



UNIVERSITY OF PÉCS  
MEDICAL SCHOOL



# Sport-specific Injury Prevention

Prevention of overtraining, non-functional overreaching in elite sports



**PTE553**

Eva Tékus PhD

Fall semester, 2024, Pécs

<http://potecho.pte.hu>



## Requirements

- 25 % absence is allowed (attendance record)
- Examination: written test (simple choice, true false questions)

Lessons:

- 10/09/2024
- 17/09/2024
- 24/09/2024
- 01/10/2024

Room: SIOT1047

Result of the test (%)	Grade
100-85	5
84-75	4
74-65	3
64-50	2
0-49	1

Presentations: POTEPEDIA, homepage of Sports Medicine Center (Educational materials)

# Definition of overreaching and overtraining

**Overreaching:** accumulation of training load that leads to performance decrements and requiring days to weeks for recovery. Overreaching followed by appropriate rest can lead to performance increases. Types: functional, non-functional

**Overtraining:** if overreaching is extreme and combined with an additional stressor, overtraining syndrome (OTS) may result.

Term	Synonym	Definition	Performance Decrement	Outcome
Functional overreaching	Short-term overreaching	Increased training leading to a temporary performance decrement and with improved performance after rest	Days to weeks	Positive (super-compensation)
Nonfunctional overreaching	Long-term overreaching	Intense training leading to a longer performance decrement but with full recovery after rest; accompanied by increased psychologic and/or neuroendocrinologic symptoms	Weeks to months	Negative due to symptoms and loss of training time
Overtraining syndrome		Consistent with extreme nonfunctional overreaching but with (1) longer performance decrement (> 2 months), (2) more severe symptomatology and maladapted physiology (psychologic, neurologic, endocrinologic, immunologic systems), (3) and an additional stressor not explained by other disease	Months	Negative due to symptoms and possible end to athletic career

Reference: Kreher, J. B., & Schwartz, J. B. (2012). Overtraining syndrome: a practical guide. *Sports health*, 4(2), 128–138.  
<https://doi.org/10.1177/1941738111434406>

## Epidemiology of overtraining syndrome

### ❖ **OTS extremely rare!**

- ❖ **NFO prevalence elite runners ~60%, amateur female runners 33% (Morgan et al., Int J Sports Med. 1987; 8:124-131.)**
- ❖ **Multi-country study: 35% of adolescent swimmers had been “overtrained” at least once (Raglin et al., Pediatr Exerc Sci. 2000;12:61-70.).**
- ❖ **15% of British elite athletes had OTS (Koutedakis et al., Clin J Sport Med. 1998;8(1):18-21.).**
- ❖ **elite adolescent athletes, ~30% reported NFO at least once in their careers. was More common: in individual sports, females, and elite athletes. (Matos et al., Med Sci Sports Exerc. 2011;43(7):1287-1294.)**

NFO - nonfunctional overreaching

OTS – overtraining syndrome



## Symptoms of overtraining syndrome (ECSS)

### Main clinical symptoms:

- ❖ Prolonged loss of performance and fatigue
- ❖ Psychological and hormonal deviations (e.g. lack of motivation)
- ❖ Loss of appetite, weight loss
- ❖ Sleep disorders...
- ❖ Frequent upper respiratory tract infections (URTI)

References: Kreher, J. B., & Schwartz, J. B. (2012). Overtraining syndrome: a practical guide. *Sports health*, 4(2), 128–138.

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Matos, N. F., Winsley, R. J., & Williams, C. A. (2011). Prevalence of nonfunctional overreaching/overtraining in young English athletes.

*Medicine and science in sports and exercise*, 43(7), 1287–1294. <https://doi.org/10.1249/MSS.0b013e318207f87b>

## Symptoms of overtraining syndrome (ECSS)

Parasympathetic Alterations <sup>a</sup>	Sympathetic Alterations <sup>b</sup>	Other
Fatigue	Insomnia	Anorexia
Depression	Irritability	Weight loss
Bradycardia	Agitation	Lack of mental concentration
Loss of motivation	Tachycardia	Heavy, sore, stiff muscles
	Hypertension	Anxiety
	Restlessness	Awakening unrefreshed

<sup>a</sup>More common in aerobic sports.

<sup>b</sup>More common in anaerobic sports.

