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350

# Cardiac rehabilitation and physical activity

## Mind the heart and the brain

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# Cardiac rehabilitation

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- “The ***coordinated sum of interventions*** required to ***ensure the best physical, psychological and social conditions*** so that patients with chronic or post-acute ***cardiovascular disease*** may, by their ***own efforts***, preserve or resume ***optimal functioning in society*** and, through improved health behaviors, ***slow or reverse the progression of disease.***“

Fletcher. Exercise standards for testing and training. A statement for healthcare professionals from the American Heart Association. Circulation 2001.



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# Cardiac rehabilitation

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# Cardiovascular disease

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- Heart and blood vessel disease

Coronary artery disease:

- Angina pectoris
- Myocardial infarction



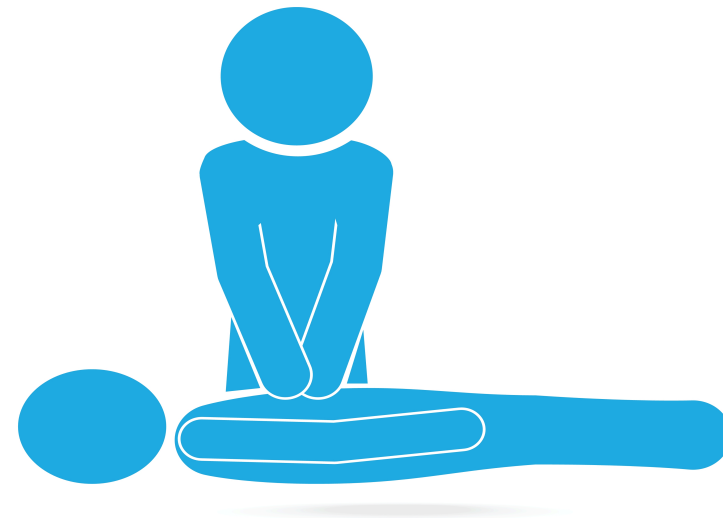
# Cardiac disease and cardiac arrest

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The most common cause

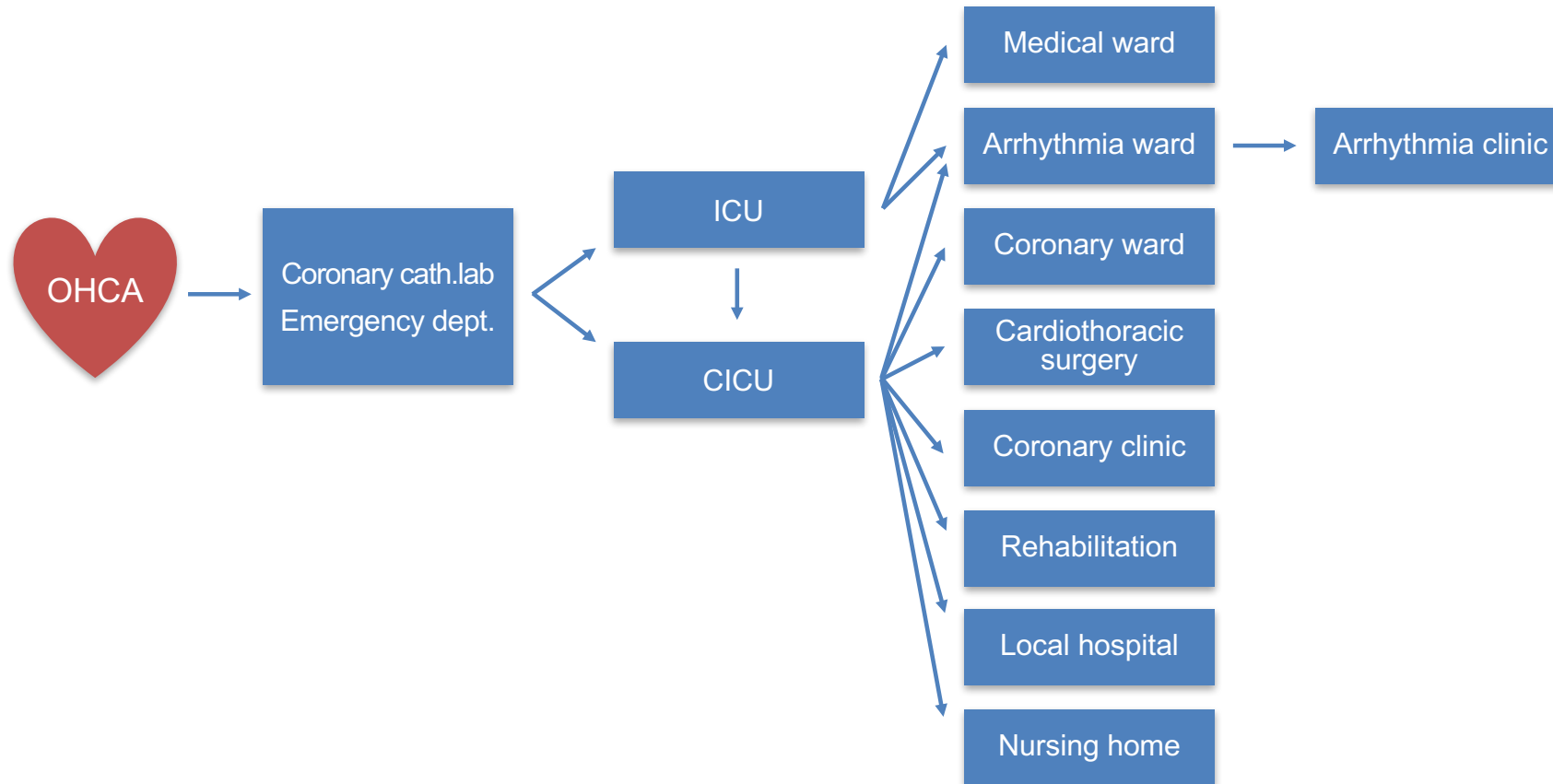
66% of all cardiac arrests in Sweden between 1990-2015 (n=51 442 patients) were due to heart disease

