Exercise Induced Fatigue- Physiological Mechanisms

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Objectives:

1. The student will understand the basic concepts of exercise induced fatigue
2. The student will acquire knowledge about the mechanisms that determine fatigue
3. The student will acquire skills of assessing research quality in the area of fatigue

Course Program:

#	Topic	References
1	Different definitions for fatigue The discovery of lactate, the relationships between lactate, O2 and fatigue	[1,2]
2	Different definitions for fatigue The discovery of lactate, the relationships between lactate, O2 and fatigue	[1,2]
3	Hill's theory of fatigue	[3–6]
4	Hill's theory of fatigue	[3–6]
5	Newer approaches to the effects of lactate on fatigue	[3]
6	Newer approaches to the effects of lactate on fatigue	[3]
7	Involvement of the brain in fatigue	[7]
8	Involvement of the brain in fatigue	[7]
9-10	The central governor model of fatigue	[2,8,9]
11	presentations	
12	presentations	

13	presentations	
14	The central governor model of fatigue	[2,8,9]

Short Course Description:

The course will include 14 sessions, each addressing a specific topic. The course will be taught in both class and online materials and tasks for practice and self-evaluation. Some of the study materials will available in the on-line modules, and will be discussed and exercised in class sessions.

Student Workload

30 contact hours + home workload 5 ECTs

Student Obligations:

1. To read the online materials addressed in all online modules
2. To report to the online tasks
3. To write a report about the content and practical applications of a research paper
4. To present a research article in class

Assessment Criteria:

1. 50 % final examination
2. 25 % online assignments
3. 25% class presentation

References:

1. Ferguson BS, Rogatzki MJ, Goodwin ML, Kane DA, Rightmire Z, Gladden LB. Lactate metabolism: historical context, prior misinterpretations, and current understanding [Internet]. European Journal of Applied Physiology. Springer Berlin Heidelberg; 2018. doi:10.1007/s00421-017-3795-6

2. Noakes TD. Fatigue is a brain-derived emotion that regulates the exercise behavior to ensure the protection of whole body homeostasis. Front Physiol. 2012;3 APR: 1–13. doi:10.3389/fphys.2012.00082

3. Cairns SP, Inman LAG, MacManus CP, van de Port IGL, Ruell PA, Thom JM, et al. Central activation, metabolites, and calcium handling during fatigue with repeated maximal isometric contractions in human muscle. Eur J Appl Physiol. 2017;117: 1557–1571. doi:10.1007/s00421-017-3640-y

4. Hostrup M, Bangsbo J. Limitations in intense exercise performance of athletes - effect of speed endurance training on ion handling and fatigue development. J Physiol. 2017;595: 2897–2913. doi:10.1113/JP273218

5. Fitts RH. The cross-bridge cycle and skeletal muscle fatigue. J Appl Physiol. 2008;104: 551–558. doi:10.1152/japplphysiol.01200.2007

6. Juel C. Changes in interstitial K^+ and pH during exercise: implications for blood flow regulation. Appl Physiol Nutr Metab. 2007;32: 846–851. doi:10.1139/H07-065

7. Gandevia SC. Spinal and supraspinal factors in human muscle fatigue. Physiol Rev. 2001;81: 1725–89. Available: http://www.ncbi.nlm.nih.gov/pubmed/11581501

8. Rattray B, Argus C, Martin K, Northey J, Driller M. Is it time to turn our attention toward central mechanisms for post-exertional recovery strategies and performance? Front Physiol. 2015;6: 79. doi:10.3389/fphys.2015.00079

9. Swart J, Lamberts RP, Lambert MI, St Clair Gibson A, Lambert E V, Skowno J, et al. Exercising with reserve: evidence that the central nervous system regulates prolonged exercise performance. Br J Sports Med. 2009;43: 782–788. doi:10.1136/bjsm.2008.055889