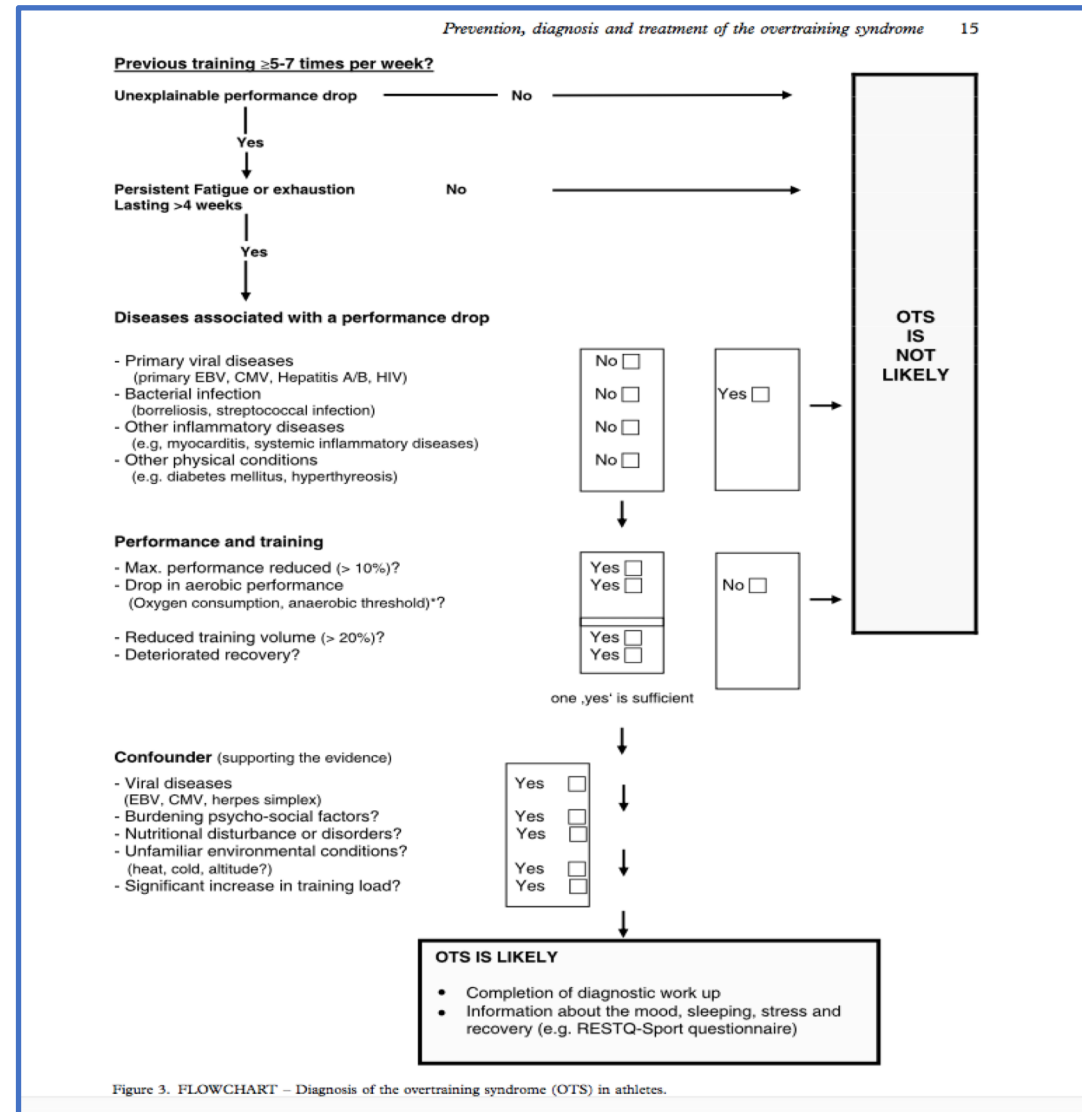
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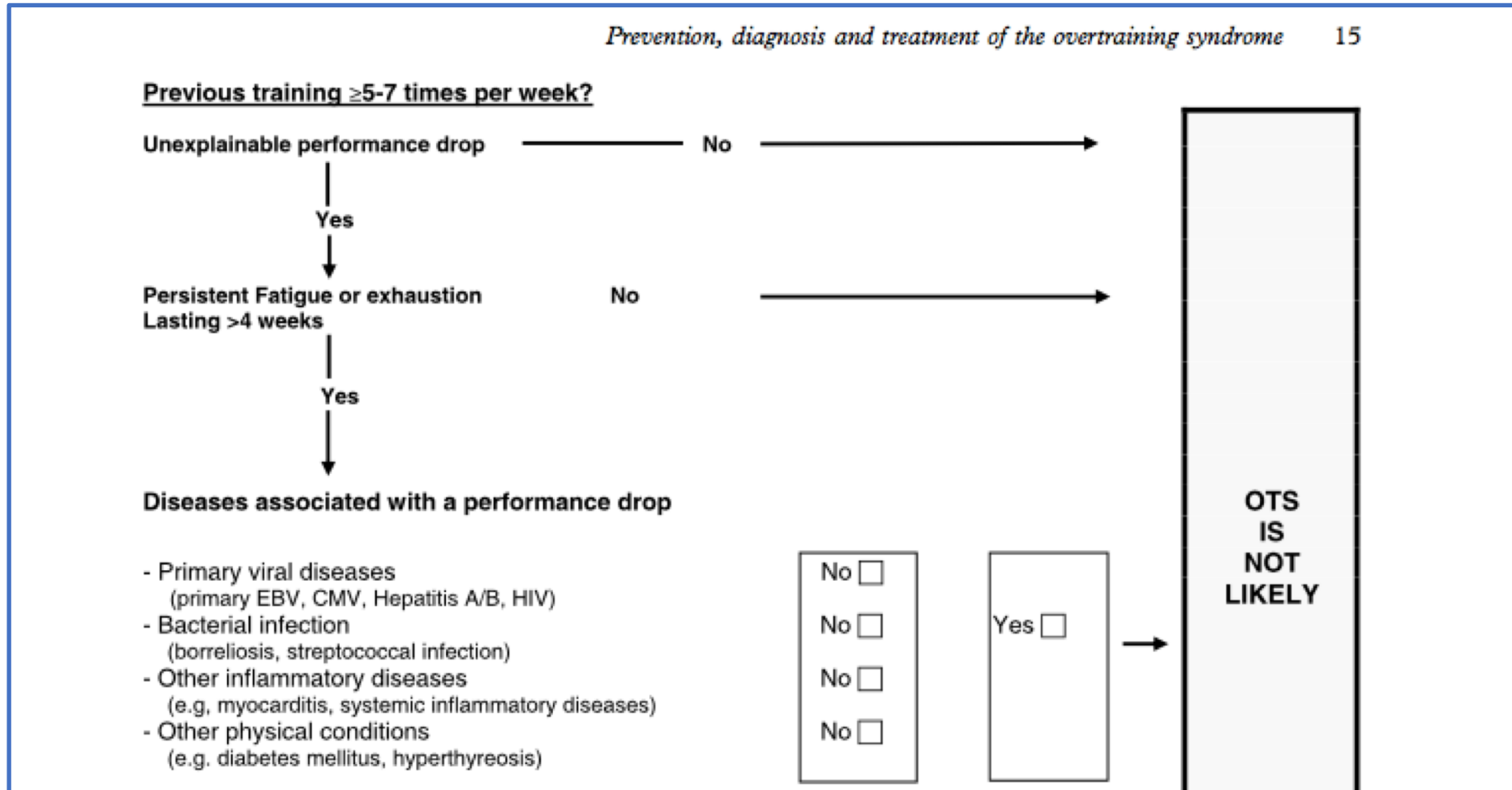
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# Identification of overtraining syndrome (ECSS, ACSM)



