



# Exercise guidelines in adolescents and young adults with congenital heart disease

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- Dua JS et al. Exercise training in adult congenital heart disease: feasibility and benefits. Int J Cardiol 2010;138:196-205
  - n = 61 (36 males, age 31.7±10.9)
  - 20% overweight, 11% obese
  - 10% > 30 min of moderate intensity activity 5/7 per week
- Lunt D et al. Physical activity level in adolescents with congenital heart disease. Aust J Physiother 2003;49:43-50
  - n = 434 (age 12-18)
  - Significantly less physical active than healthy peers

# Exercise and congenital heart disease

## Key questions

- **Is it beneficial?**
  - Morbidity/mortality
  - Physical performance
  - QOL
- **Is it safe?**
  - Sudden cardiac death
  - Risk stratification
- **Is it feasible?**

# Is it beneficial?

- **Morbidity/mortality**
  - HF-ACTION trial (JAMA 2009;301:1439-50)
    - 2300 patients
    - no difference
  - Congenital heart disease
    - do not know



# Is it beneficial?

- **Physical performance/QOL**

- Moalla W et al. Effect of exercise training on respiratory muscle oxygenation in children with congenital heart disease. *Eur J Cardiovasc Prev Rehabil* 2006
- Therrien J et al. A pilot study of exercise training in adult patients with repaired tetralogy of Fallot. *Can J Cardiol* 2003
- Fredriksen PM et al. Effect of physical training in children and adolescents with CHD. *Cardiol Young* 2000
- Rhodes J et al. Sustained effects of cardiac rehab in children with serious CHD. *Pediatrics* 2008.
- Dua JS et al. Exercise training in adult congenital heart disease: feasibility and benefits. *Int J Cardiol* 2010
- Hager A. QOL and exercise in adult CHD. *Heart* 2005

# Is it safe?



- **Sudden cardiac death**

- **Toronto data** (*Harrison, Can J Cardiol 1996*)

- 5.3 scd per 1'000 pt-yrs, mean age 34
- 2 cases during ex. (AS/hockey; Cor.Fist./Tennis)

- **Minneapolis data** (*Moller, Am J Cardiol 1992*)

- no exercise death in 30'000 patient-yrs

- **Brompton data** (*Somerville, 1998*)

- 7/94 cases of scd occurred during exercise
- 10/70 attacks of AF during stress, often same patient

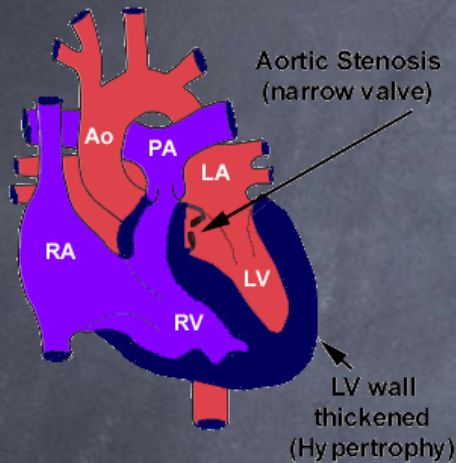
# Guidelines and recommendations

- Hirth A et al. Recommendations for participation in competitive and leisure sports in patients with congenital heart disease. *Eur J Cardiovasc Prev Rehabil* 2006;13:293-9
- Pellicia A et al. Recommendations for sports participation in athletes with cardiovascular disease. *Eur Heart J* 2005;26:1422-45
- Sklansky. Guidelines for exercise & sports in children and adolescents with congenital heart disease. *Prog Paediatr Cardiol* 1993;2:55-66

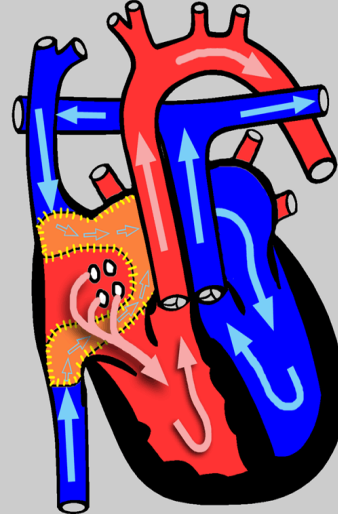
**Table 2 Recommendations for sport participation in congenital heart diseases**

