

# Opponent's review of the Master thesis

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Title: **Exploring Heart Rate Recovery as an Aerobic Fitness Indicator in Elite Athletes**  
Author: Bc. Zhaoyan Lu  
Supervisor: Doc. Jiří Baláš, Ph.D.  
Opponent: Doc. PaedDr. Tomáš Malý, Ph.D.

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The presented work on the topic of „ Exploring Heart Rate Recovery as an Aerobic Fitness Indicator in Elite Athletes “ contains 47 pages of text, the totally 66 of sources used, the work is supplemented by appendices containing list of tables and list of figures. I missing the approval of the ethics committee and informed consent in the thesis.

In the introduction of the thesis there is an acknowledgement for the supervisor, but there should have been also an acknowledgement for the workplace and the people where the work was carried out.

The student chose interesting topic for his work, the aim of which was „ to investigate the potential of HRR as an indicator of aerobic fitness in elite athletes, hypothesizing a significant correlation between HRR and aerobic fitness variables in elite athletes. This topic is a current and very important for athletes in terms of better understanding and load management in athletes (especially in soccer players, where character of activity is intermittent).

The work has a standard structure – 8 main chapters - which is in accordance with the rules for diploma theses.

Theoretical background contains two main sections and ten subsections.

The student describes the heart rate parameters (monitoring, heart rate recovering, applied heart rate in soccer and triathletes) and aerobic fitness variables (oxygen consumption, maximal oxygen consumption, ventilatory treshold and percentage of VO<sub>2</sub>max at VT<sub>2</sub>).

In this passage I would like to more focus for current knowledges in this area with addressing to level of importance for both, science and clinicial practice. Anyway, student addressed the theoretical background more generaly, but with support of relevant sources.

I have one commnets in introduction regarding the definition/justification of „maximal exercise“: Page 13 „Bentley et al., (2020) investigated the effects of chronic endurance training by HRR following maximal exercise in 36..” Can you clarify, what does it mean please?

The objective of the research is formulated correctly. For the hypotheses, I would expect the assumptions to be broken down into individual parts.

Since you looked at 2 different sports with different loading patterns (soccer: intermittent loading, triathlon: continuous loading), on what basis did you assume the same relationships between aerobic capacity and HRR?

Methodological procedures are reported in Chapter 4, and written briefly, but all clearly and comprehensibly with possibility of full replication.

Regarding methodology I have just two comments:

- i) Why does the methodology specify an inclusion criterion of 16 to 28 years of age (Page 20)?
- ii) How did you check “smoke” as exclusion criteria in elite and youth athletes?

The results are presented in chapter 5, they are briefly described and also presented in clear Tables and figure.

The results are formulated correctly and clearly. I have several comments or questions:

- i) I would like to ask the author why he used absolute values for recovery (HRR) and not relative (%HRR) (Table 2)?
- ii) What explains the significance of the recovery in the first minute and not in the second and third minute?
- iii) what explains the significant difference in VO<sub>2</sub>max between youth and adult soccer players?

The discussion is the content of chapter 6. The discussion is written on only three pages, and I consider this passage to be the weakest part of the entire thesis due to its brevity. I expected more discussion in terms of comparison with similar research and also author’s own opinions. On the other hand, the author states the correct limits of the work and the orientation for further research.

Page 33. Why chapter 6.1 why is the title “personal factors”? Did you compare individual, or group differences?

Page 35. You reported following text: “However, triathletes daily train at 78% under VT1, 4% between VT1 and VT2 and 18% over VT2 (Seiler, 2010) to perform a better...” It should be better written, because it seems that triathletes don’t have a days-off in weekly schedule.

The formal side of the thesis is very good.

## Conclusion

The student fulfilled the goals he set for himself with the submitted work. Despite the above mentioned comments, the presented work meets the standard requirements for diploma theses. I therefore recommend that the commission for state final examinations accept Bc. Zhaoyan Lu's diploma thesis for defense.

Suggested classifications: very good – excellent (base on author’s defending)

Defense question:

- i) explain how (based on what) your outcomes should be beneficial for research or clinical practitioners?
- ii) How we can help athletes with recovery in training and post training?

In Prague June 7, 2024

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