

# Træningsfysiologi og testning - SAMLET

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## Epidemiology, Physical Activity, Exercise and Health.

### Exercise physiology is the study of:

- Functional changes that occur in response to a single session of exercise
- Adaptations that occur as a result of regular, repeated exercise sessions

**Physical activity (PA)** – Any movement that works larger muscles of body • *Arm, leg, & back muscles*

**Exercise** – Planned, structured, & repetitive PA – *Results in an outcome* • *Improvement in physical fitness*

**Physical Fitness:** - Participating in PA or exercise, or both

- Improves body's ability to carry out daily tasks
- Still have enough reserve energy to respond to unexpected demands – Subdivided categories:
  - Health-related fitness
  - Skill-related fitness

### Health-related fitness refers to:

- Your ability to stay healthy & fit
- Includes obtainable optimal levels of:
  - Cardiovascular (CV) fitness • Body composition • Muscular strength
  - Muscular endurance • Flexibility

**Skill related fitness.** -Your ability to perform successfully in variation of sports. Components of skill-related fitness:

- Agility
- Balance
- Speed
- Power
- Coordination
- Reaction time

### Functional health

- Maintain high levels of health and wellness high reducing or controlling your health risk for development of health problems.
- Maintain your physical movements independence to perform
  - Functional abilities
  - Activities of daily living (ADL)

**Personal fitness** - Individual attainment and maintenance of both functional health and physical fitness

**Epidemiology** - Study of how a disease or health outcome is distributed in populations & what risk factors influence or determine this distribution. The study infectious or communicable diseases such as: Influenza or tuberculosis, Heart diseases, Cancer and behavior that may positively impact those chronic diseases.

Triglycerides are another type of blood fat. **High concentrations of triglycerides in the blood are associated with a greater heart disease risk** (.150 units mg/dl). Therefore, it is important to limit fat intake in the diet and take lipid medications as prescribed by a physician. In that way, individuals can manage their blood cholesterol and triglyceride concentrations. Regular participation in exercise can also help to manage blood cholesterol and triglyceride concentrations independent of the exercise weight loss effect by metabolic up-regulation (see Chapters 4–6, 6A, 6B, and 11 for more information).

## Diabetes

Type 2 diabetes: Also called adult-onset diabetes: initially linked to excessive weight gain. It causes the insulin resistance at tissues. It used to be older than 40 years. However recently as many as 50 % of new type 2 diabetic cases are seen in childhood and adolescence.

Type 2 diabetes, or adult-onset diabetes, was initially linked to excessive weight gain and causes insulin resistance at the tissues, thereby slowing down or inhibiting the glucose uptake. It is important to control diabetes risks because this disease can lead to premature health problems such as diabetic ulcers, limb gangrene, limb amputation, blindness, renal nephropathy, and kidney failure, which requires renal dialysis and transplantation

Gestational diabetes: Particular for women who become pregnant after age 35

Type 1 diabetes was initially thought to be a genetic disease. However, type 1 diabetes has been diagnosed in people of all ages, and causes an individual's immune system to attack and destroy the insulin-producing beta cells of the is- lets of Langerhans in the pancreas (treat- able with insulin).

**Stress:** Stress is defined as the physical and psychological responses of your body as you try to adapt to stressors. A stressor is anything that requires you to adapt and cope with either positive or negative situations. Distress is excess negative stress, caused by fear, anger, confusion, or other similar mood states in one's life. Distress can increase the risk for chronic disease (such as heart attack) or can make a disease process worse. Distress can produce negative physical responses (increases in heart rate, increases in stress hormone concentrations, headaches, and so on). It can also have negative emotional effects such as anxiety, sleeplessness, and depression, among others.



Eustress is positive stress and is healthy. It is an enjoyable type of stress, such as what you might feel prior to becoming elected class president, scoring well on an exam, or obtaining your driver's license.

A few ways to cope positively with stress and distress include changing one's diet (for example, by eating breakfast regularly and reducing caffeine intake), meditation (it can be as simple as reflecting about a pleasant event in one's life), or engaging regularly in exercise (such as brisk walking, weight lifting, climbing stairs). Dealing with stress and distress in a positive way is something that will challenge you daily for the rest of your life.