Lesion	Recommendation
ASD (closed or non-significant or PFO)	No restrictions Scuba diving should be avoided in those with a remaining shunt, due to the risk of paradoxical embolism
VSD (closed or non-significant)	No restrictions
PDA (closed or non-significant)	No restrictions
AVSD (successfully repaired)	No restrictions
Moderate MVR	Low to moderate dynamic and static sports
PAPVC/TAPVC (successfully repaired)	No restrictions
Pulmonary stenosis (mild)	No restrictions
Moderate	Low to moderate dynamic and static sports
Aortic stenosis (mild)	Low to moderate dynamic and static sports
Moderate	Low dynamic and static sports No competitive sport if left ventricular dysfunction or symptoms
CoA (successfully repaired)	No restrictions <sup>a</sup>
TOF (successfully repaired)	Low to moderate dynamic and static sports <sup>a</sup>
Residual disease	Low dynamic and static sports <sup>a</sup>
TGA	
asoTGA (successfully repaired)	No restrictions
iarTGA, ccTGA	Low to moderate dynamic and low static sports <sup>b</sup>
Ebstein anomaly	Low to moderate dynamic and low static sports <sup>b</sup>
Univentricular hearts/Fontan circulation	Low to moderate dynamic and low static sports <sup>b</sup>
Eisenmenger's syndrome	Low dynamic sports <sup>b</sup>
Congenital coronary artery anomalies	No restrictions
Successfully repaired	

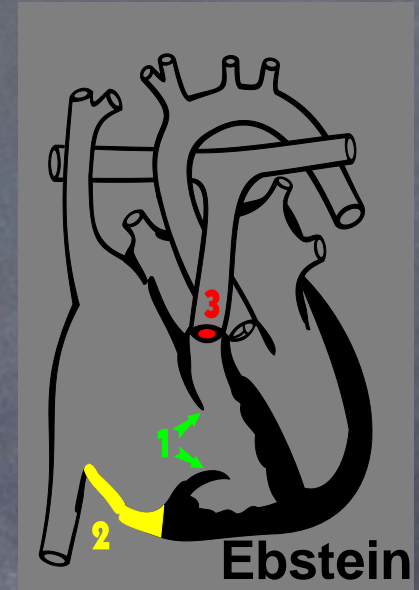
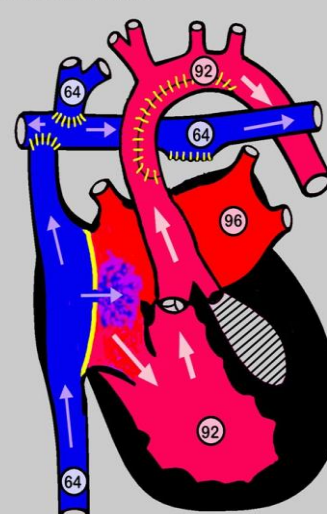
# High risk groups



Transposition of the Great Arteries  
Mustard Repair



HYPOPLASTIC LEFT HEART SYNDROME  
Fontan Procedure



- LVOTO
- Poor ventricular function/systemic RV
- Arrhythmia
- Pulmonary hypertension (Eisenmenger syndrome)
- Congenital coronary artery anomalies

# Individual assessment

## Cardiac function

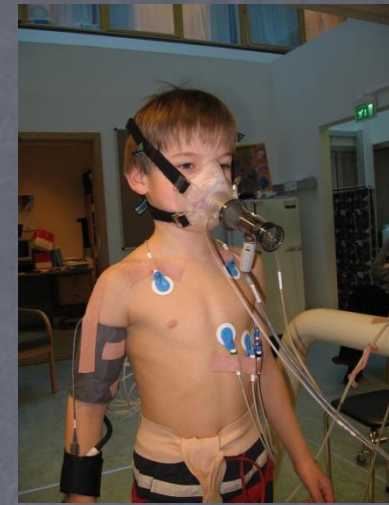
- Echocardiography
  - Significant rest-lesion, LV and RV function, Mean/Peak transvalvular gradients, TR/RVP (Pulmonary Hypertension), Significant hypertrophy
  - Doppler myocardial imaging...?
  - Exercise echo.....?
  - 3D/4D echo.....?
- MRI

# Individual assessment

## Arrhythmia

- Extensive surgery, transventricular repair, repair late in life
- Exercise induced dizziness or syncope
- Depolarization disturbances or hypertrophy
- 24-h ECG

# Individual assessment Cardiopulmonary exercise testing



## Measurements

- Lung function (spirometry)
- Maximal test – treadmill or bicycle
- Standardised protocol (Bruce)
- BP, ECG

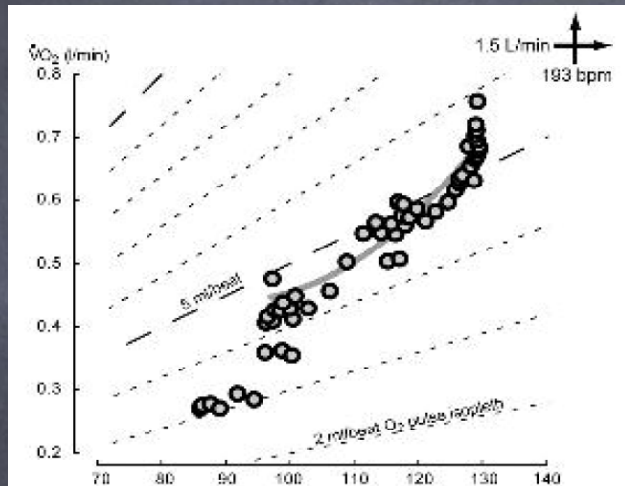
## Report

- BP response
- Chronotrope response
- Peak VO<sub>2</sub>
- Oxygen pulse
- VO<sub>2</sub>/CO<sub>2</sub> slope
- Exercise recommendations

