The QUALIREHAB trial

Early hybrid cardiac rehabilitation in adolescents and young adults with congenital heart disease: a multicentre randomised controlled trial

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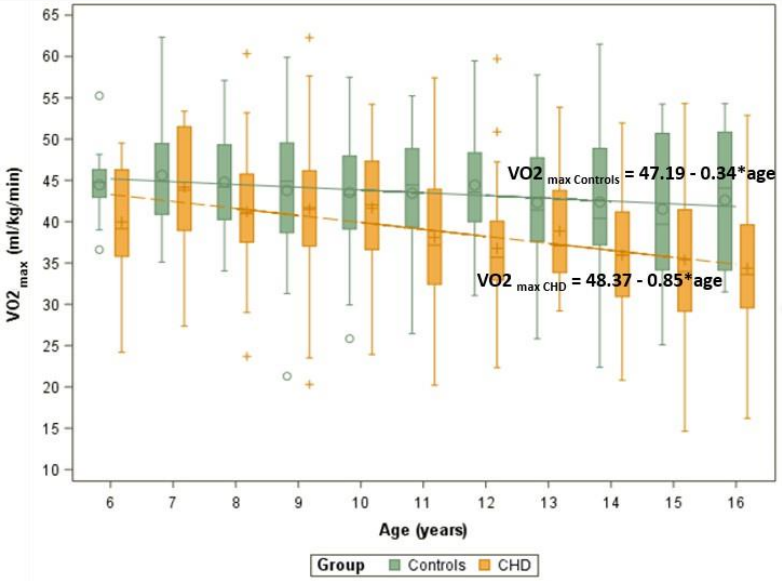
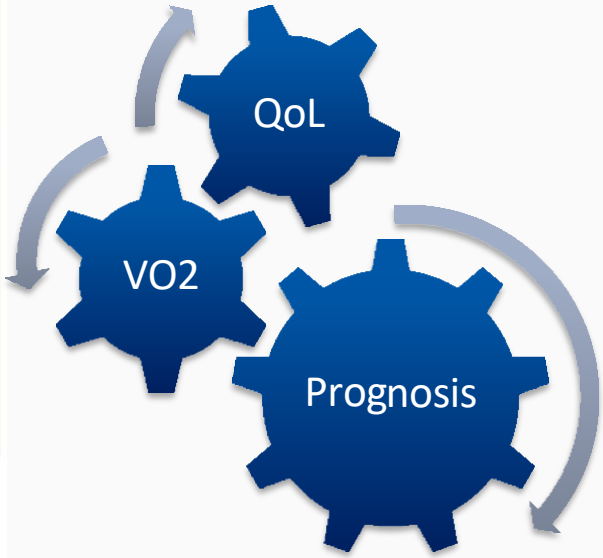
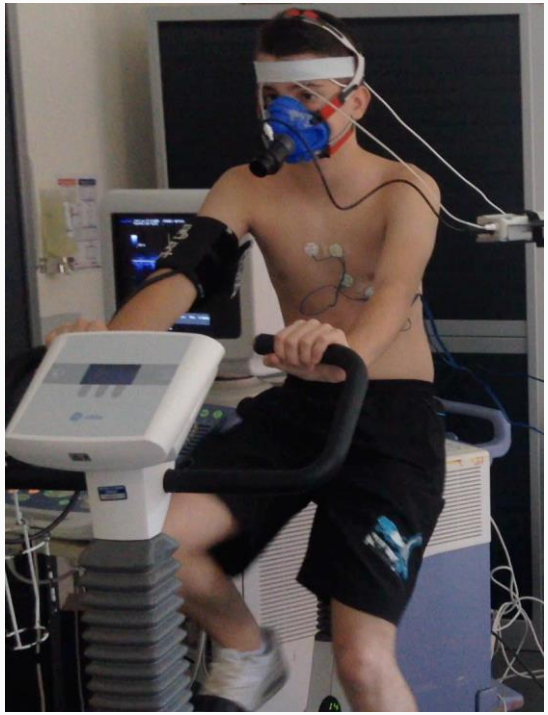
Early onset of physical deconditioning in youth with CHD

