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Resistance training in patients with chronic organ failure

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Content



- **Chronic obstructive pulmonary disease (COPD)**
 - *definition*
 - *daily physical inactivity*
 - *muscle atrophy*
 - *pulmonary rehabilitation*
 - *resistance training*
- **Lung transplantation**
- **Chronic heart failure**
- **Summary and conclusions**



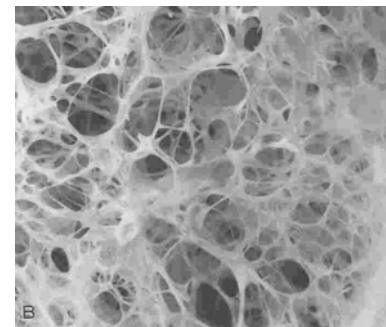
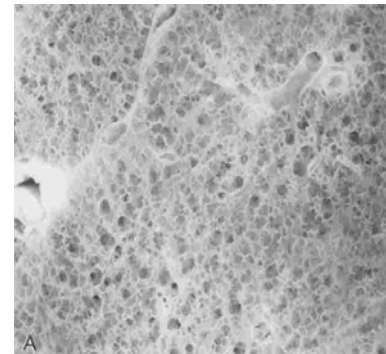
COPD



Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease

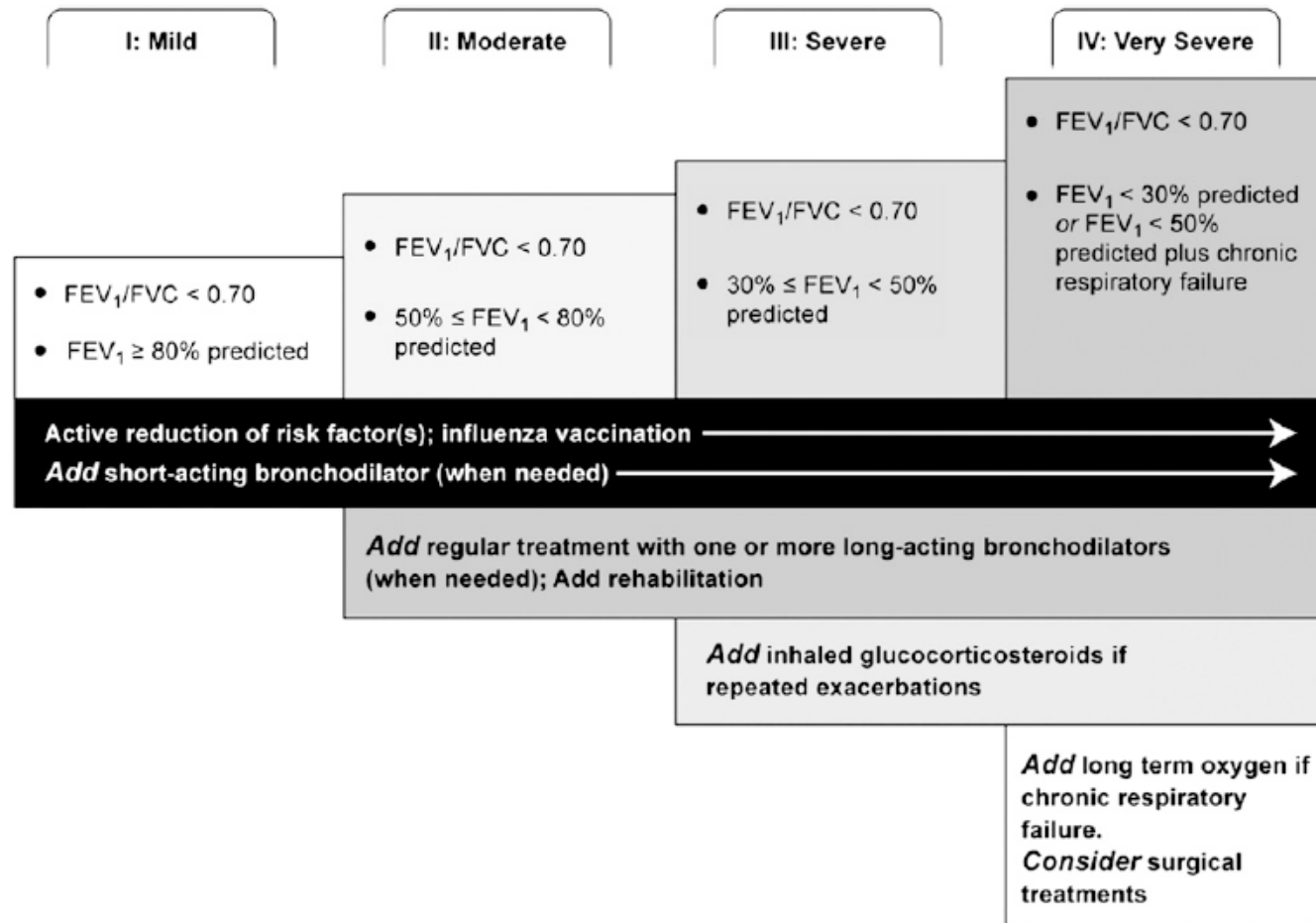
Pulmonary components

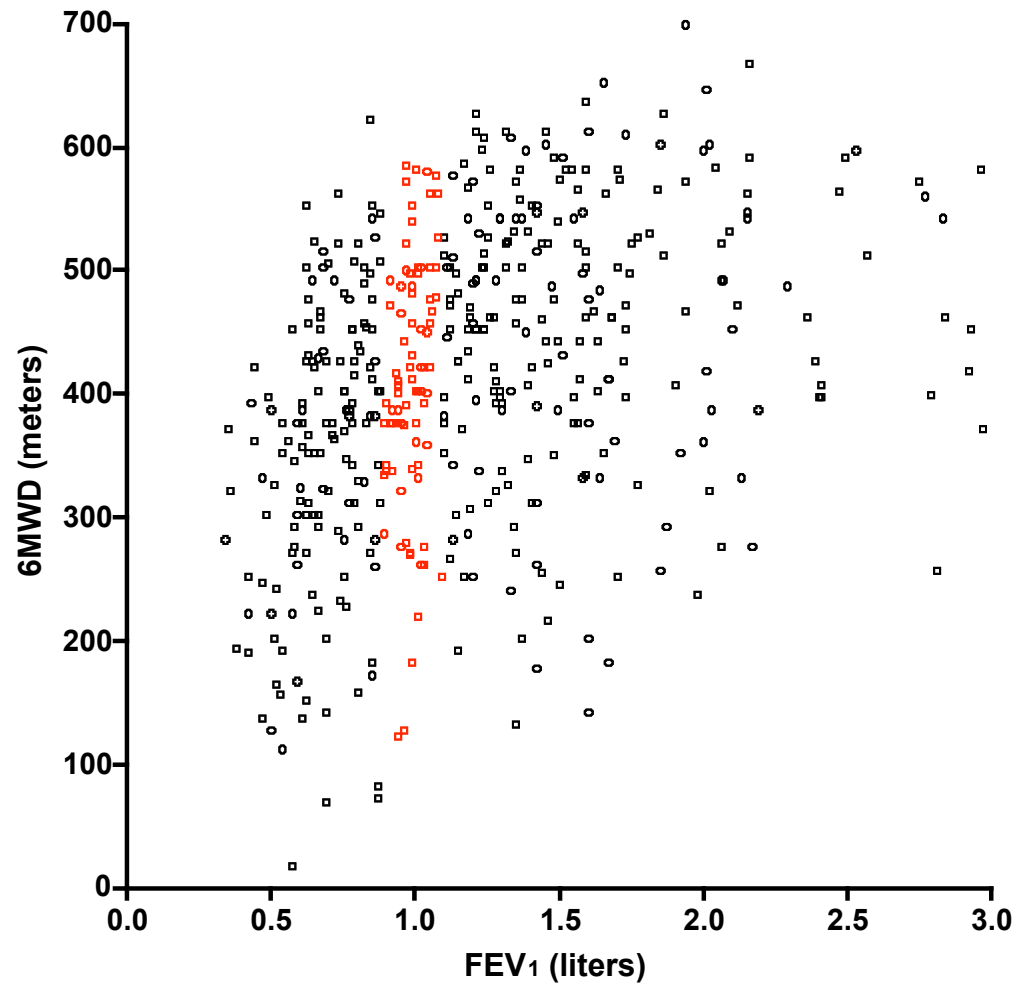
- **airflow limitation**
- **not fully reversible**
- **progressive**
- **abnormal inflammatory response**

