

Physiology

- ◆ Ondřej Sitek
 - ◆ ondrasitek@mail.muni.cz
- ◆ Jakub Mazúr
 - ◆ jakubmazur@mail.muni.cz
- ◆ (Both A34 / door 208)
- ◆ Thursdays 9.00–10.40
- ◆ Seminar room 203 (Laboratory room 130)

Course 2

- ◆ Compulsory attendance at the lectures (up to 2 excused absences),
- ◆ active participation during the lectures,
- ◆ final test (Jan 2021).

Recomm

- ◆ BERNACIKOVÁ, Martina. *Physiology*. Brno: Masarykova univerzita, 2012. ISBN 978-80-210-5844-6,
- ◆ MCARDLE, William D., Frank I. KATCH & Victor L. KATCH. *Exercise physiology: energy, nutrition, and human performance*. 6th ed. Philadelphia: Lippincott Williams & Wilkins, 2007. xxi, 1068 p. ISBN 9780781749909,
- ◆ *Sport and exercise physiology testing guidelines: the British Association of sport and exercise sciences guide*. Edited by Edward M. Winter. 1st ed. London: Routledge, 2007. 364 p. ISBN 9780415361415,
- ◆ WILMORE, Jack H., David L. COSTILL & W. Larry KENNEY. *Physiology of sport and exercise*. 4th ed. Champaign, Ill.: Human Kinetics, 2008. xvii, 574 p. ISBN 9780736055833,
- ◆ MCARDLE, William D., Frank I. KATCH & Victor L. KATCH. *Essentials of exercise physiology*. Fifth edition. Philadelphia: Sage, 2016. xx, 702 p. ISBN 9781496309099.

1. Introductory seminar
2. Anthropometry (body height, weight, skinfolds) + Somatotype
3. Skeletal muscle + Nervous system
4. Metabolism + Energy + Basal metabolism
5. Cardiovascular system + Blood pressure + Heart rate
6. Respiratory system + Spirometry
7. Cardiovascular and respirational adaptations
8. Thermoregulation
9. Endocrine glands and their hormones
10. Anaerobic and Aerobic ability (W170, Wingate test)
11. Ventilatory threshold (Conconi test)
12. Spiroergometry (aerobic capacity, maximum oxygen uptake)
13. Reserve lecture (revision, protocols check, extra topic)
14. Final lecture, test

Some re

- ◆ Practical character of the most lectures – please come in aware, representative and comfortable state and clothing
 - ◆ Anthropometry, stress tests, et cetera
- ◆ The last 3 lectures are physically demanding (yet fun), get yourselves ready



AN INTRODUCTION TO EXERCISE AND SPORT PHYSIOLOGY



Learning

- ◆ Learn to differentiate exercise physiology and sport physiology.
- ◆ Note the differences between acute responses to exercise and chronic adaptations to training.

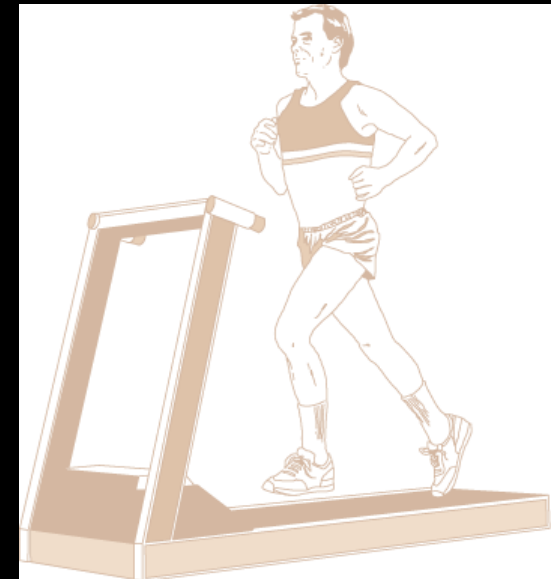
Learning

- ◆ Learn what factors affect the body's acute response to exercise.
- ◆ Understand the six basic principles of training.
- ◆ Learn whether cross-sectional studies or longitudinal studies are more accurate.