- 90% of children with CHD are expected to reach adulthood
- Advances in the management of CHD have shifted the focus from childhood mortality to life-long morbidity



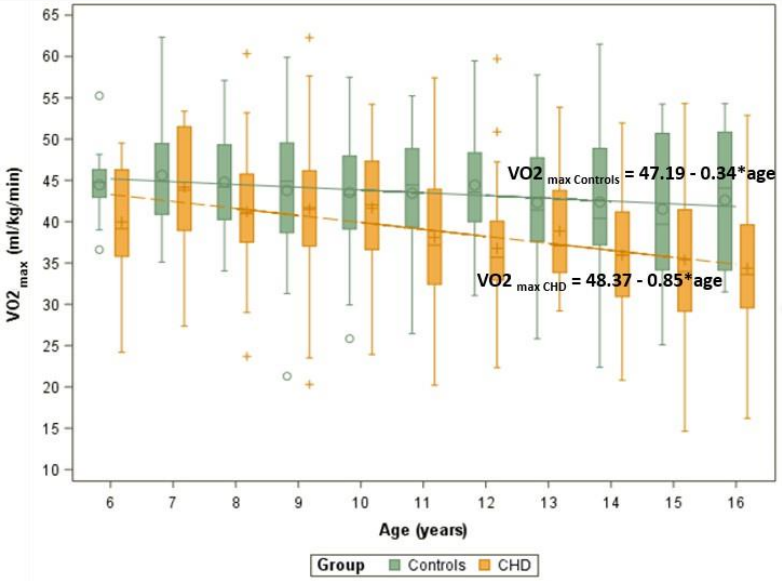


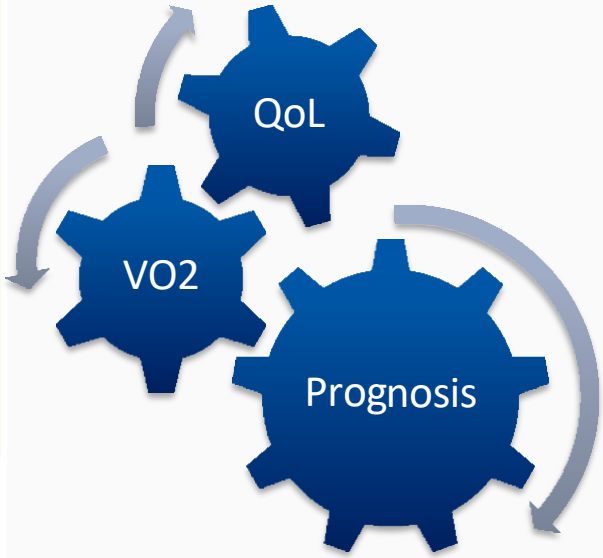


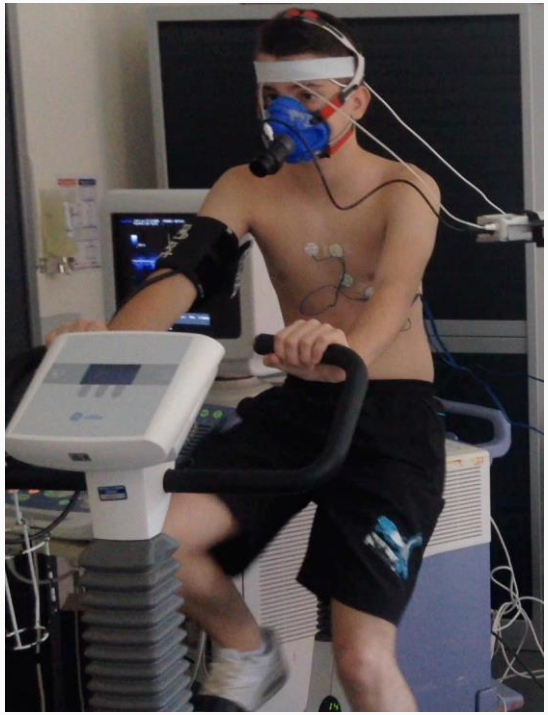
Amedro et al. *Heart* 2018
Amedro et al. *Int J Cardiol* 2019
Gavotto et al. *Int J Cardiol* 2023

Early onset of physical deconditioning in youth with CHD

- VO_{2max} decrease = -2 % per year vs. -0.4% per year (*P<0.01*)
- Low ventilatory anaerobic threshold (VAT): 18% vs 6% (*P<0.01*)
- VO_{2max} & VAT correlate with HRQoL in children with CHD







Amedro et al. *Heart* 2018
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Gavotto et al. *Int J Cardiol* 2023

Consequences in adult CHD cardiovascular morbidity

Circulation

ORIGINAL RESEARCH ARTICLE

Substantial Cardiovascular Morbidity in Adults With Lower-Complexity Congenital Heart Disease

Serious alert!