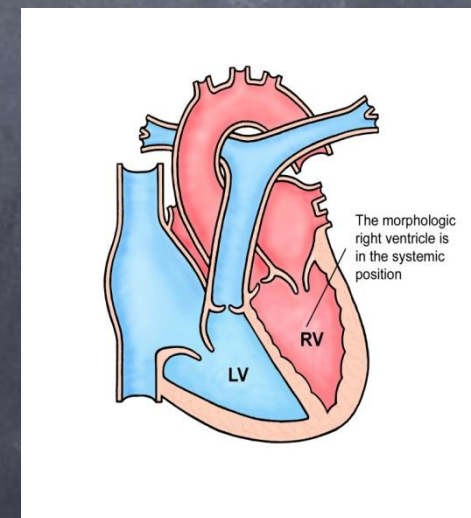
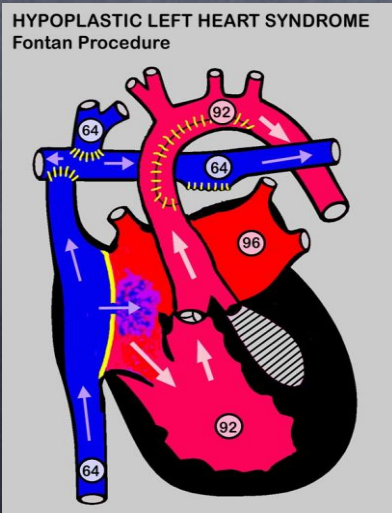
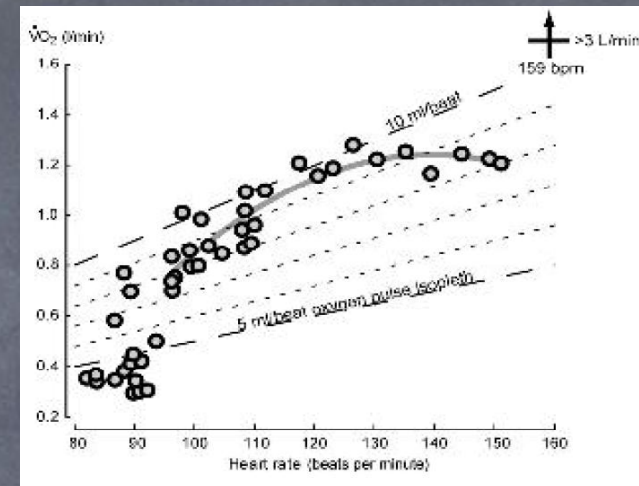
# Exercise kinetics

## Oxygen pulse

Chronotrope incompetence



Stroke volume limitation



# Classification of sports

	A Low dynamic	B Moderate dynamic	C High dynamic
I Low static	Archery, Bowling, Golf	Table tennis, Volleyball, Baseball	Badminton, walking, running (marathon)
II Moderate static	Auto racing* ⚡, Diving ⚡, Motorcycling * ⚡, Karate/Judo *	Fencing, Field events (jumping), Running (sprint)	Basketball, Ice hockey *, Football *, Cross Country, Tennis, Swimming, Running (mid/long)
III High static	Field events (throwing), Weight lifting	Body building, Downhill skiing * ⚡, Wrestling	Boxing *, Cycling * ⚡, Rowing

Symbols: \*Danger of bodily collision. ⚡Increased risk if syncope occurs.

Adapted and modified after Mitchell et al.

# Counselling

- Giannakoulas G et al. Exercise training in congenital heart disease: should we follow the HF paradigm? International J Card 2010;138:109-11 (Editorial)
  - "Adequate consultation on the importance of fitness and patient-centred exercise prescription are rare"
  - "Physicians and nurses with adequate communication skills should assist patients in achieving a positive attitude towards physical activity"

# Advices

- Put it on your agenda – early!
- Dynamic rather than static
- Long warm-up, low intensity (Fontan, Eisenmenger)
- Avoid fluid depletion (Fontan)
- Bodily collision (Marfan, PM, anticoagulation)
- Motivators
  - Follow-up exercise testing
  - Self reports
  - Accelerometers

# Exercise in congenital heart disease

## Summary

- It is safe and feasible
- It improves physical capacity and QOL
- Children < 10(-12) yrs need no restrictions
- A restrictive attitude seems wise in CHD and competitive sport
- Guidelines and recommendations are useful but can not replace a thorough individual assessment (high risk groups)

# Conclusion

- All children, adolescents and adults with CHD can and should do some kind of regular physical activity
- Only patients likely to deteriorate during exercise and/or those in whom exercise may trigger serious arrhythmias should be restricted (after individual assessment)



# Thank you for your attention