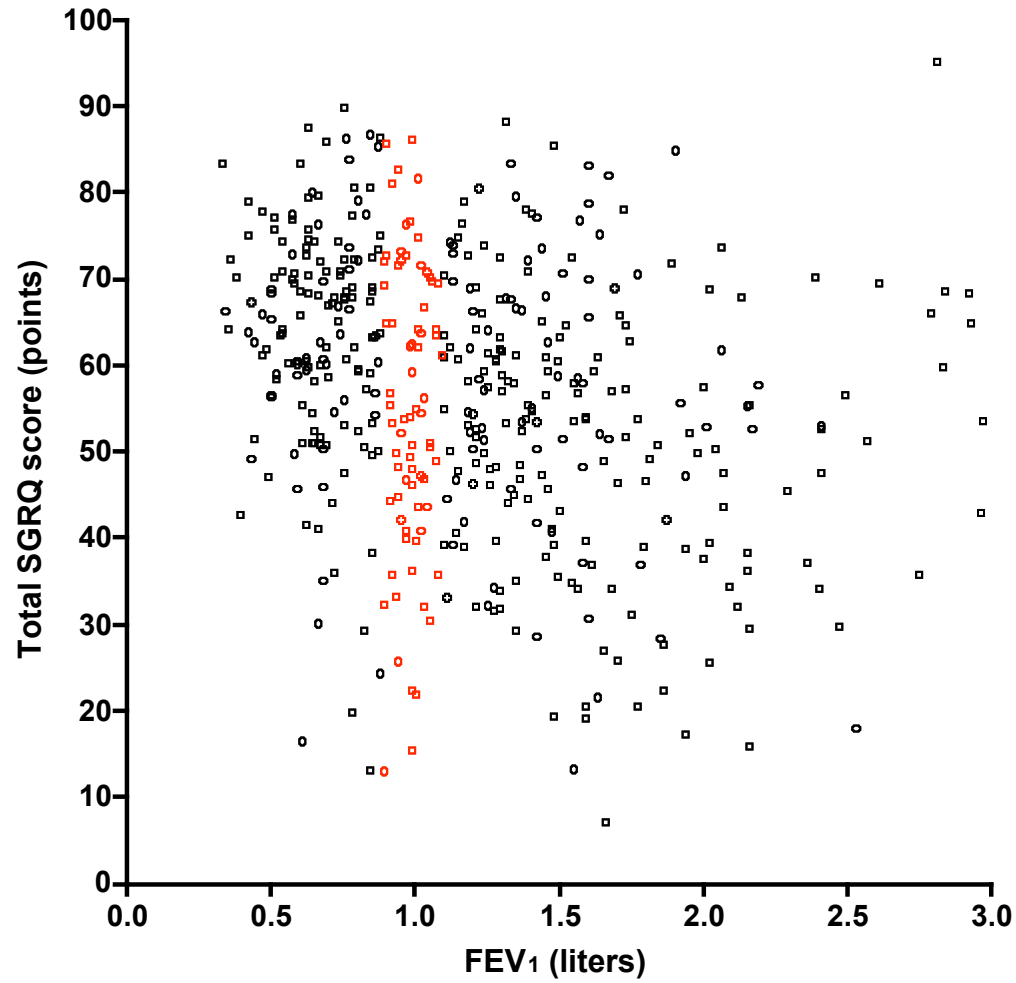




GOLD classification









COPD



Chronic obstructive pulmonary disease (COPD) is a preventable and treatable disease with some **significant extrapulmonary effects** that may contribute to the severity in individual patients.

Pulmonary components

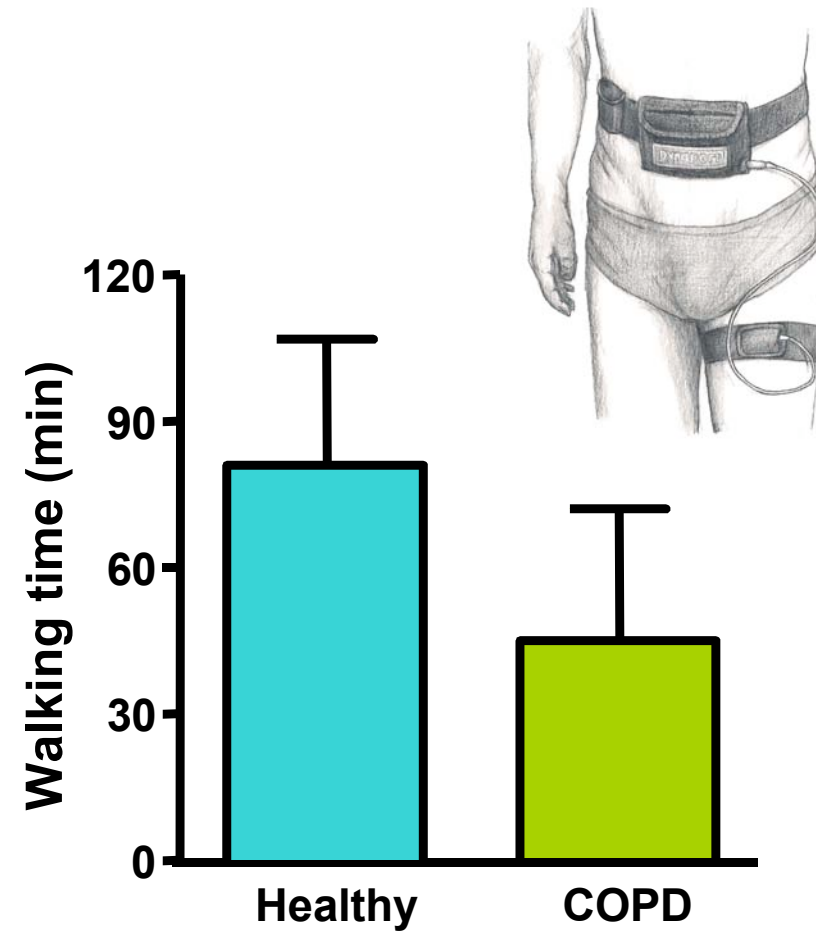
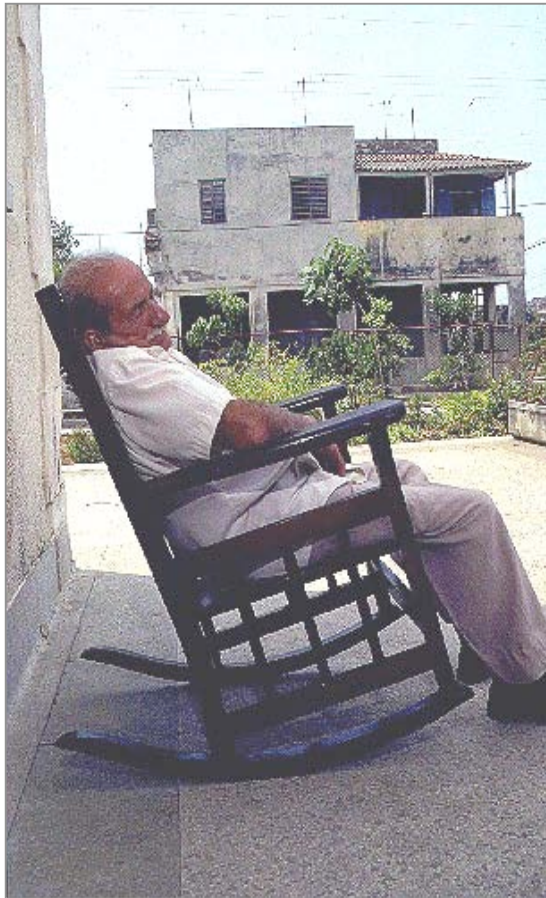
- airflow limitation
- not fully reversible
- progressive
- abnormal inflammatory response