- Adults with CHD: 51% smokers, 30% obese, 69% hypertension, 41% hyperlipidemia, and 7% diabetes mellitus
- High risk for heart failure (HR=13.0)
- High risk for acute coronary syndrome (HR=2.0)

Saha et al. *Circ* 2019

Solution: cardiovascular rehabilitation in youth with CHD as a preventive action

Main goals adapted from adult heart failure cardiovascular rehabilitation:

- Physical activity training
- Treatment optimization
- Patient education

- Class I, level of evidence A in adult heart failure
- Evidence-based medicine for early cardiac rehabilitation in CHD remains limited

Ponikowski et al *EHJ* 2016
Yance et al. *Circ* 2017
Amedro et al. *Press Med* 2017

Efficacy of early cardiac rehabilitation in youth with CHD? The QUALIREHAB multicentre randomised controlled trial

Primary outcome: change from baseline to 12-mnonth follow-up in HRQoL using the PedsQL™ total score in an intention-to-treat analysis.

Secondary outcomes: change in cardiovascular parameters, cardiopulmonary fitness, and mental health

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Impact of a centre and home-based cardiac rehabilitation program on the quality of life of teenagers and young adults with congenital heart disease: The QUALI-REHAB study rationale, design and methods☆

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- Principal Investigator: **Dr. Sophie GUILLAUMONT**
- Sponsor: **Montpellier University Hospital**, France
- Grants: **French Ministry of Health**, French Society of Cardiology, French Federation of Cardiology
- **French national CHD network**: 12 CHD centres, 9 cardiac rehabilitation centres

Amedro et al. *Int J Cardiol*. 2019

Outcome measures-Primary outcome

Quality of life score: PedsQL self-questionnaire (version 13–18 years for adolescents and version 18–25 years for young adults)

The PedsQL generic quality of life questionnaire

The PedsQL generic quality of life questionnaire has four multidimensional scales:

1. physical functioning (8 items)
2. emotional functioning (5 items)
3. social functioning (5 items)
4. school functioning (5 items)

The three summary scores are: total scale score (23 items), physical health summary score (8 items), psychosocial health summary score (15 items).

Each item uses a 5-point Likert scale from 0 (never) to 4 (almost always). Items are reversed scored and linearly transformed to a 0–100 scale, higher scores indicating a better quality of life. Psychometric properties showed reliability, validity and responsiveness to clinical change over time

In the past 1 month, how much of a problem has this been for you/your child?

Domains	Number of times	Never	Almost never	Sometimes	Often	Almost always
	Score	0	1	2	3	4

Domains	Parent-report questions	Self-report questions
(Physical Functioning) ABOUT MY HEALTH AND ACTIVITIES	1. Walking more than one block 2. Running 3. Participating in a sports activity or exercise 4. Lifting something heavy 5. Taking a bath or shower by him/herself 6. Doing chores around the house 7. Having hurts or aches 8. Low energy level	1. It is hard for me to walk more than one block 2. It is hard for me to run 3. It is hard for me to do sports activity or exercise 4. It is hard for me to lift something heavy 5. It is hard for me to take a bath or shower by myself 6. It is hard for me to do chores around the house 7. I hurt or ache 8. I have low energy
(Emotional Functioning) ABOUT MY FEELINGS	1. Feeling afraid or scared 2. Feeling sad or blue 3. Feeling angry 4. Trouble sleeping 5. Worrying about what will happen to him/her	1. I feel afraid or scared 2. I feel sad or blue 3. I feel angry 4. I have trouble sleeping 5. I worry about what will happen to me
(Social Functioning) HOW I GET ALONG WITH OTHERS	1. Getting along with other children 2. Other kids not wanting to be his/her friend 3. Getting teased by other children 4. Not able to do things that other children his/her age can do 5. Keeping up when playing with other children	1. I have trouble getting along with other kids 2. Other kids do not want to be my friend 3. Other kids tease me 4. I cannot do things that other kids my age can do 5. It is hard to keep up when I play with other kids
(School Functioning) ABOUT SCHOOL	1. Paying attention in class 2. Forgetting things 3. Keeping up with schoolwork 4. Missing school because of not feeling well 5. Missing school to go to the doctor or hospital	1. It is hard to pay attention in class 2. I forget things 3. I have trouble keeping up with my schoolwork 4. I miss school because of not feeling well 5. I miss school to go to the doctor or hospital