Exercise Physiology vs Sport Physiology

Exercise physiology studies how the body's structures and functions are altered when exposed to acute and chronic bouts of exercise.

Sport physiology applies exercise physiology concepts to an athlete's training and performance.



Acute Responses vs Chronic Adaptations

Acute responses to training involve how the body responds to one bout of exercise.

Chronic physiological adaptations to training mark how the body responds over time to the stress of repeated exercise bouts.



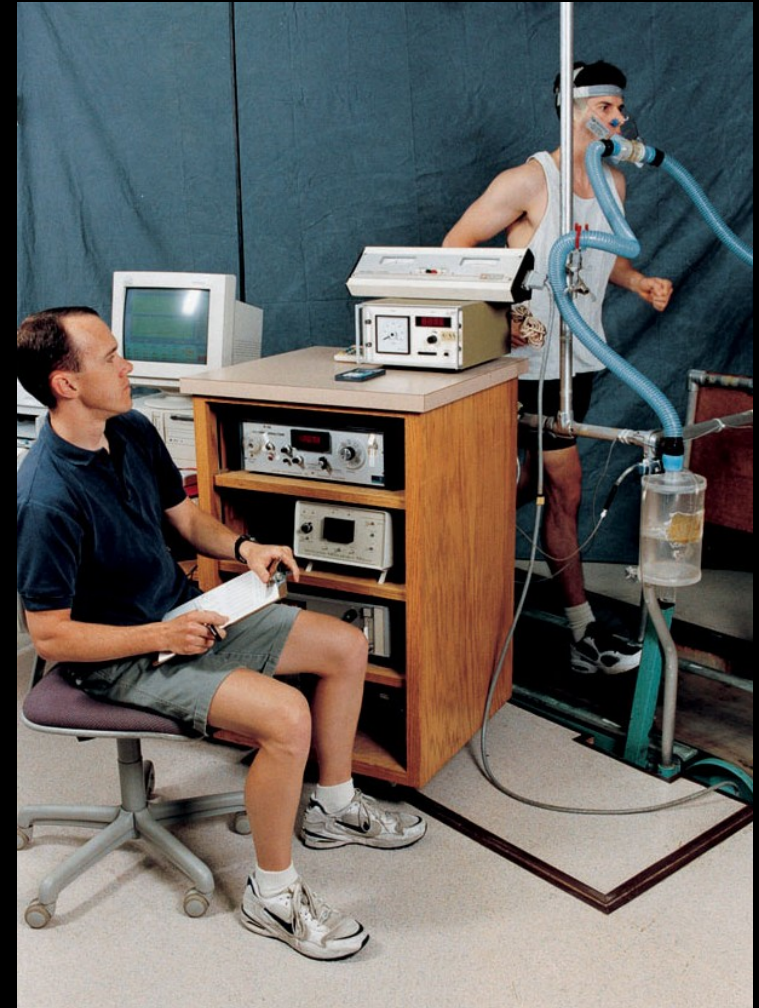
Cycle Ergometer

- ◆ Makes it easier to assess blood pressure and collect blood because upper body is relatively immobile
- ◆ Results are not greatly affected by body weight or changes in body weight