Extrapulmonary

- **muscle atrophy**
- **osteoporosis**
- **chronic heart failure**
- **metabolic syndrome**

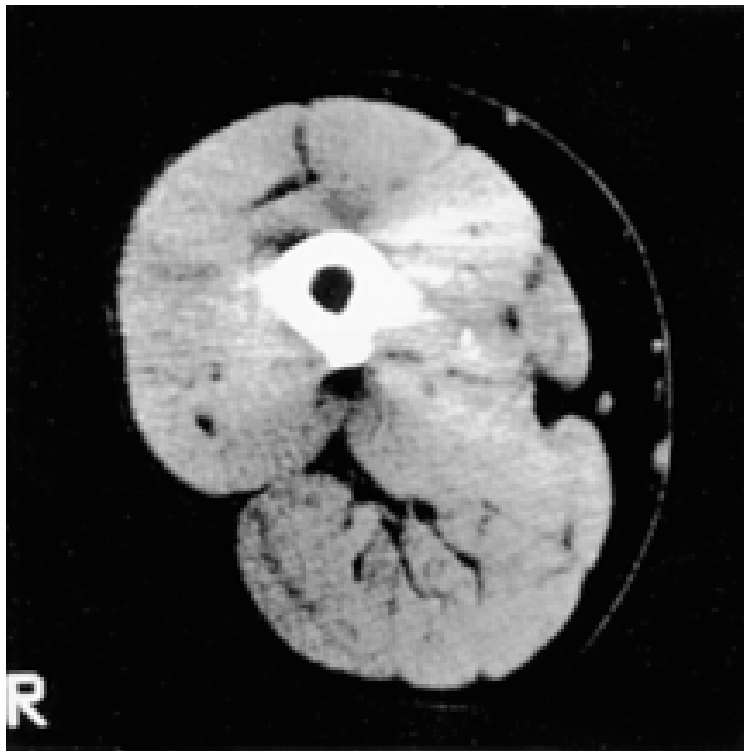


Physical inactivity

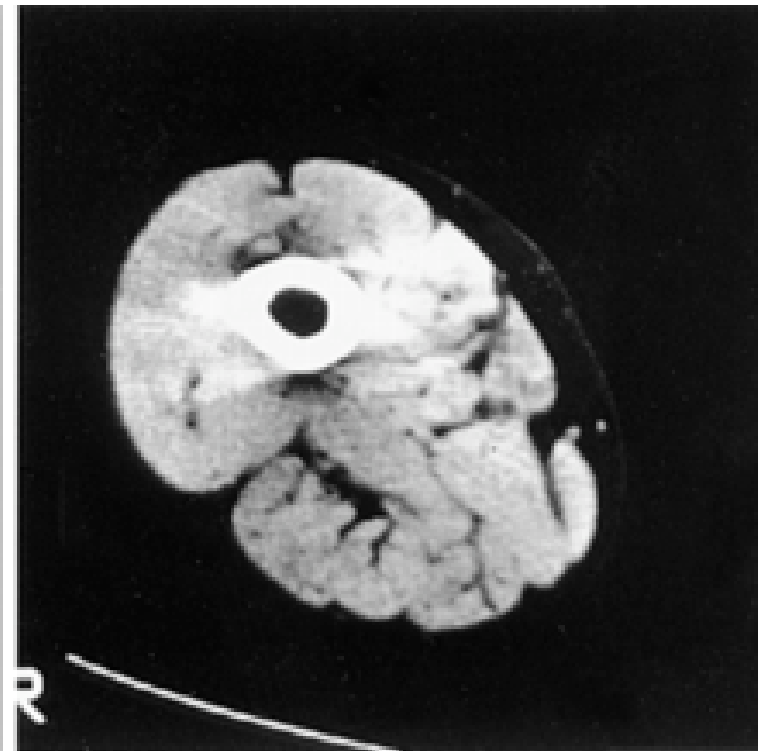




Muscle atrophy



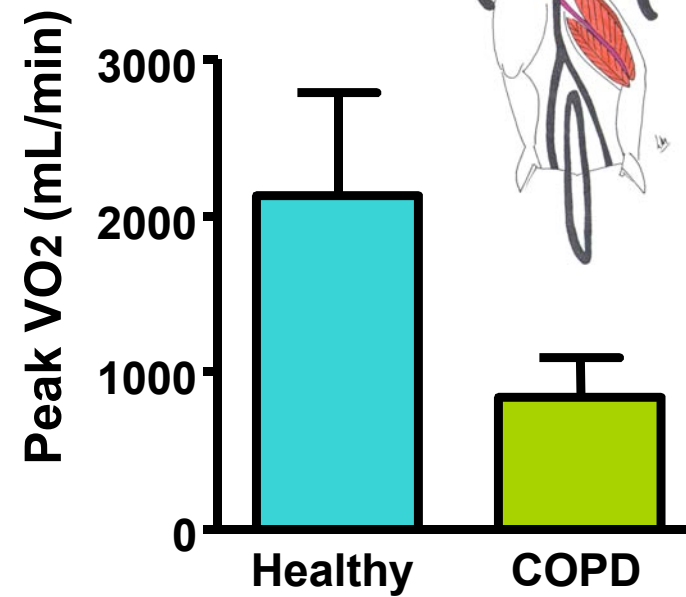
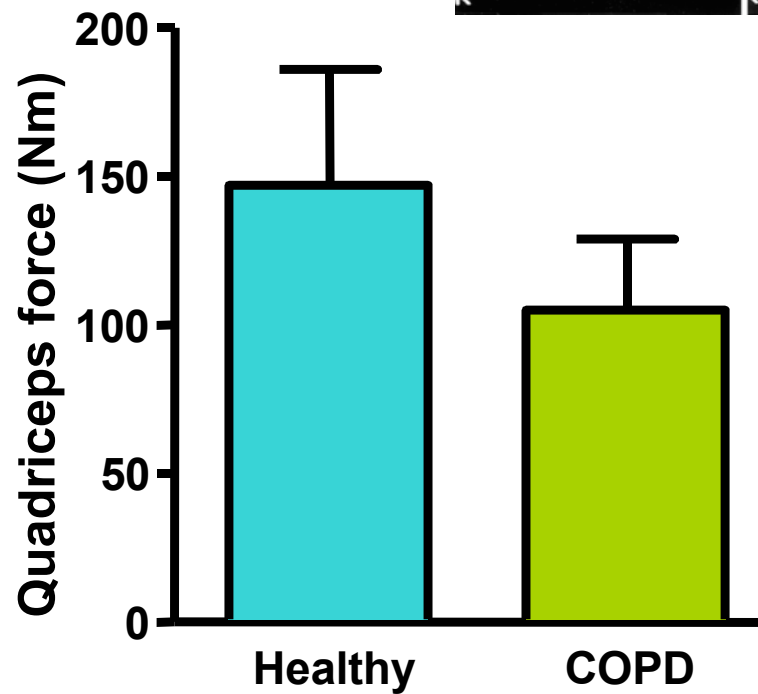
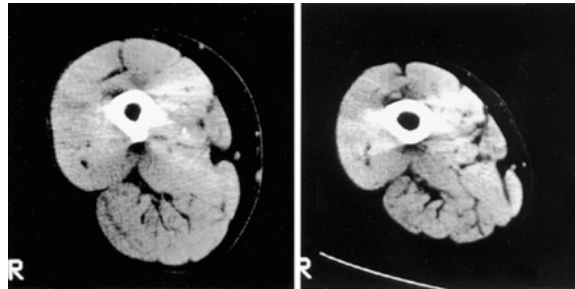
Healthy elderly

