

Editorial

Prolonged Abnormal Effects of Exercise in Myalgic Encephalomyelitis and Chronic Fatigue Syndrome

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Abstract

Exercise, especially exercise programs, has various beneficial health effects. However, in the case of Myalgic Encephalomyelitis and chronic fatigue syndrome physical exertion can induce prolonged negative effects on the patient's condition (post-exertional "malaise"). The exacerbation of symptoms after exercise can plausibly be explained by exertion-induced abnormalities in ME/CFS.

In order to unravel the pathophysiology and to protect the patients' from iatrogenic harm of exercise regimes, it is essential to assess and diagnoses patients objectively.

Keywords: Myalgic Encephalomyelitis; Chronic Fatigue Syndrome; Exercise Therapy; Assessment; Diagnosis

Abbreviations:

ME: Myalgic Encephalomyelitis;
CFS: Chronic Fatigue Syndrome;
IL: Interleukin

Introduction

Exercise has several well-known beneficial health effects [1,2] and various authors have proposed that exercise therapy (GET), often combined with cognitive behavioral therapy (CBT), improves the status of patients with ME and CFS [3-5].

By definition, all patients with ME [6] and a subgroup of pa-

tients with the diagnosis CFS [7] experience post-exertional malaise: a long-lasting exacerbation of typical symptoms, e.g. muscle weakness and cognitive impairment, after minor exertion.

The Effects of Exercise on Symptoms in ME and CFS

Not surprisingly, a minor exertion, e.g. cardiopulmonary exer-

cise test, can cause durable negative effects on the symptoms in ME/CFS (as is illustrated in Table 1).

Table 1. Effects of exertion on symptoms in ME/CFS.

Symptom	References
“ Fatigue ”	[8-10]
(Muscle) Weakness	[8, 11, 12]
Pain	[8, 9, 13]
Cognitive dysfunction	[14-16]

Exercise-Induced Abnormalities in ME/CFS

Although contradicted by some studies, several studies have observed (long-lasting) aberrations in ME/CFS induced by minor exertion (see Table 2). Some of these studies, e.g. [17-20], revealed distinct patient subgroups, which is likely due to the heterogeneity of the CFS patient population [21]. A recent study [22] subjected skeletal muscle cell cultures to electrical pulse stimulation for 24 hours to examine for exercise-related changes. The researchers found four abnormalities: elevated myogenin expression in the basal state, diminished release of IL-6 during differentiation, and impaired activation of AMP-activated protein kinase and glucose uptake in response to exercise. Glucose uptake responded to insulin in ME/CFS, implicating an exercise-related defect. Post-exertional muscle weakness/pain, with long-lasting “recovery” times, is an unique and distinctive characteristic of ME [6].

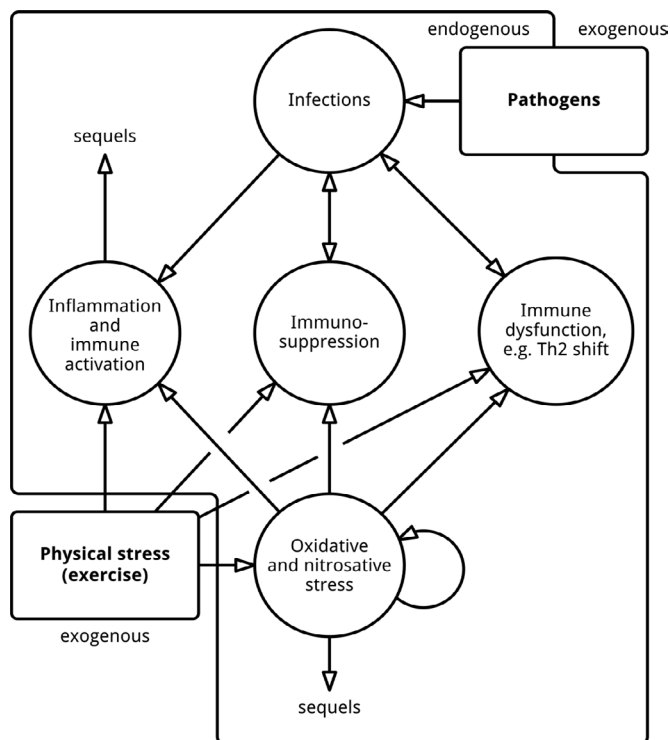
Table 2. Exertion-Induced Abnormalities in ME/CFS.

Abnormalities	References
Immunological effects	[10,23-26]
Oxidative and nitrosative stress	[19,27-30]
Exercise capacity	[31-34]
Metabolic abnormalities	[17,35-37]
Cerebral perfusion and oxygenation	[38,39]
Pain sensitivity and pain processing	[10,20,40-42]

A Plausible Explanation for Post-Exertional in ME/CFS

Although the etiology and pathophysiology is still unclear, there is ample evidence that (chronic/reactivating) infections, immunological abnormalities (inflammation, immune activation, immune dysfunction and immunosuppression) and elevated oxidative and nitrosative stress are central elements in the pathophysiological explanation of ME/CFS [21,43-45]. Since exercise induces inflammation, immune dysfunction, immunosuppression and oxidative and nitrosative stress [1,2], it is conceivable that exercise amplifies pre-existing abnormalities in ME/CFS (Figure 1), which is illustrated by several observations summarized in Table 2.

Figure 1. The potential effects of exercise in ME/CFS.



Discussion

Due to its enigmatic character, there is controversy about ME and CFS, which includes the nature of the symptoms [43,46] the etiology [43,47], the pathophysiology [48,49] and proposed effective behavioral interventions, including CBT/GET [3-5,50].

A key symptom of ME [6] is post-exertional malaise, including (long-lasting) post-exertional muscle weakness and muscle pain. By definition post-exertional malaise present in a subgroup of CFS [7] patients. Due to the heterogeneity of the CFS patient population, and use of subjective measures to diagnoses patients and to assess the effects of proposed therapies, the debate has continued for decades.

Post-exertional malaise in ME/CFS is accompanied by various exercise-induced abnormalities, which could account for the (prolonged) effects of exertion on the symptoms in ME/CFS, and rationally explains “avoidance behavior” in ME/CFS [51].

Conclusion

Exercise has various beneficial well-known effects on the health status. However, in the case of ME (always) and CFS (often) physical exertion induces post-exertional “malaise”: a prolonged aggravation of characteristic symptoms, e.g. cognitive impairment, and muscle weakness. The increase of these symptoms after exercise can plausibly be explained by various

exertion-induced abnormalities in ME/CFS.

In order to unravel the pathophysiology and to protect the patients' from iatrogenic harm of exercise regimes, it is essential to assess and diagnose patients objectively.

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