National Quality Registry for Cardiopulmonary Resuscitation annual report 2016



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# Out of Hospital Cardiac Arrest



# Risk factors for coronary artery disease

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- Old age
- Male gender
- Heredity
  
- Physical inactivity
- Smoking
- High blood pressure
- Blood lipid disorders
- Diabetes
- Overweight



# Risk factors for coronary artery disease

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# England 1950

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## Epidemiological studies on physical activity

- Bus drivers sedentary
- Ticket inspectors in motion



# 1960

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- Total immobilization 
- Exercise was used as therapy for coronary artery disease



Sanne. Mobilization and rehabilitation in cases of myocardial infarction. Läkartidningen. 1967.  
Hellerstein. Exercise therapy in coronary disease. Bull N Y Acad Med 1968.



# Exercise-based cardiac rehabilitation – WHY?

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- Reductions in cardiac and all-cause mortality
- A reduced risk of a subsequent myocardial infarction
- Effects on cardiac risk markers, including smoking, blood pressure and lipid profile

Clark. Meta-analysis: secondary prevention programs for patients with coronary artery disease. *Ann Intern Med.* 2005.

Taylor. Exercise-based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomized controlled trials. *Am J Med.* 2004.

Lawler. Efficacy of exercise-based cardiac rehabilitation post-myocardial infarction: a systematic review and meta-analysis of randomized controlled trials. *Am Heart J.* 2011.

Heran. Exercise-based cardiac rehabilitation for coronary heart disease. *Cochrane Database Syst Rev.* 2011.



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Exercise in cardiac rehabilitation compared to regular care ***lowers total mortality with 20%*** and ***lowers cardiac mortality with 26%***.

Taylor. Exercise-based rehabilitation for patients with coronary heart disease. Systematic review and metaanalysis of randomized controlled trials. Am J Med 2004.