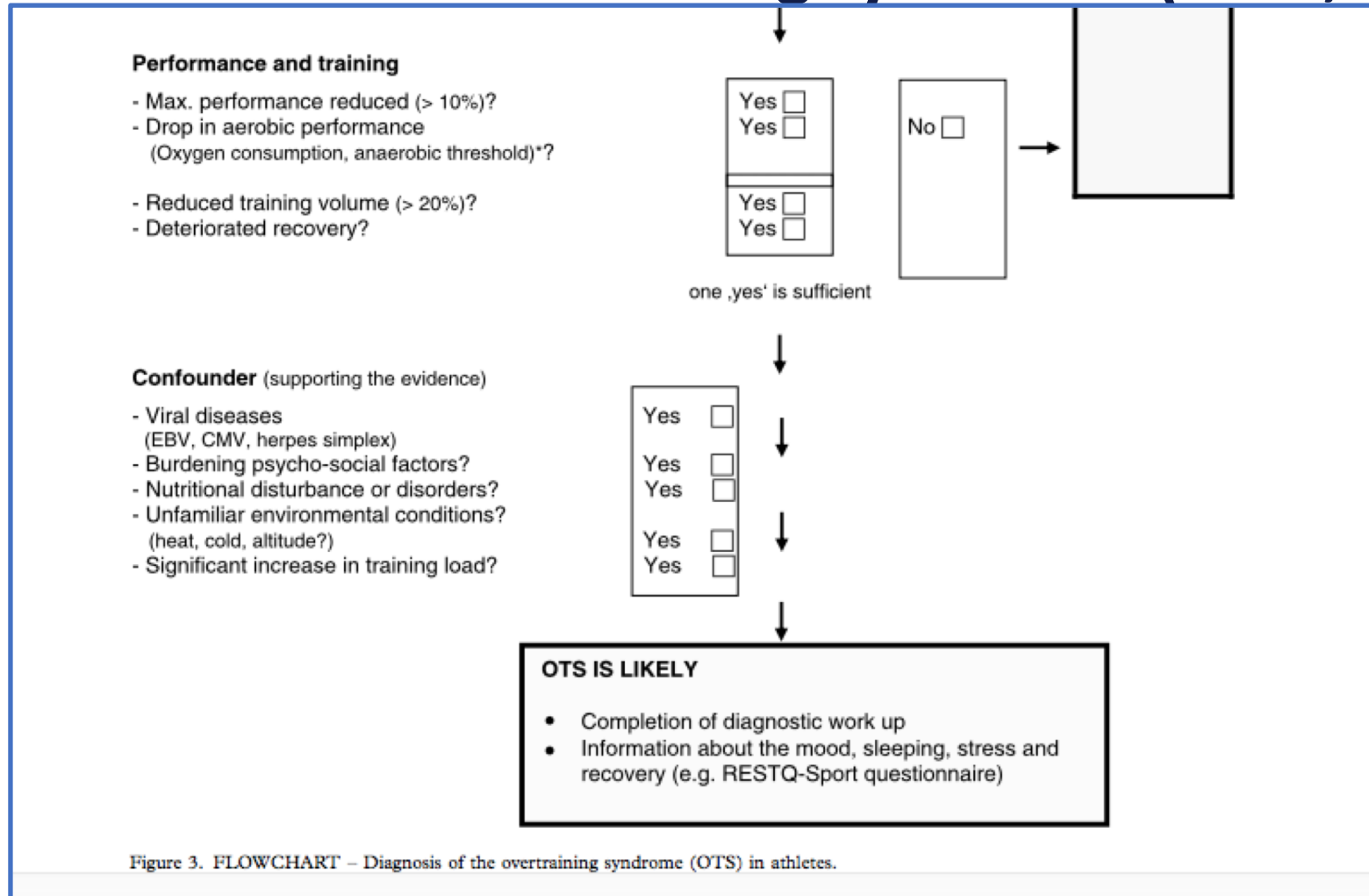
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## Prevention of overtraining syndrome (ECSS, ACSM)