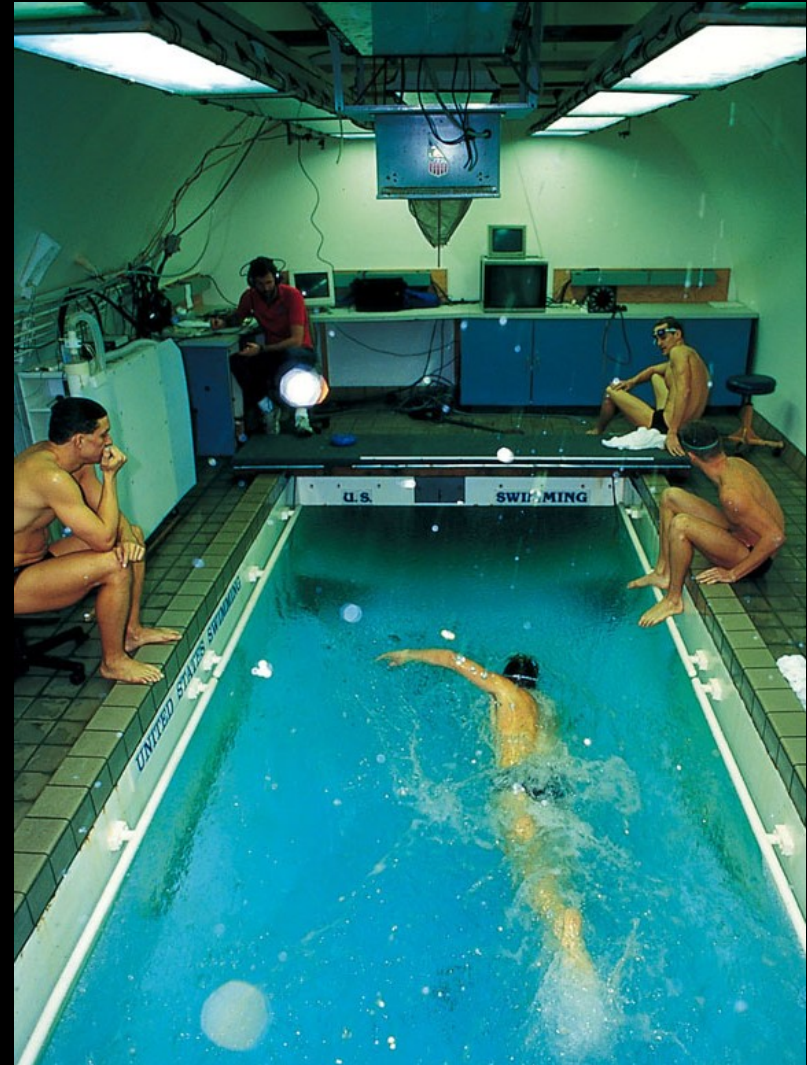
Treadmill

- ◆ Results in generally higher maximal physiological values—heart rate, ventilation, and oxygen uptake—than cycle ergometer



Swimming Flume

- ◆ Allows swimmers to closely simulate their natural swimming strokes while researchers collect data



Acute Responses to Exercise

- ◆ Control environmental factors such as temperature, humidity, light, and noise.
- ◆ Account for diurnal cycles, menstrual cycles, and sleep patterns.
- ◆ Use ergometers to measure physical work in standardized conditions.
- ◆ Match the mode of testing to the type of activity the subject usually performs.

Basic Training Principles

Individuality—Consider the specific needs and abilities of the individual.

Specificity—Training adaptations are highly specific to the type of activity and the volume and intensity of training.

Disuse—Include a program to maintain fitness.

Progressive overload—Increase the training stimulus as the body adapts.

Hard/easy—Alternate high-intensity with low-intensity workouts.

Periodization—Cycle specificity, intensity, and volume of training.