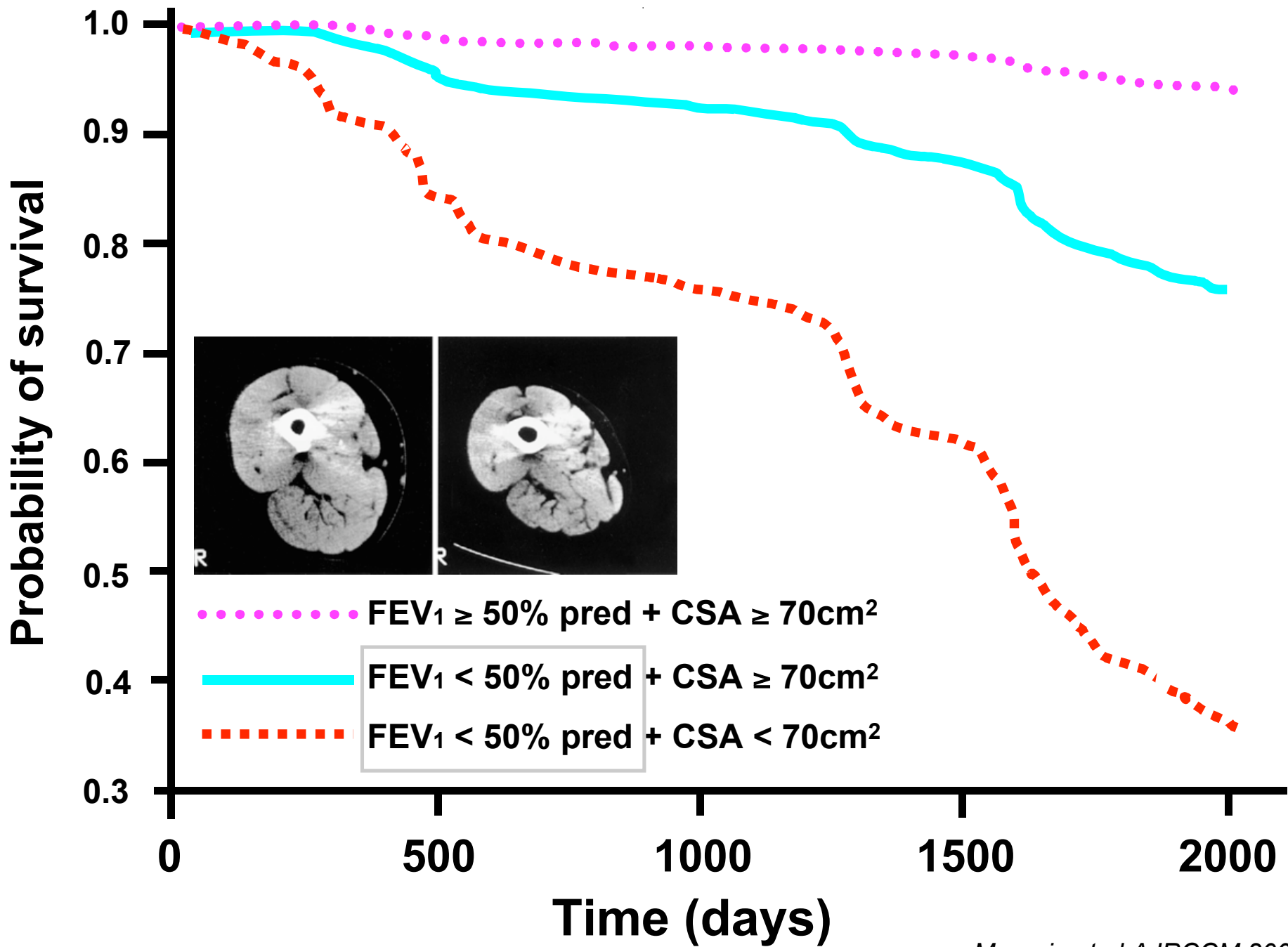


COPD patient



Physical fitness







Exercise training



- **Endurance training** (treadmill walking, ergometry cycling)
- **Interval training** (treadmill walking, ergometry cycling)
- **Resistance training** (muscles of ambulation / respiratory muscles)
- **NMES** (muscles of ambulation)
- **Supplements** (nutritional, hormonal, oxygen, etc.)