Examples of questions from the PedsQL parent-reporting and self-reporting scale. PedsQL, Pediatric Quality of Life.

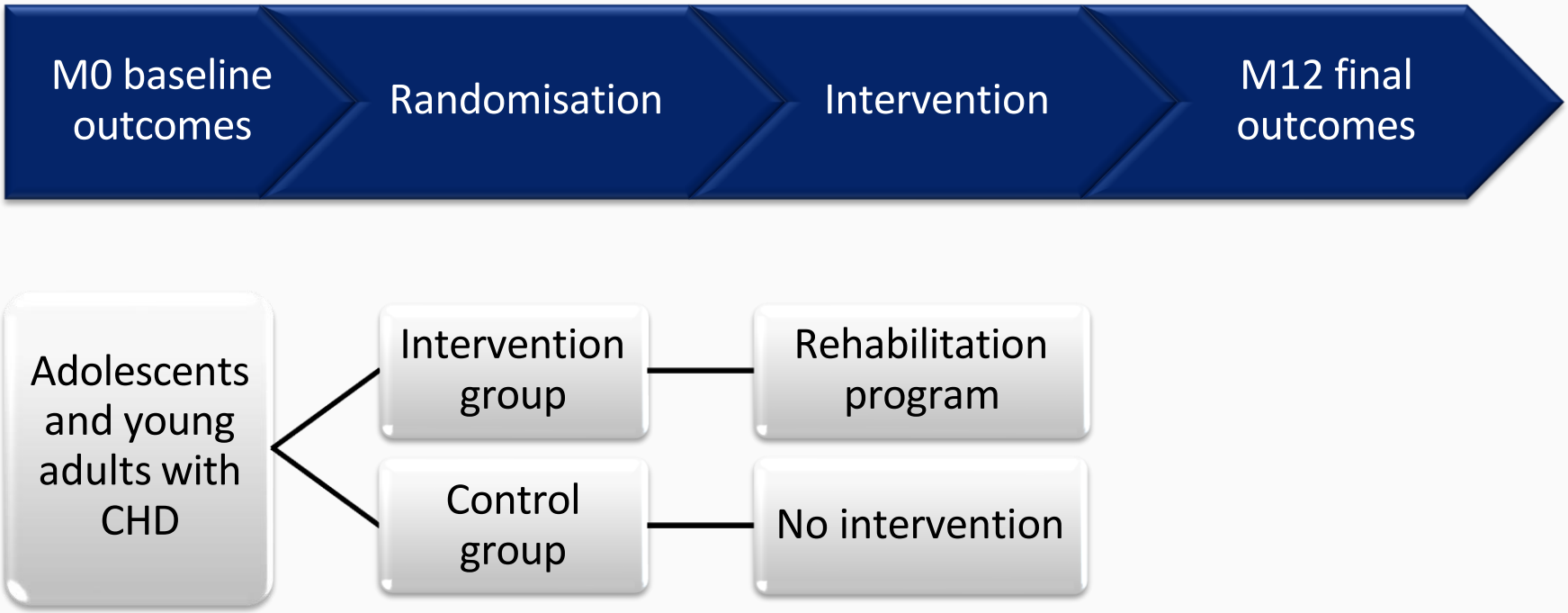
Outcome measures-Secondary outcomes

- CPET variables
- VO2max
- VAT
- VE/VCO2 slope
- OUES (oxygen uptake efficiency slope)
- Oxygen pulse
- Peak exercise stroke volume (PhysioFlow®)
- Level of physical activity (Ricci and Gagnon questionnaire)