1. Maintain accurate **records** of performance during training and competition. Adjust daily training intensity/volume, or allow a day of complete rest, when performance declines.
2. Always **individualize** the intensity of training.
3. Avoid excessive **monotony** of training.
4. Encourage and regularly reinforce optimal nutrition, hydration status and sleep.
5. Be aware that multiple stressors (such as sleep disturbance, environmental stressors, and interpersonal or family difficulties) may add to the stress of physical training
6. **Treat the OTS with rest!** Reduced training may be sufficient for recovery overreaching.
7. Resumption of training should be individualized on the basis of the signs and symptoms.
8. **Communication** with the athletes is important (about their physical, mental and emotional concerns)
9. **Psychological questionnaires** is necessary to evaluate the emotional and psychological state of the athlete-
10. Maintain confidentiality each athlete's condition (physical, clinical and mental)
11. Regular **health checks** performed by a multidisciplinary team (physician, nutritionist, psychologist etc)
12. Allow the athlete time to recover after illness/Injury.
13. Athlete should be encouraged to suspend training or reduce the training intensity when suffering from an infection.
14. Always exclude an organic disease in cases of performance decrement.
15. Unresolved viral infections are not routinely assessed in elite athletes, but it may be worth investigating this in individuals experiencing fatigue and underperformance in training and competition.