## Less Modifiable Risk Factors

## Cholesterol

- High-density lipoprotein (HDL)**
  - “Good cholesterol”
  - Higher amounts are associated with a lower risk for heart disease (> 60 mg/dl)
- Low-density lipoprotein (LDL)**
  - “Bad cholesterol”
  - (>100–130 mg/dl)
- Very low-density lipoprotein (VLDL)**
  - “Bad cholesterol”
- Higher amounts of LDL & VLDL are associated with higher heart disease risk**

- muscles
  - For example: World class 100 meter sprinter may only take one breath during the race
  - Anaerobic power activities might include
    - Sprint
    - Plyometric movement
    - Resistance training
- **Anaerobic capacity**
  - High-intensity activities that:
    - Last for longer than 10 seconds.
    - May last up to 2 to 3 minutes
    - Indicate total reserve of anaerobic energy sources
      - These activities include:
        - 100- to 800 meter sprints, plyometric drills, sports-specific drills, other muscular power activities.
- **Aerobic power**
  - Last 3 to 15 minutes
  - Require large delivery of O<sub>2</sub> to working muscles
  - These types of activities stress an individual
    - VO<sub>2</sub>max (oxygen uptake)
    - Maximal ability to use O<sub>2</sub>
  - Aerobic power activities might include:
    - Running a mile, brisk walking up a steep, long hill, running, bicycling or rowing.
- **Aerobic capacity**
  - Activities that
    - Last longer than 15 to 20 minutes
    - Require large amounts of O<sub>2</sub> delivered to muscles
  - Also stress an individual
    - Ability to work at a high % of VO<sub>2</sub> max
    - Require a maximal ability to use O<sub>2</sub>
    - Cardiorespiratory endurance activities
      - Running 3 miles, Tour De France and participating in a marathon or triathlon.

## Absolute Intensity

- **For endurance (dynamic):**
  - kcal/min,
  - metabolic equivalents (METs),
  - or like walking 3 miles/hour or jogging at 6 miles/hour
- **For resistance exercise:**
  - Amount of weight lifted or force exerted (pounds, kilograms)

## Relative Intensity

- **Expressed as:**
  - % of aerobic power
    - VO<sub>2</sub>max
  - VO<sub>2</sub> reserve
    - VO<sub>2</sub> max - resting VO<sub>2</sub>
  - % of measured heart rate
  - % heart rate reserve
    - maximum HR - resting heart rate [RHR]
  - Perceived exertion rating
    - RPE
  - % of 1 repetition maximum

## Kapitel 5

Isotopes are used in exercise physiology research to calculate the flux of energy substrates in and out of the bloodstream.

Energy substrates are the nutrients that yield ATP in a biological system.

If a person were to engage in exercise of low intensity with a high duration, what would be the primary fuel source during the exercise session? (FAT)

The weakness of isotopic methods is the assumption that the distribution and clearance of the endogenous molecule is the same as that of the isotope.

Which organ is dependent on the body's ability to preserve glucose homeostasis because it almost exclusively relies on glucose metabolism to function properly? The brain almost exclusively relies on glucose metabolism to function properly.

Carbohydrates are more metabolically efficient than fats under high-intensity exercise because carbohydrates can be broken down in the cytosol of a cell without the presence of oxygen

Which of the following macronutrients will produce the greatest amount of energy per gram? (FAT)

Fats are immiscible with water and are therefore stored in pure form.

The process of transforming non-carbohydrate sources into glucose is extremely efficient; therefore carbohydrate ingestion during prolonged exercise is not suggested for athletes (FALSE)

Both the heart and brain can utilize ketone bodies as a fuel source.

Hyperglycaemia is not the result of prolonged exercise.

Lipids contain approximately two times more energy than carbohydrates

During heavy exercise, muscle glycogen and blood glucose are used at high rates because of the requirement for a metabolically efficient fuel

Which macronutrient(s) is the most metabolically efficient, and therefore utilized extensively during heavy exercise? (CARBOHYDRATES)

Which macronutrient(s) is the most storage-efficient fuel, and therefore utilized primarily in low-intensity activity? (LIPIDS)

Maintaining a high fat diet will not replenish glycogen stores to optimal levels prior to competition.