Outcome measures-Secondary outcomes

- Level of knowledge (Leuven knowledge CHD questionnaire)
- Clinical outcomes: NYHA functional class, blood pressure, body mass index (BMI), healthcare usage (primary and secondary care contacts, hospitalisation), and medication
- Level of anxiety (STAI self-questionnaire for young adults and the STAI-Children self-questionnaire for adolescents)
- Level of depression (BDI self-questionnaire for young adults and CDI self- questionnaire for adolescents)
- Proxy version of the PedsQL for parents of adolescents (aged 13–18 years old)
- The socio-economic status of the patient and/or the family (only at baseline)
- Safety outcomes
- Acceptability of the intervention to participants

The QUALIREHAB trial

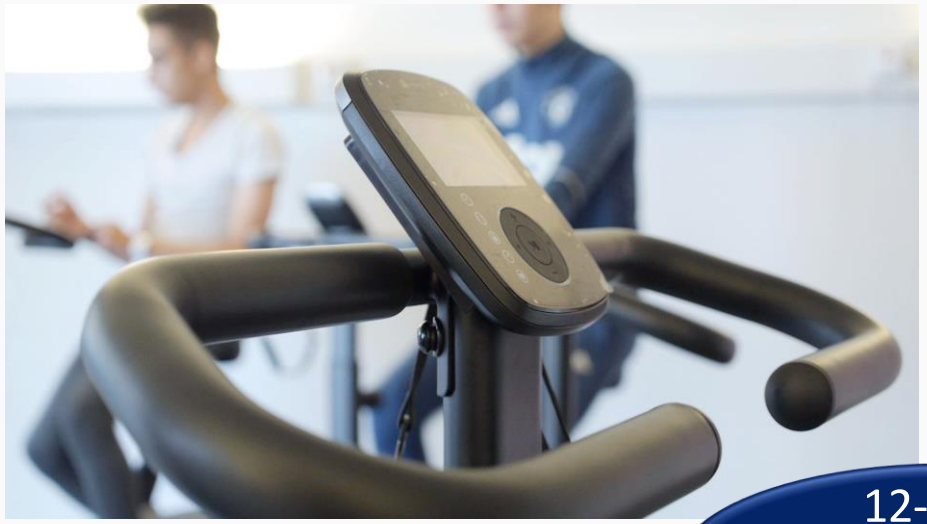


The QUALIREHAB "hybrid" rehabilitation program