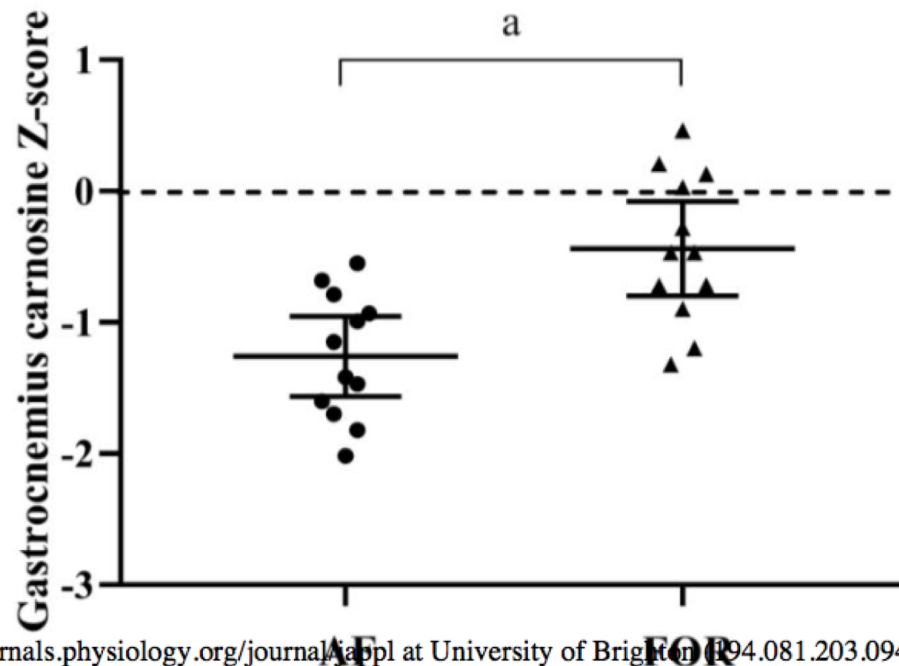
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## Consequences of overreaching and overtraining

- **Short-term consequences are known.**
- **Long-term consequences of repeated non-functional overreaching and overtraining?**

## Results of recent researches I.

Middle-distance runners (n=25) performed overload training for 3 weeks. Muscle fiber type ratio correlates with overreaching.



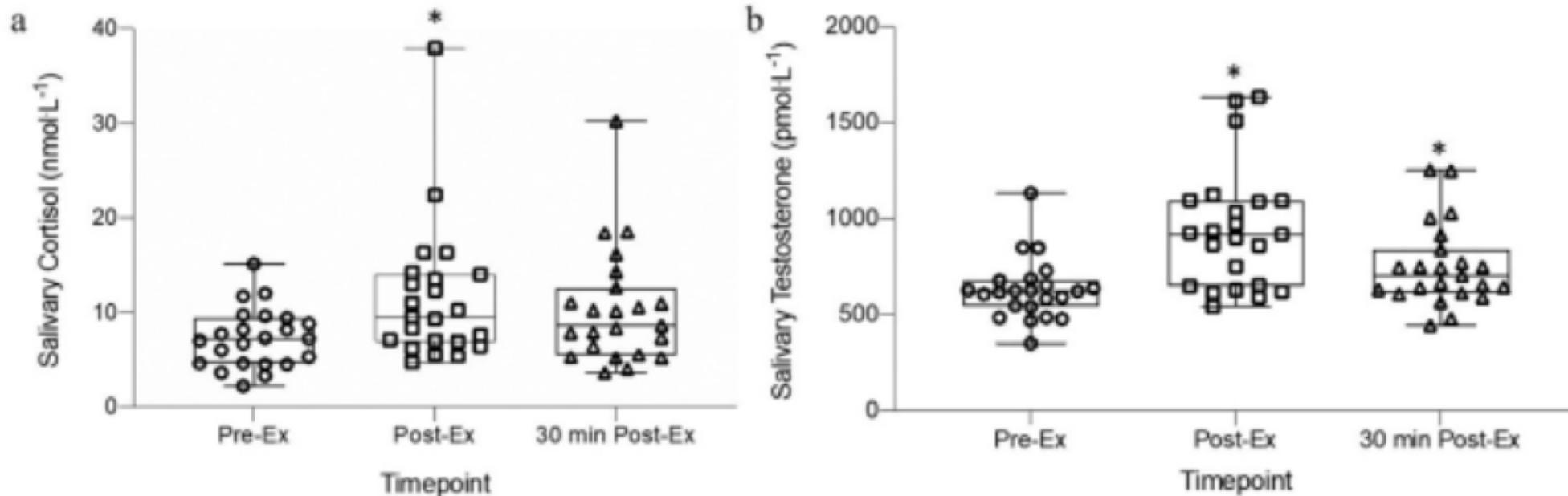
Higher type II muscle fiber ratio can cause a higher chance of FOR.

urnals.physiology.org/journal/jappl at University of Brighton (194.081.203.094)



## Results of recent researches II.

Salivary testosterone and cortisol levels increase after high-intensity exercise among cyclists. They can be good markers of overreaching.



References: Hough, J., Leal, D., Scott, G., Taylor, L., Townsend, D., & Gleeson, M. (2021). Reliability of salivary cortisol and testosterone to a high-intensity cycling protocol to highlight overtraining. *Journal of Sports Sciences*, 1–7. doi:10.1080/02640414.2021.1918362

## Short summary



<https://www.youtube.com/watch?v=xhVzoENkVNs>



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# Thank you for your attention!



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