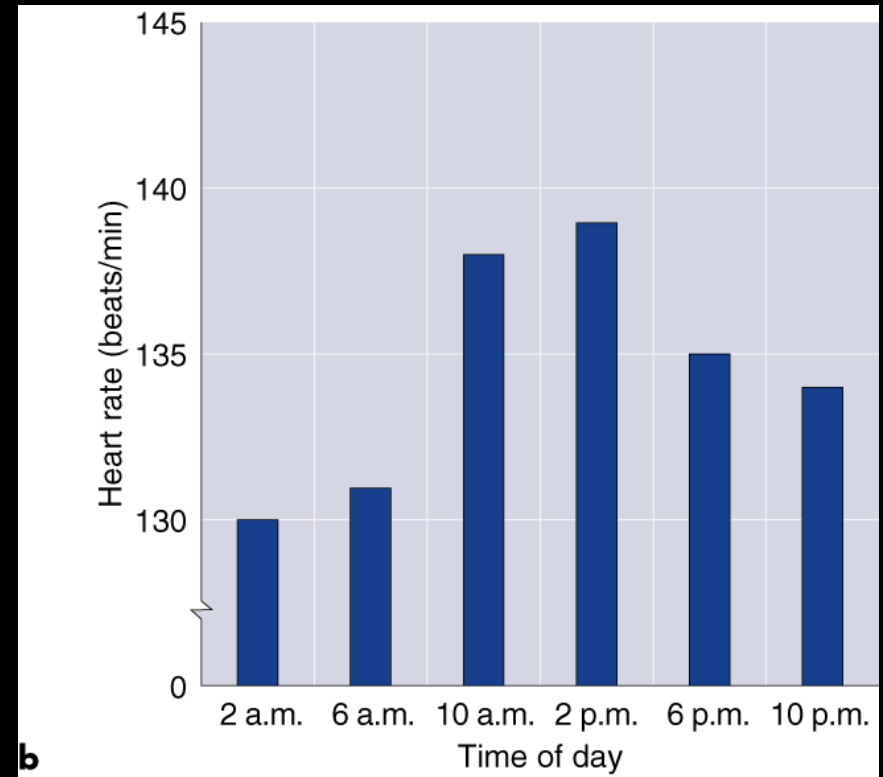
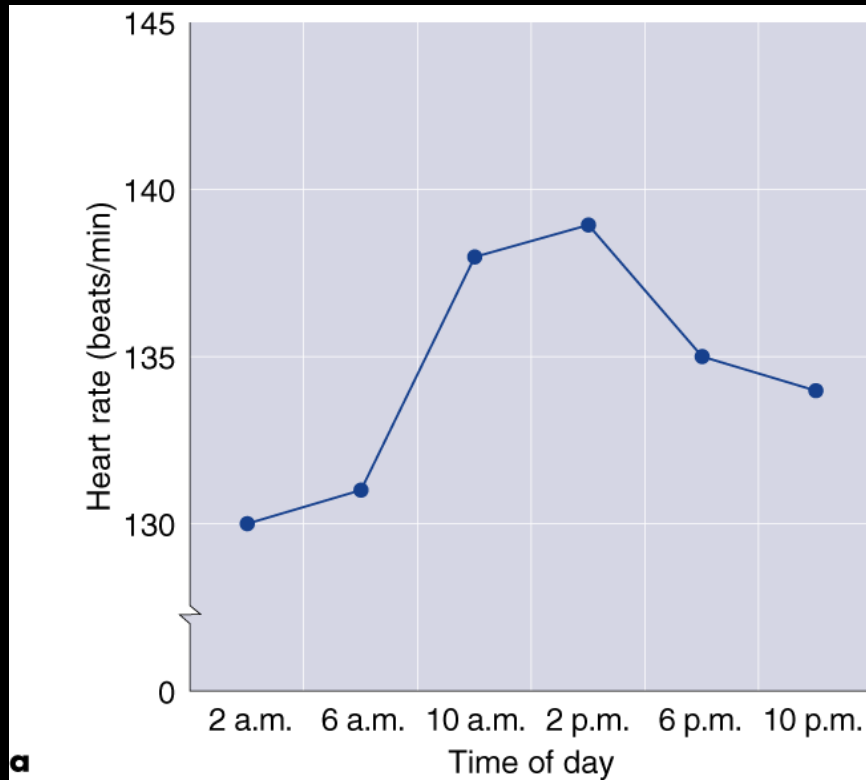