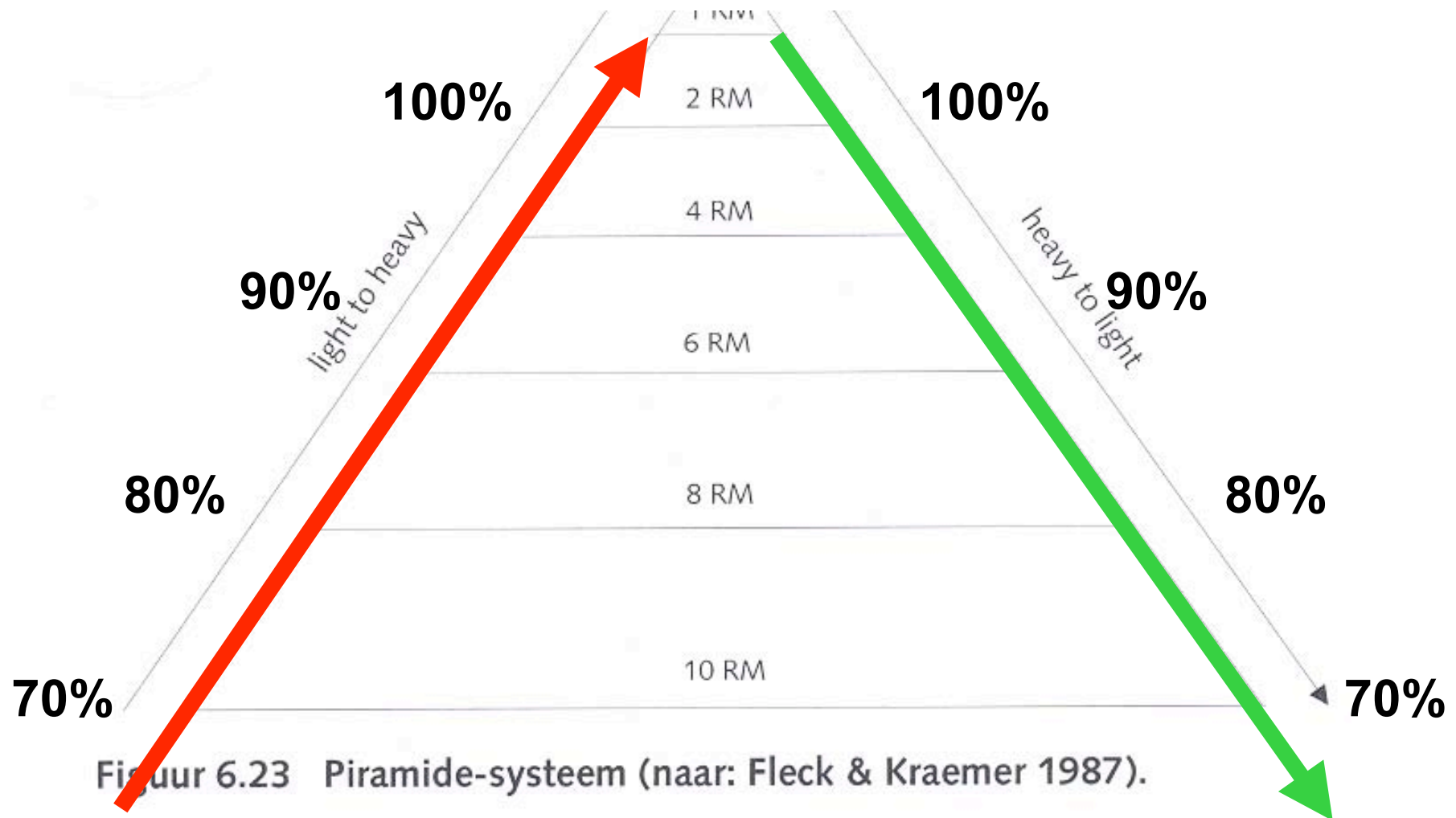
Resistance training



- **RT typically consists of lifting heavier weights with longer rest periods (a greater anaerobic component)**
- **RT should be performed**
 - **in a rhythmical manner**
 - **at a moderate to slow controlled speed**
 - **through a full range of motion**
 - **avoiding breathholding and straining (Valsalva maneuver) by exhaling during the contraction or exertion phase of the lift and inhaling during the relaxation phase**
- **Alternating between upper- and lower-body work to allow for adequate rest between exercises**



Resistance training



Figuur 6.23 Piramide-systeem (naar: Fleck & Kraemer 1987).

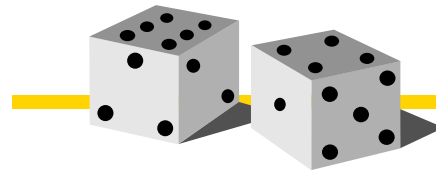


Resistance training



34 COPD patients

- FEV1: 48% predicted
- 6MWD: 302 meters



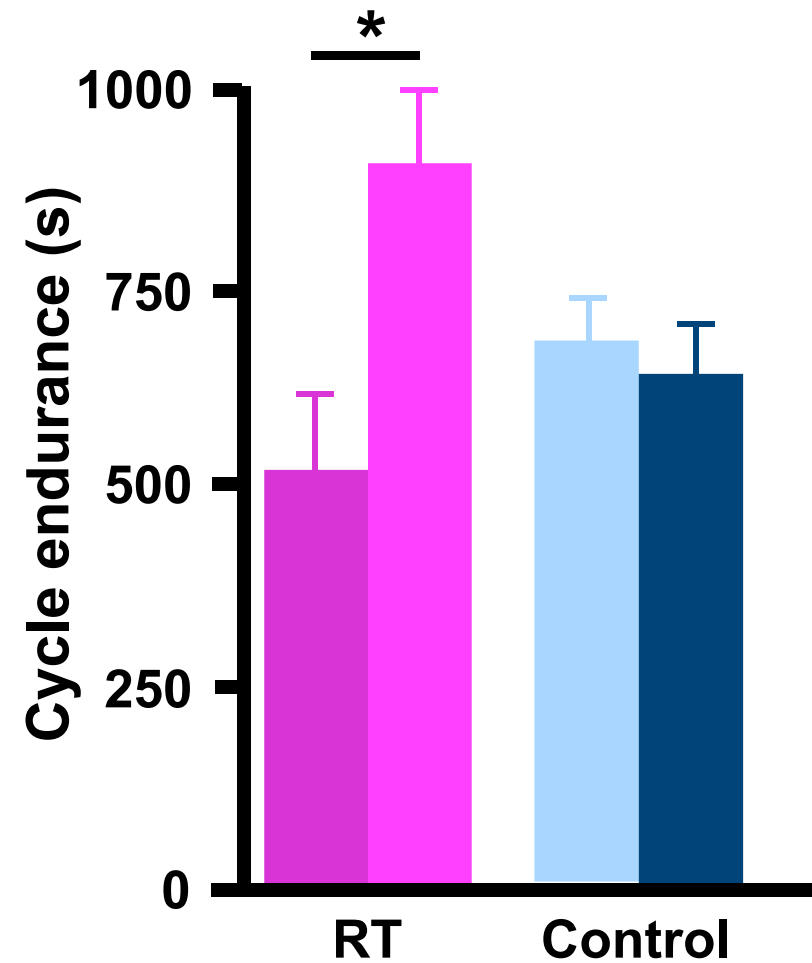
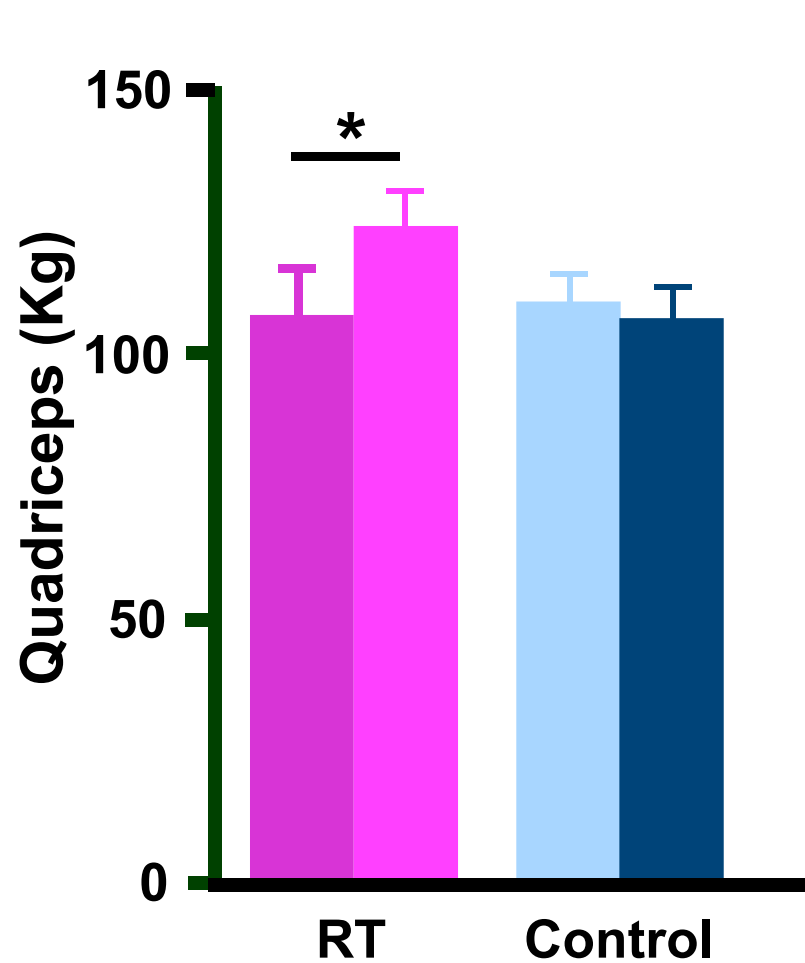
Resistance training (n=17)