Shephard. Exercise as cardiovascular therapy. Circulation 1999



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# Effects of exercise in cardiac rehabilitation

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- **Cardiovascular effect**

Lower heart rate at rest and during exercise, lower blood pressure at rest and during exercise

- **Metabolic effect**

Increased glucose tolerance, improved blood lipid profile

- **Lifestyle effect**

Reduced likelihood of smoking, possible reduction of stress physiological responses





# Primary prevention

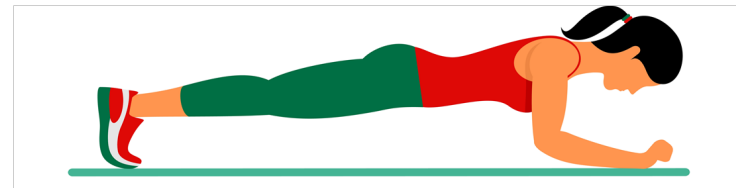
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## Aerobic exercise

- Frequency > 5 days/week
- Moderate intensity
- Duration > 30 min
  
- Combination of moderate and vigorous intensity can be performed. 150 activity minutes/week

## Resistance exercise

- Frequency 2-3 days/week
- Intensity 60-70% of 1 RM
- Repetitions 8-12 for most adult, 10-15 for older persons
- Duration 1-3 sets of each major muscle group



Garber. American College of Sports Medicine position stand. Quantity and quality of exercise for developing and maintaining cardiorespiratory, musculoskeletal, and neuromotor fitness in apparently healthy adults: guidance for prescribing exercise. Med Sci Sports Exerc. 2011.