An Example of Diurnal Variations in Heart Rate at Rest and During Exercise

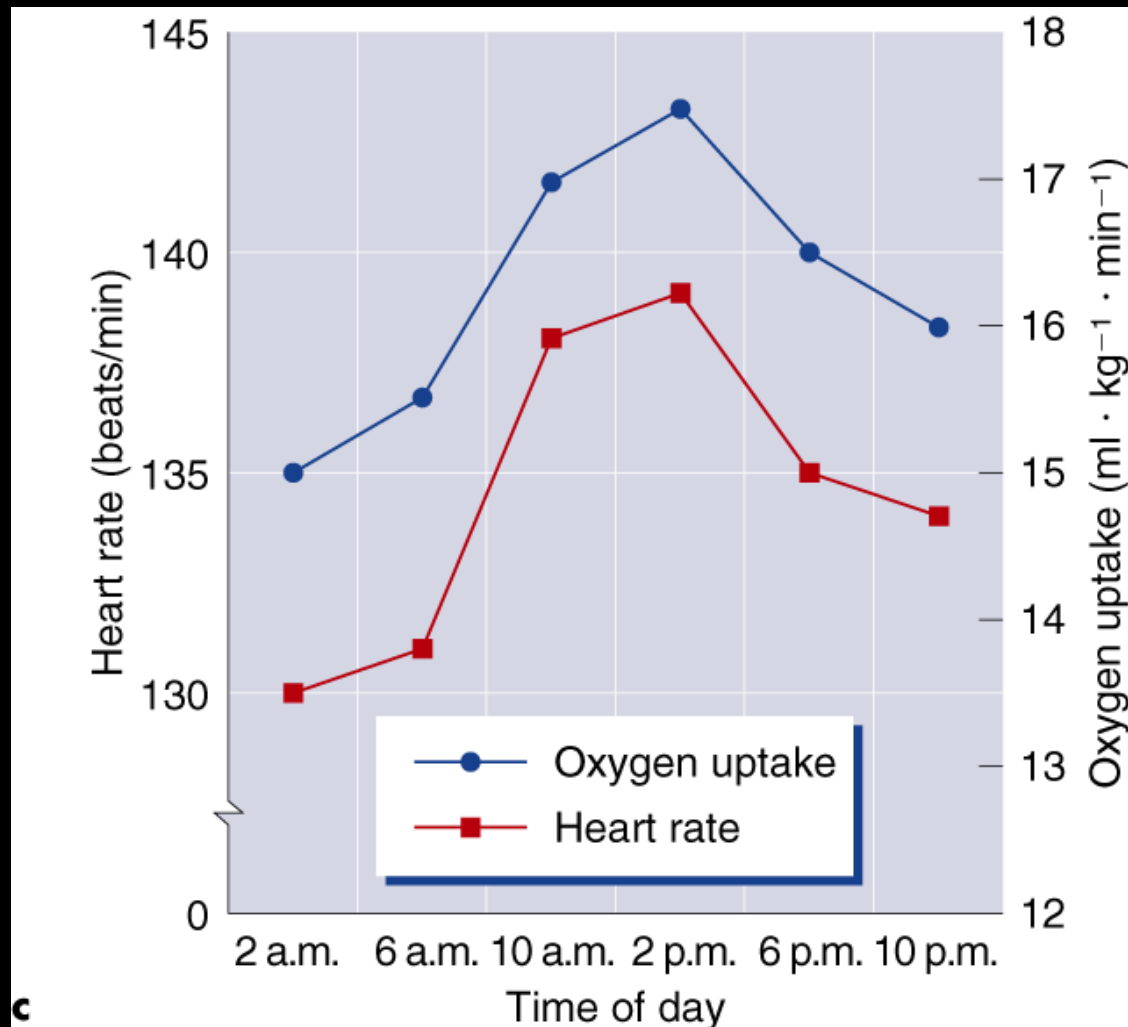
Condition	Time of day					
	2 a.m.	6 a.m.	10 a.m.	2 p.m.	6 p.m.	10 p.m.
Resting	65	69	73	74	72	69
Light exercise	100	103	109	109	105	104
Moderate exercise	130	131	138	139	135	134
Maximal exercise	178	178	181	181	181	181
Recovery 3 min	118	122	129	128	128	125

Data from Reilly and Brooks (1990).

READING AND INTERPRETING GRAPHS



READING AND INTERPRETING GRAPHS



c

Research Methodology

- ◆ Longitudinal research tests the same subjects and compares results over time.
- ◆ Cross-sectional research collects data from a diverse population and compares the data for each group in that population.
- ◆ Longitudinal studies are often more accurate than cross-sectional studies, but they can't always be done.