- 8 weeks
- 3 sessions per week
- outpatient
- supervised
- 3x8 repetitions
- 70% 1RM

'Usual' care (n=17)



Resistance training

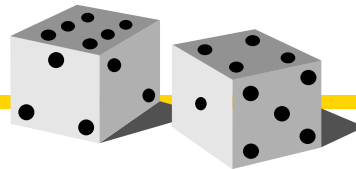




Resistance vs. endurance

48 COPD patients

- 42 men
- age: 64 years
- FEV₁: 38%
- VO₂: 50% predicted
- 6MWD: 45% predicted
- Quadriceps strength: 57% predicted



RT (n=24)

- upper + lower extremities
- supervised
- 12 weeks
- 3 sessions per week
- 3x8 repetitions
- 80% 1RM
- 6 to 9 sec per repetition



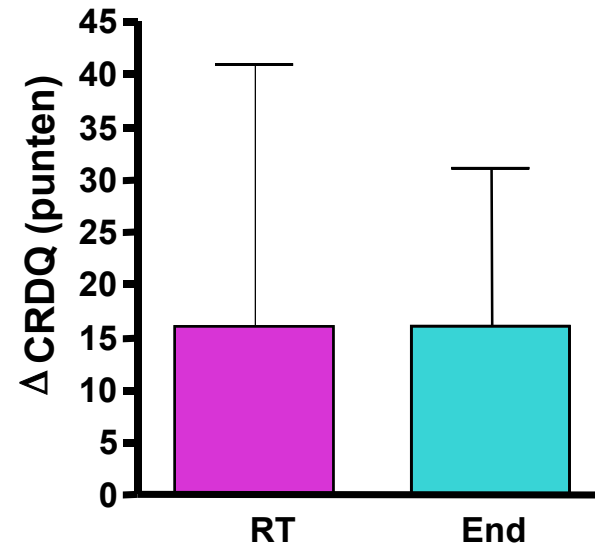
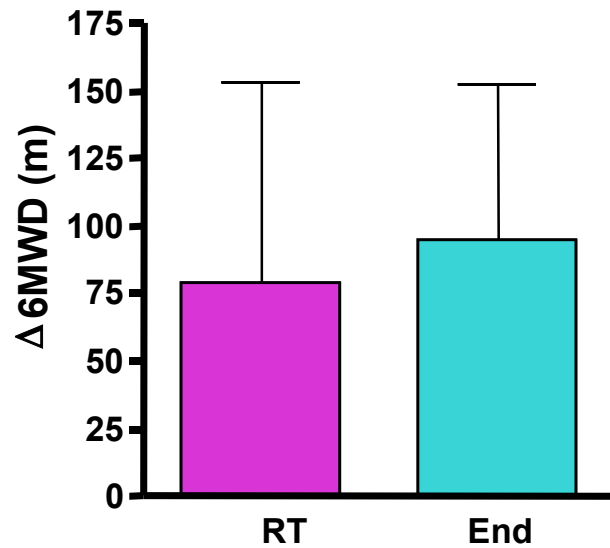
Endurance (n=24)

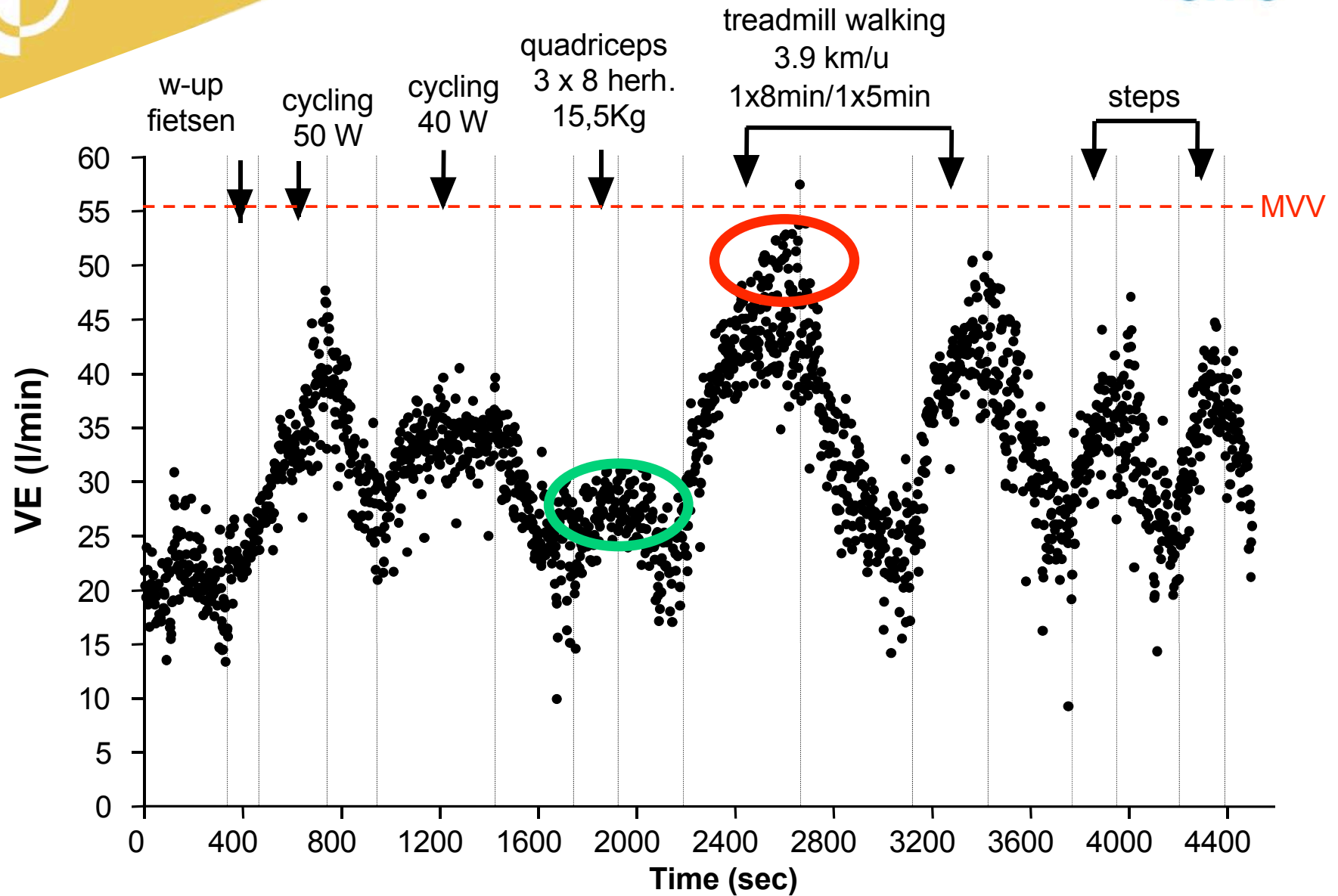
- supervised
- 12 weeks
- 3 sessions per week
- ergometry cycling
- treadmill walking
- 60 to 80%