Main inclusion criteria

- 13-25 year old CHD patients
- VO_{2max} <80% and/or VAT <55%

12-month follow-up

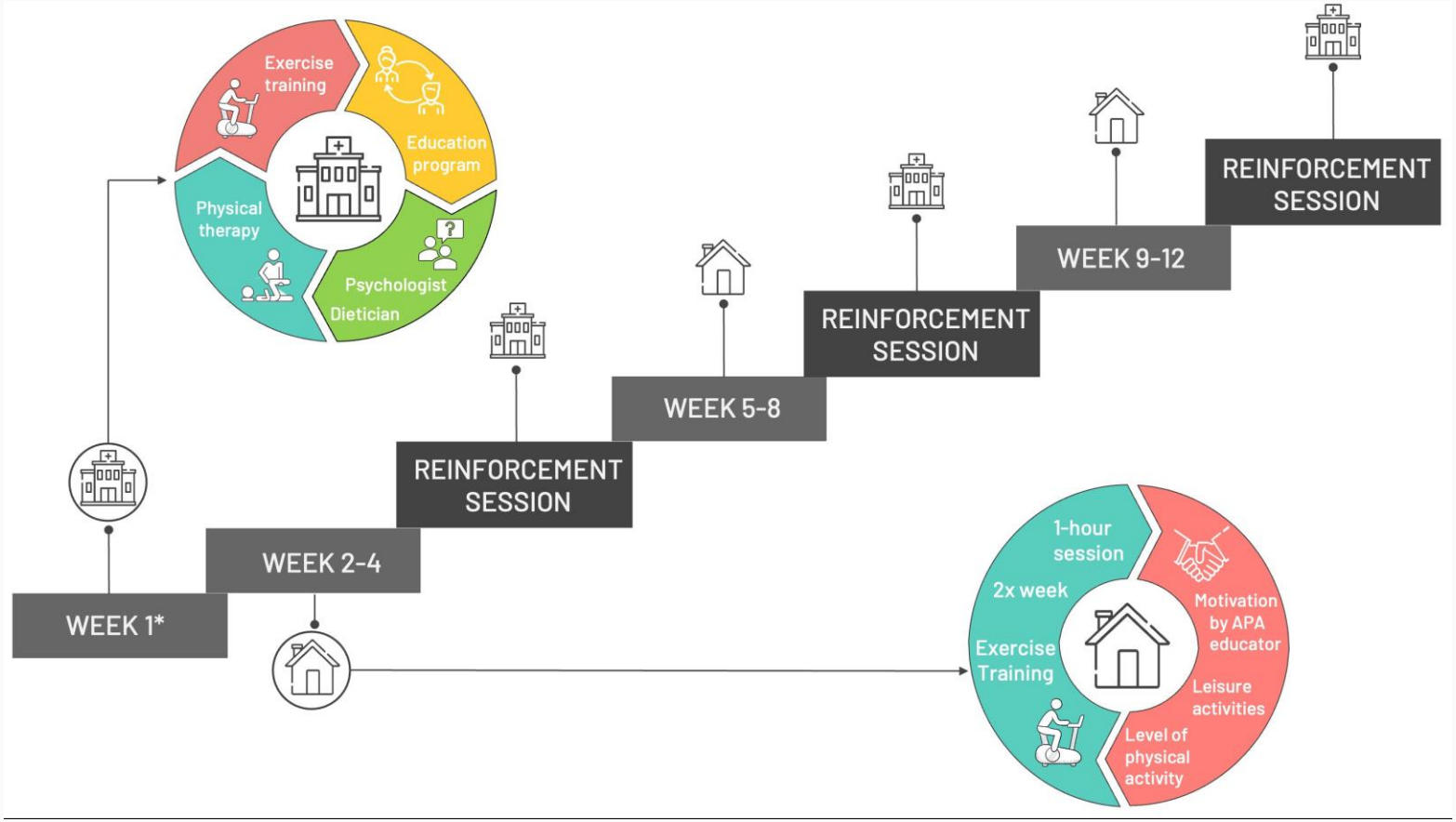


12-week rehabilitation program

Rehabilitation center

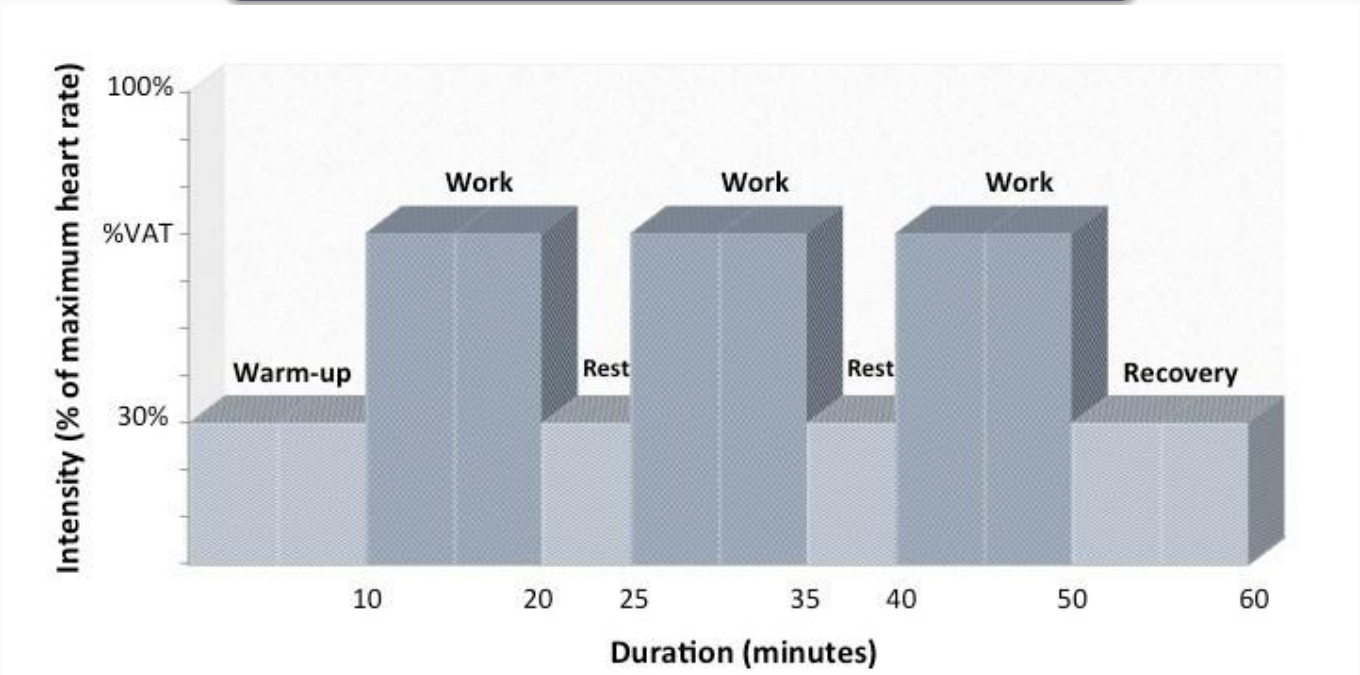
Home

The QUALIREHAB “hybrid” rehabilitation program



Interval training exercise at VAT level

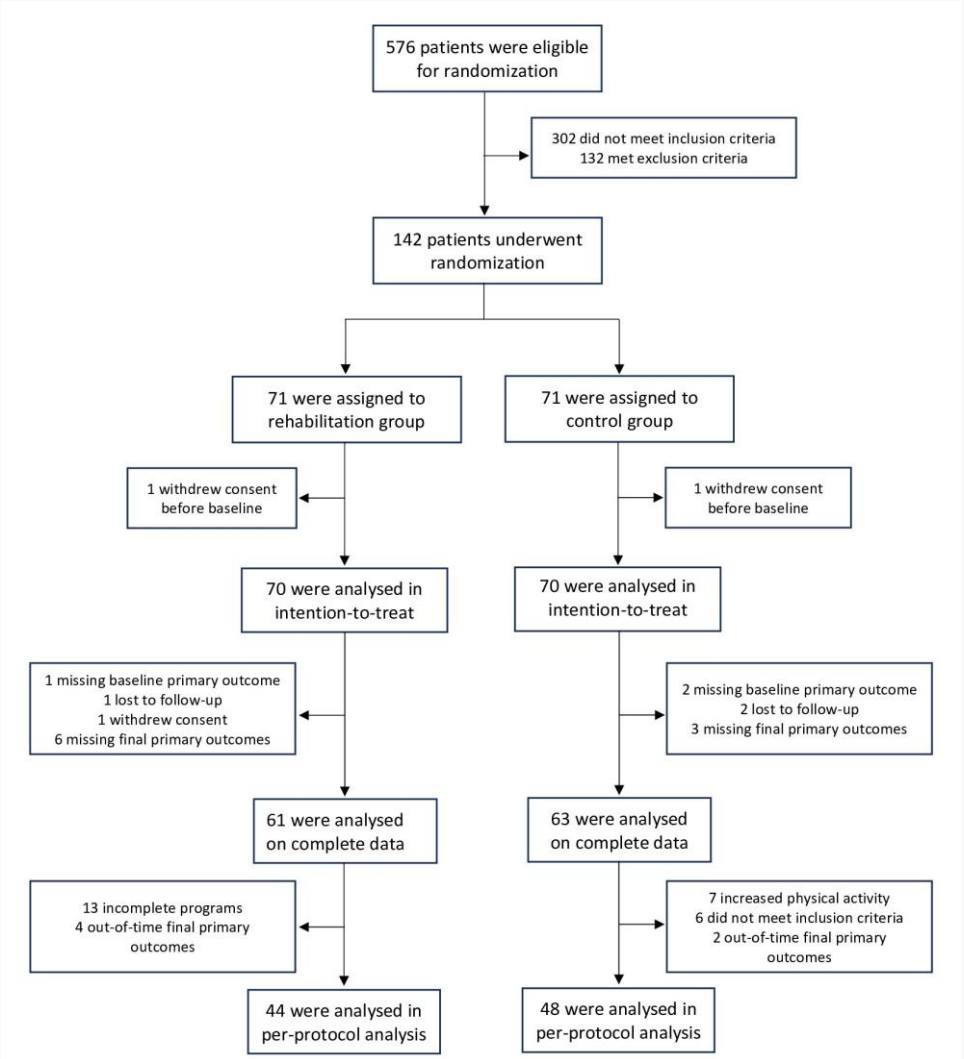
Moderate intensity (60% to 80 % VO_{2max})



