VO <sub>2</sub> peak day 1 (ml.kg.min <sup>-1</sup> )	24.95 +/- 8	31.99 +/- 10.88	24.5 +/- 6.6	29.3 +/- 7.1
VO <sub>2</sub> peak day 2 (ml.kg.min <sup>-1</sup> )	26.27 +/- 7.78	33.06 +/- 12.5	23.1 +/- 5.7	29.6 +/- 7.7
Peak workload day 1 (W)	135 +/- 43	167 +/- 40	133 +/- 40	165 +/- 36.2
Peak workload day 2 (W)	126 +/- 45W	164 +/- 40	126 +/- 41	169 +/- 38.4
VO <sub>2</sub> peak at AT day 1 (ml.kg.min <sup>-1</sup> )	20.95 +/- 4.32	23.55 +/- 8.99	15.5 +/- 3.8	17.6 +/- 4.5
VO <sub>2</sub> peak at AT day 2 (ml.kg.min <sup>-1</sup> )	22.22 +/- 6.19	28.45 +/- 12.5	14.4 +/- 3.8	18.9 +/- 5.4
Workload at AT day 1 (W)	105 +/- 30	119 +/- 28	75 +/- 26	88 +/- 23
Workload at AT day 2 (W)	93 +/- 37	132 +/- 42	61 +/- 26	94 +/- 27

Notes:

- Energy expenditure at, or close to the anaerobic threshold, represents vigorous activity which can only be sustained for short periods of time.
- The International Labor Organization regards 30% or less of maximal oxygen consumption (VO<sub>2</sub> max) as the threshold for acceptable physiological demands over an 8-hour work day. This would suggest a threshold of 7.49 ml.kg.min<sup>-1</sup> for ME/CFS compared to 9.6 ml.kg.min<sup>-1</sup> for healthy control.
- The estimated oxygen requirement for seated office or computer work is 5.25 ml.kg.min<sup>-1</sup>. For normal office tasks, the energy cost rises to 10.5 ml.kg.min<sup>-1</sup>, which could be near to some individuals' anaerobic threshold.
- Energy expenditures at or close to the anaerobic threshold level will likely result in symptom exacerbation and delayed recovery. Therefore, activities such as getting ready for bed (8.05 ml.kg.min<sup>-1</sup>) or dressing (8.75 ml.kg.min<sup>-1</sup>) may also be above the safe level, and the person with ME/CFS may find that symptoms of PEM are experienced after completing these simple everyday tasks.
- The large majority of individuals with ME/CFS may experience symptoms of post-exertional malaise for activities such as showering (7.0 ml.kg.min<sup>-1</sup>) or making the bed (11.6 ml.kg.min<sup>-1</sup>).
- A study examining how these daily tasks contribute to PEM is well overdue and should use the compendium of physical activity<sup>11</sup>.

**Other Studies**

There are many exercise studies in the scientific literature for ME/CFS. However, when using or reviewing these studies it is important to consider the criteria used to select participants. It is well known that the Fukuda case definition (1994) may not select participants that experience PEM and may represent a more general group. Look for studies that have used the Canadian Consensus Criteria (CCC 2003), the International Consensus Criteria (ICC 2011) and/or the Institute of Management criteria (IOM 2015).

**EXERCISE/ACTIVITY AND ME/CFS**

Is exercise safe and effective for anyone with ME/CFS?

Certainly, we have seen that:

- Negative physiological changes occur after exercise.
- Daily activities, such as showering or desk work, may be difficult or impossible.
- Cognitive performance is also impacted after exercise.
- A study examining how daily tasks contribute to PEM is well overdue.

**Recommendations for health professionals supporting people with ME/CFS:**

- Validate the patient's experience of PEM.

- Actively avoid any treatments that trigger PEM.
- Support patients' efforts should they choose to monitor the impacts of daily activities and any exercise they feel able to include (through monitoring heart rate, and optionally blood pressure and /or oxygen levels).
- Recognise that there is a spectrum of symptom severity in ME/CFS. It is likely that some but not all individuals may tolerate formal exercise programmes.
- A two-day CPET exercise test can show an individual where they are at in terms of their peak oxygen consumption levels, heart rate and anerobic threshold. Although risky, the CPET can be useful when assessing the contribution of everyday tasks to PEM. However, there is significant risk of elevated PEM symptoms and is unsuitable for most patients as they may take weeks or months to return to baseline.
- Refer to recognised guidelines for pacing /activity management.<sup>12 13</sup>

## References:

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- <sup>2</sup> Bond. J., Nielsen. T., Hodges. L.D. (2021). Effects of Post-Exertional Malaise on Markers of Arterial Stiffness in Individuals with Myalgic Encephalomyelitis/Chronic Fatigue Syndrome. *Environmental Research and Public Health*. <https://doi.org/10.3390/ijerph18052366>
- <sup>3</sup> Hodges. L.D., Nielsen, T., Cochrane. D., Baken. D. (2020). The physiological time line of post-exertional malaise in Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS). *Translational Sports Medicine*. <https://doi.org/10.1002/tsm2.133>
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- <sup>5</sup> [ME/CFS-GET-Letter-to-Health-Care-Providers-v4-30-2.pdf \(workwellfoundation.org\)](#)
- <sup>6</sup> NICE Evidence Review Pg 317 <https://www.nice.org.uk/guidance/GID-NG10091/documents/evidence-review-7>
- <sup>7</sup> <https://meassociation.org.uk/wp-content/uploads/NICE-Patient-Survey-Outcomes-CBT-and-GET-Executive-Summary-from-Forward-ME-03.04.19.pdf>
- <sup>8</sup> [https://www.researchgate.net/publication/216572185\\_Reporting\\_of\\_Harms\\_Associated\\_with\\_Graded\\_Exercise\\_Therapy\\_and\\_Cognitive\\_Behavioural\\_Therapy\\_in\\_Myalgic\\_EncephalomyelitisChronic\\_Fatigue\\_Syndrome](https://www.researchgate.net/publication/216572185_Reporting_of_Harms_Associated_with_Graded_Exercise_Therapy_and_Cognitive_Behavioural_Therapy_in_Myalgic_EncephalomyelitisChronic_Fatigue_Syndrome)
- <sup>9</sup> NICE Guideline Draft: ME/CFS: diagnosis and management <https://www.nice.org.uk/guidance/indevelopment/gid-ng10091>
- <sup>10</sup> <http://www.virology.ws/2017/07/10/trial-by-error-the-cdc-drops-cbtget/> and <https://www.cdc.gov/me-cfs/healthcare-providers/clinical-care-patients-mecfs/treating-most-disruptive-symptoms.html>
- <sup>11</sup> [https://cdn-links.lww.com/permalink/mss/a/mss\\_43\\_8\\_2011\\_06\\_13\\_ainsworth\\_202093\\_sdc1.pdf](https://cdn-links.lww.com/permalink/mss/a/mss_43_8_2011_06_13_ainsworth_202093_sdc1.pdf)
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