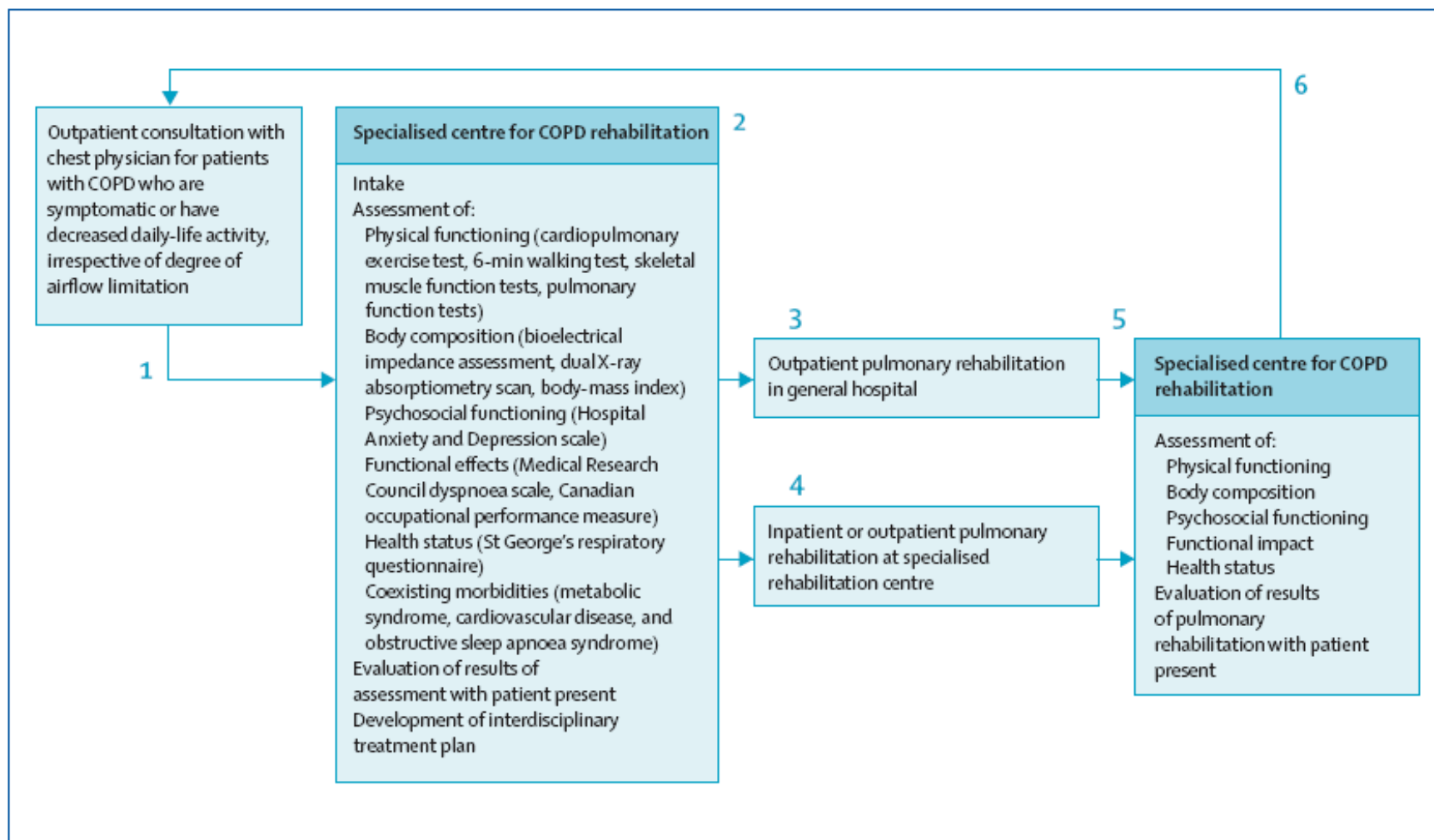
Resistance vs. endurance

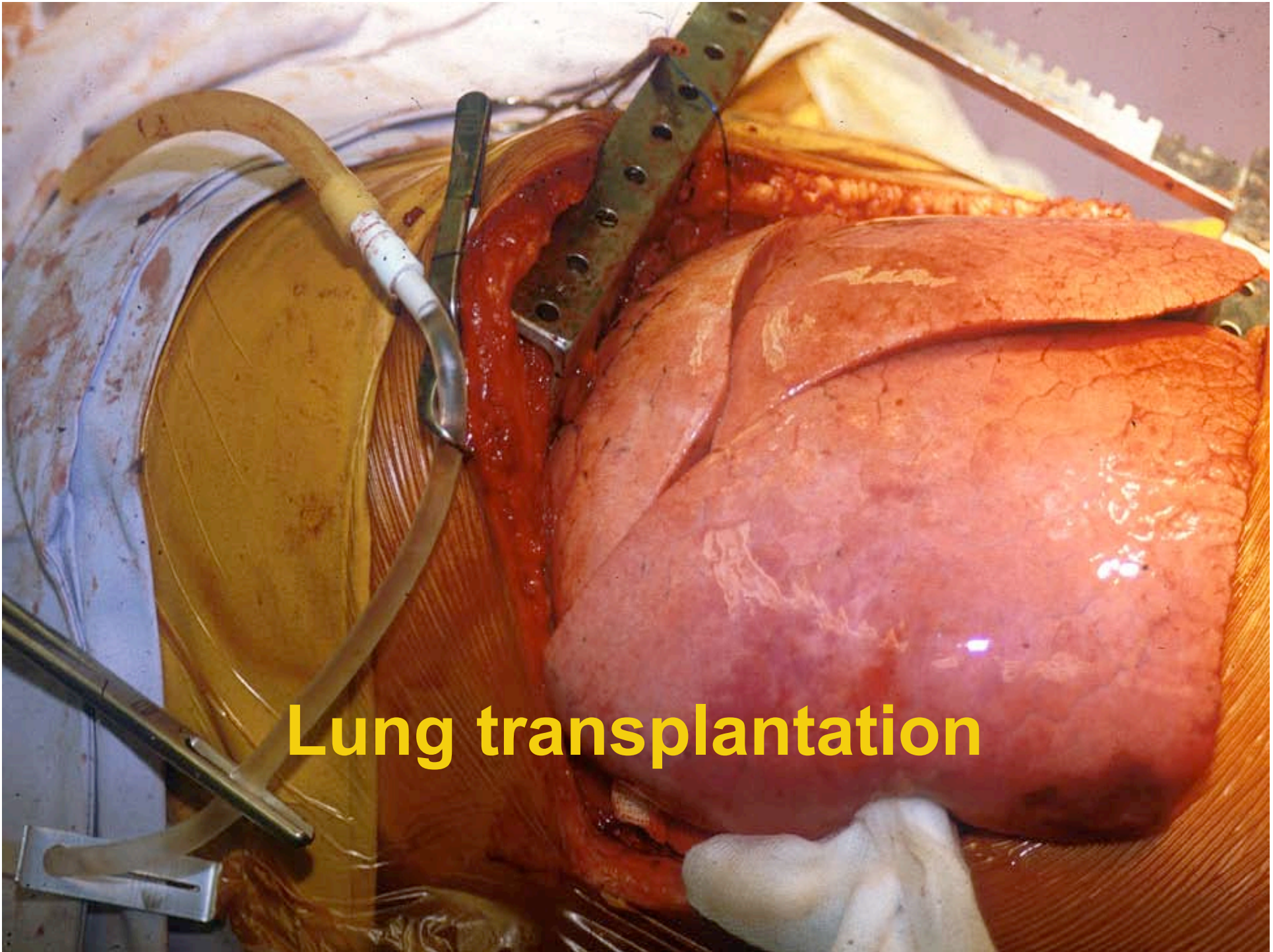






Pulmonary rehabilitation

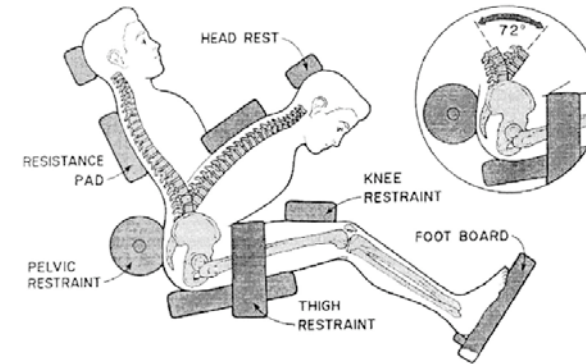
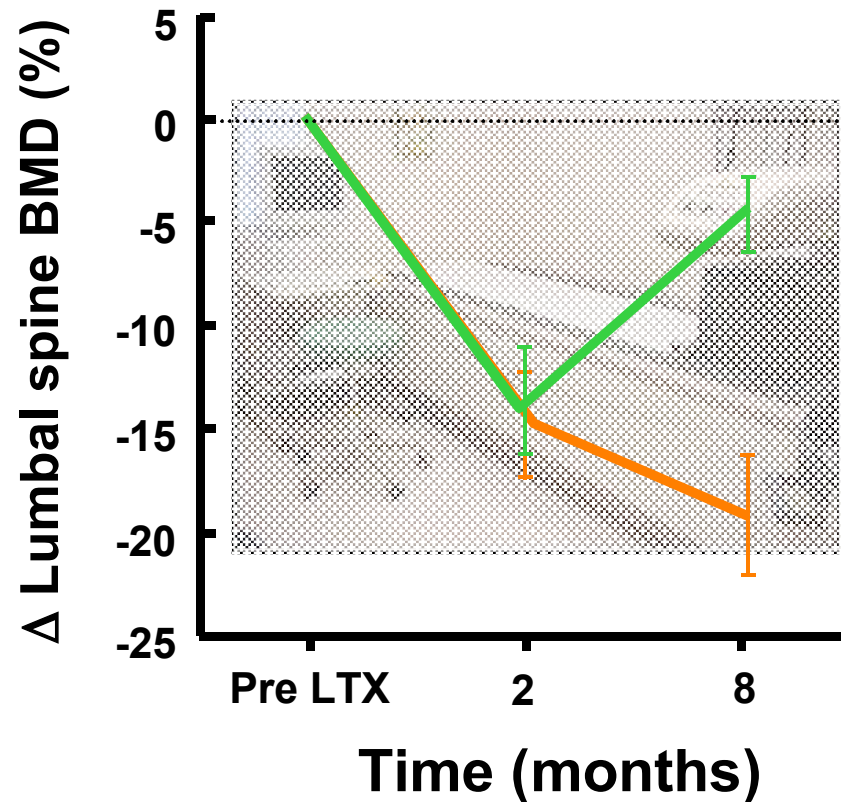




Lung transplantation



Resistance training



Chronic heart failure



- **Physical inactivity**

(Van den Berg-Emons et al. Physical Therapy 2001)

- **Muscle atrophy**

(Uszko-Lencer et al. Eur. J Heart Failure 2006)

- **Muscle weakness**

(Hamilton et al. AJRCCM 1995)

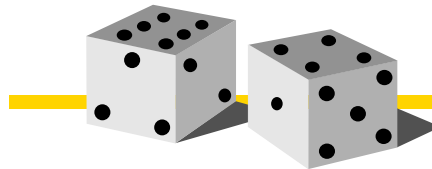
- **Resistance training?**



Chronic heart failure

16 CHF patients

- all women
- age: 76 years
- LVEF: 36%
- VO₂: 15 ml/min/kg
- Number of co morbidities: 7
- Number of medications: 8



RT (n=9)

- upper + lower extremities
- supervised
- 10 weeks
- 3 sessions per week
- 3x8 repetitions
- 80% 1RM – retested !
- 6 to 9 sec per repetition