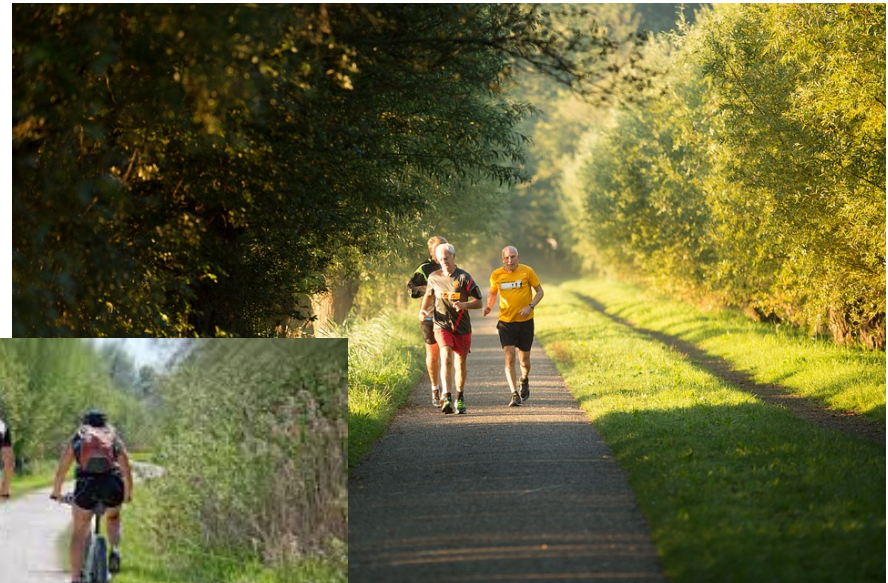


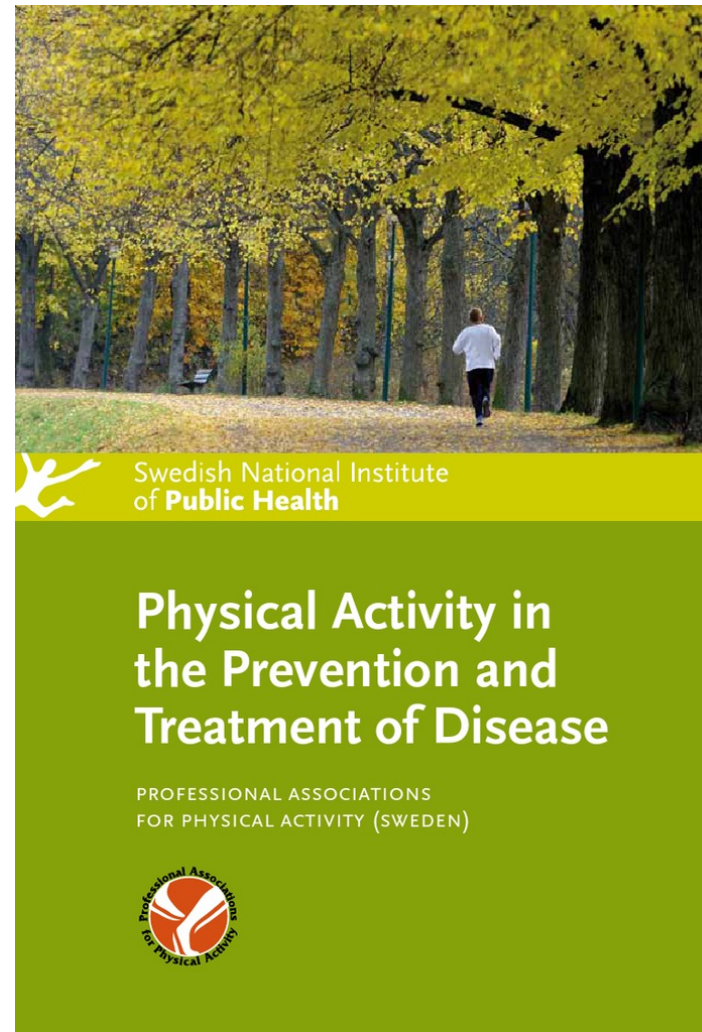
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# Aerobic exercise

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- Brisk walk
- Jogging
- Cykling
- Swimming
- Exercise or aquafit classes
- Skiing
- Skating
- Dance
- Ball sports





# Secondary prevention coronary artery disease

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## Aerobic central circulatory training

- distance or interval
- 50–80% of VO<sub>2</sub> max
- 12–15 of the Borg scale
- 3–5 times per week
- 30-45 min./session

## Resistance training

- 1–3 sets
- 13–16 of the Borg scale
- 2–3 times per week
- 8–10 exercises



# Exercise in cardiac rehabilitation

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- Under supervision of a specialised physiotherapist and access to emergency care equipment
- Cardiac rehabilitation for 3-6 months
- Continue exercise outside the hospital when the condition has been properly established





## After OHCA before and after cardiac rehabilitation

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- Fitness test
- Muscle function test
- Assessment of the current level of physical activity



An appropriate physical activity level and exercise programme is designed with the patient



# Obstacles for physical training within cardiac rehabilitation

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- Qualitative study: No need/no point, not worth it, not possible
- Reduced executive functioning is associated with poorer outcome in cardiac rehabilitation.

Bäck. Important aspects in relation to patient's attendance at exercised-based cardiac rehabilitation. 2017

Kakos. Reduced Executive Functioning is associated with poorer outcome in Cardiac Rehabilitation. 2009



# Mind the brain and the heart....

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Resuscitation 115 (2017) 90–95



Contents lists available at [ScienceDirect](#)

## Resuscitation

journal homepage: [www.elsevier.com/locate/resuscitation](http://www.elsevier.com/locate/resuscitation)



Clinical paper

Out-of-hospital cardiac arrest survivors with cognitive impairments have lower exercise capacity<sup>☆</sup>



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Henk J. van Exel<sup>a,c</sup>, Thea P.M. Vliet Vlieland<sup>a,b,c</sup>, Paulien H. Goossens<sup>a,c</sup>