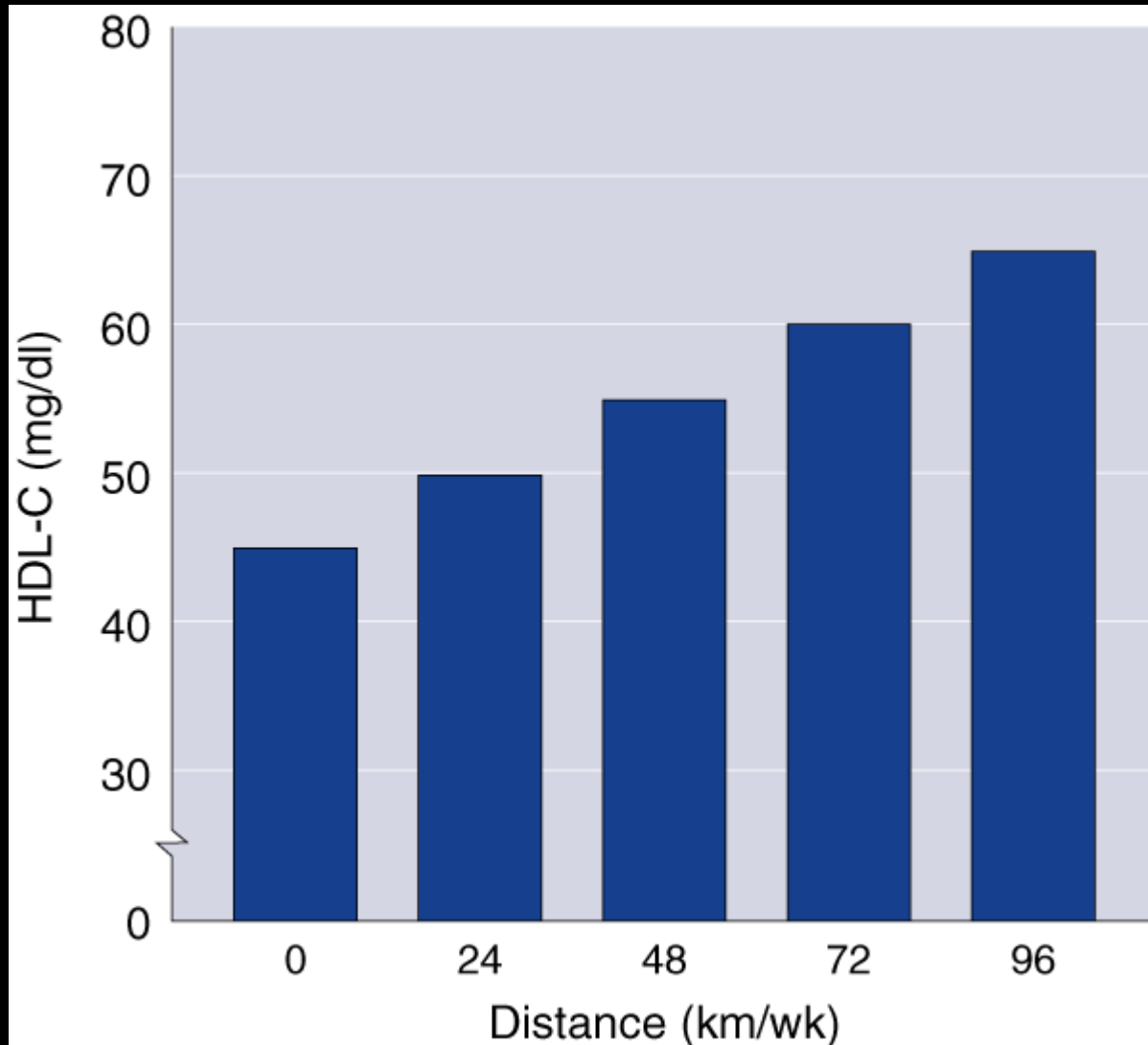
(continued)

Key Points

Research Methodology

- ◆ Laboratory research allows investigators to carefully control variables and use accurate equipment.
- ◆ Field research allows for less control of variables and equipment, but participant's activities are often more natural.

CROSS-SECTIONAL RESEARCH



LONGITUDINAL RESEARCH