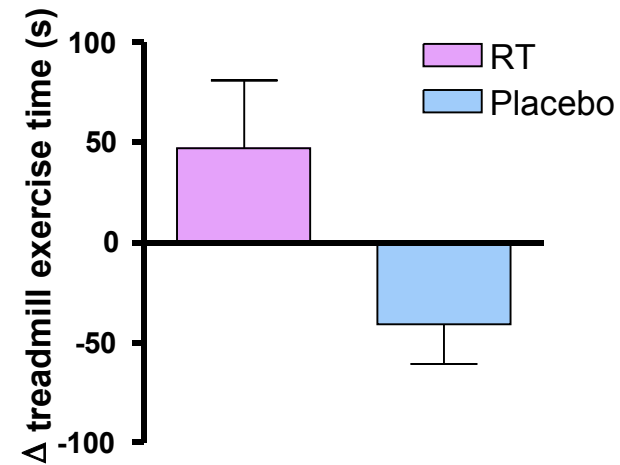
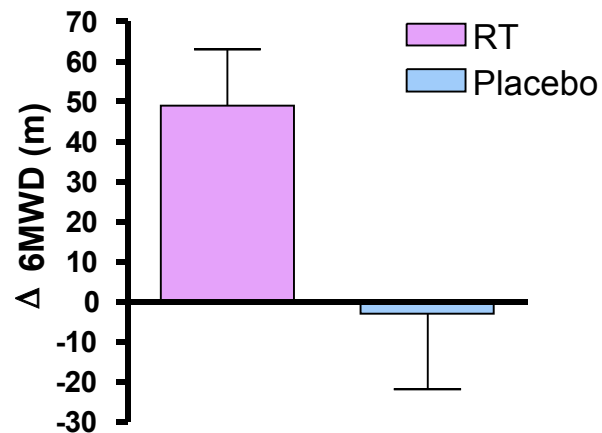
Placebo (n=7)

- 10 weeks
- 2 sessions per week
- supervised
- low-intensity stretching
- instruction to not start any new exercise regimen



Chronic heart failure

- all subjects completed 10 weeks
- no deaths
- no hospitalizations
- minimal changes in medication
- attendance rate: 98%
- mean load: 82% most recent 1RM





AHA / ACSM statement

'It appears that resistance training can be incorporated safely into rehabilitation programs for chronic heart failure. Although further study of this important area is needed.'



Summary

- **Physical inactivity in chronic organ failure**
- **Systemic consequences**
- **Local resistance training**
- **Comprehensive rehabilitation programs**
- **Generally recommended**





Thank you



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