<sup>a</sup> *Rijnlands Rehabilitation Centre, Leiden, The Netherlands*

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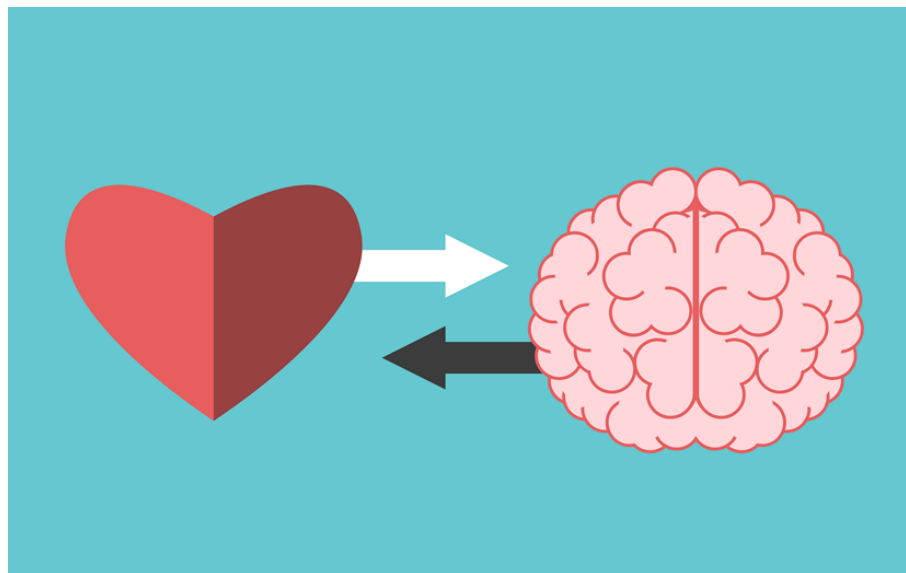
<sup>c</sup> *Leiden University Medical Center, Leiden, The Netherlands*



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# Physical function six months after cardiac arrest

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- To describe HRQoL and physical functioning in OHCA-survivors and compare this to STEMI-patients
- The OHCA-survivors reported significantly worse overall physical health compared to the STEMI-controls
- 38% of the OHCA-survivors had individual scores of impaired physical functioning
- 82% of the OHCA-survivors reported limitation with vigorous activities



Is the level of physical activity too low to obtain preventive effect?





# Physical exercise improved cognitive function

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Systematic review including 36 studies

Effects seen on:

- Global cognition
  - Attention
  - Executive function
  - Memory
  - Working memory
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- A duration of 45-60 minutes per session
  - At least moderate intensity

Northey. Exercise intervention for cognitive function in adults older than 50: a systematic review with meta-analysis. 2017



# TTM2 trial: 6 months follow up after OHCA

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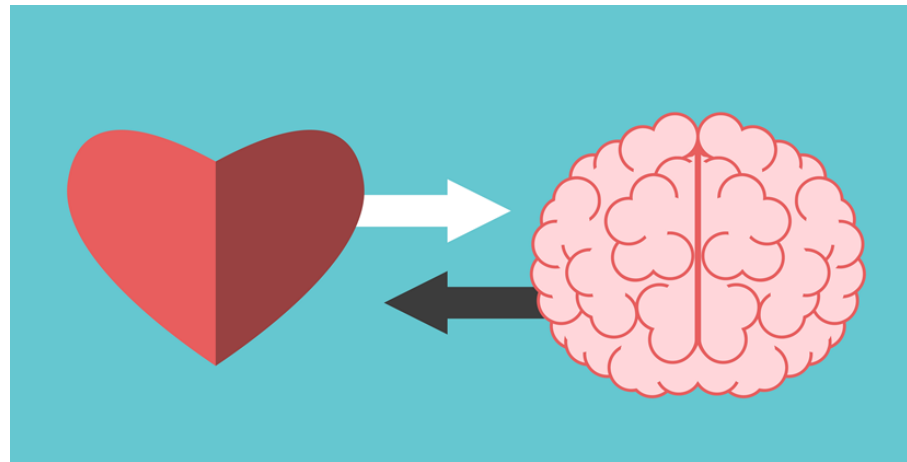
- Self-reported questions of physical activity and physical training
- Timed-Stands Test
- Objectively measured physical activity with accelerometer Actigraph



# TTM2 trial: 6 months follow up after OHCA

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- Physical inactivity is more common among OHCA-survivors compared to matched controls?
- Is physical inactivity associated with cognitive impairment and emotional problems including anxiety, depression and kinesiophobia?



# Conclusion

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- Physical activity and physical training is an important part of cardiac patients' secondary prevention
- Physical activity and physical training has positive effects on cardiac risk markers
- Physical activity and physical training may also have positive effects on cognitive function

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