Fat is the preferred fuel during prolonged exercise because: **It provides more energy per unit mass.**

ME is defined as: **ATP/L O<sub>2</sub>.**

**Triglycerides** is the most storage-efficient.

Carbohydrates are more metabolically efficient because: **They can be broken down in the absence of O<sub>2</sub>.**

Compared to triglyceride, glycogen is less economical to store because: **Water is also stored along with it.**

The process of gluconeogenesis involves: **recycling carbon from other sources into glucose.**

**Glycolysis** is not contained within mitochondria.

Carbohydrate loading is intended to prevent **glycogen depletion.**

**Acetyl CoA** is not used in the gluconeogenesis pathway.

Branch-chain AA are significant during prolonged exercise because: **they are oxidized during exercise in an attempt to spare glycogen.**

After 120 minutes of continuous exercise, the greatest percentage of energy comes from **FFA.**

Glycerol recycled into glucose comes from: the **breakdown of triglycerides.**

High concentration levels of ketone bodies mostly occur: **during high levels fat oxidation.**

**FILL IN:** Calculating the flux of energy substrates in and out of the bloodstream is accomplished using **Isotopes**. A muscle sample obtained to measure the composition of muscle is known as a muscle **Muscle biopsy**. An element that has identical chemical properties but slightly different physical properties is known as an **Isotope**. Calculating the amount of a molecules entering and leaving an organ or tissue bed is used with the **Arteriovenous difference** technique. **Glucose** metabolism uses 6 molecules of oxygen and produces 6 molecules of carbon dioxide. The **RQ** for glucose is **1**. When rounding upward, RQ for fatty acids is **0,7**. During prolonged exercise (>90 min) there is a **Decrease** in blood glucose levels. During high-intensity exercise there is typically an **increase** in blood glucose levels. Anaerobic glycolysis occurs in the **Cytosol** of the muscle fiber. The citric acid cycle is located in the **Mitochondrial** of a muscle fiber. Carbohydrate metabolism is more ME because, unlike fats, it can be metabolized without **Oxygen**. Recycling carbons into glucose is a process known as **Gluconeogenesis**. Leucine, isoleucine, and valine are collectively known as the **Branched-chain AA**.

Following tests does not measure aerobic capacity: **maximal oxygen uptake.**

The ventilation threshold is defined as the workload when: **An increase in VEO<sub>2</sub> occurs without a change in VECO<sub>2</sub>.**

What is measured when the energy required to run at 8 mph is divided by the energy actually measured in a client while running at 8 mph: **exercise economy.**

What term is used to describe the highest speed a swimmer can maintain for several minutes without fatiguing: **critical power.**

Following does a respiratory exchange ratio value greater than 1.0 indicate **All.**

The best definition of peak VO<sub>2</sub>: **VO<sub>2</sub> measured at fatigue with a plateau in VO<sub>2</sub>.**

Following is *not* true in regard to the ventilation threshold: **It coincides with the appearance of lactate in the venous blood.**

Following is *not* a name given to commonly used maximal testing protocols: **Douglas.**

Following has been found from experiments involving the manipulation of an individual's RPE using hypnosis: **During exercise, RPE values do not correlate to heart rate as once thought.**

Following is *not* part of the oxygen deficit: **All.**

Following does *not* pertain to steady-state exercise: **Slow oxidative fibers are very active, while fast glycolytic fibers are completely inactive.**

What does the abbreviation EPOC stand for: **excess postexercise oxygen consumption.**

Following is *not* responsible for the decrease in ME found during EPOC: **increase in muscle fiber damage.**

Following does *not* occur during cardiovascular drift: **increase in total peripheral resistance.**

Following does *not* apply to postexercise hypotension: **increase in calcium concentration.**

The Harvard Step Test relies on which of the following relationships: **oxygen uptake to heart rate.**

Following is *not* a common aerobic fitness test: **All.**