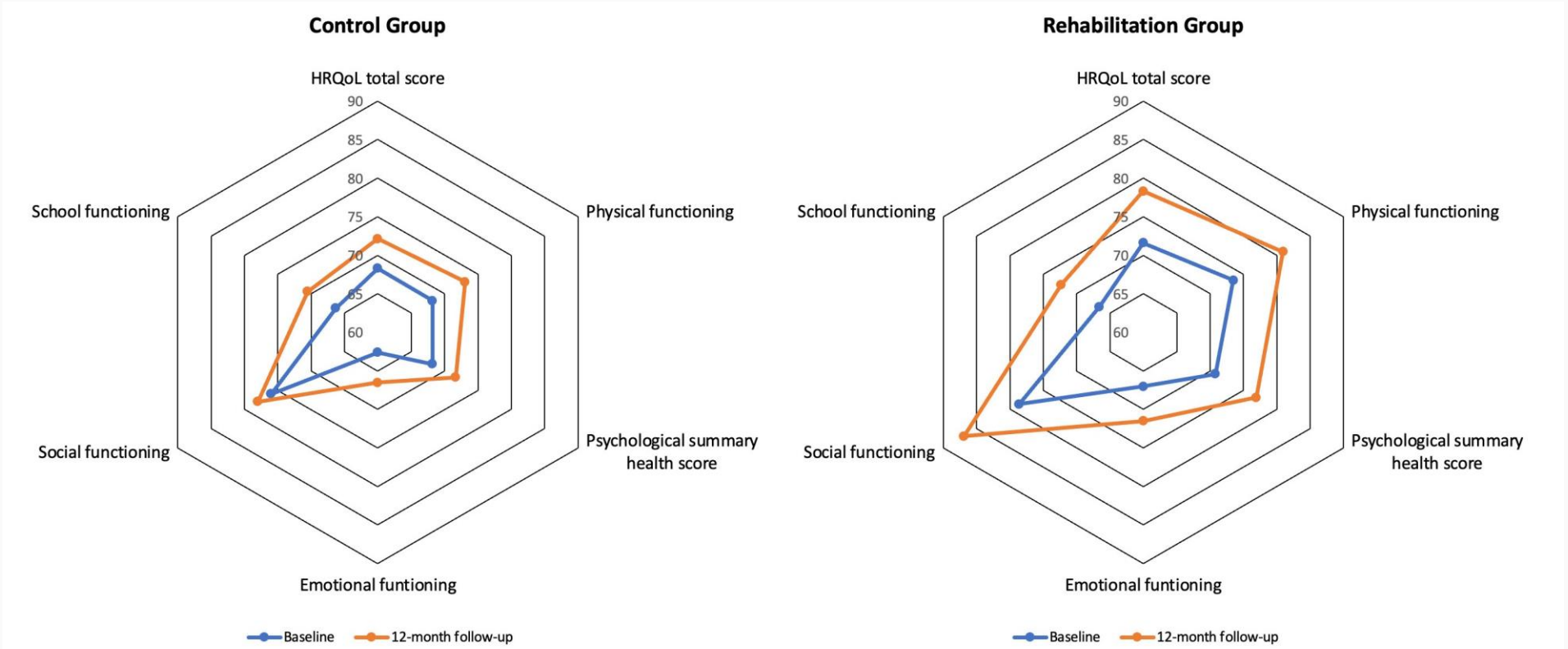
Amedro et al. *Perf Ped* 2021

Population characteristics

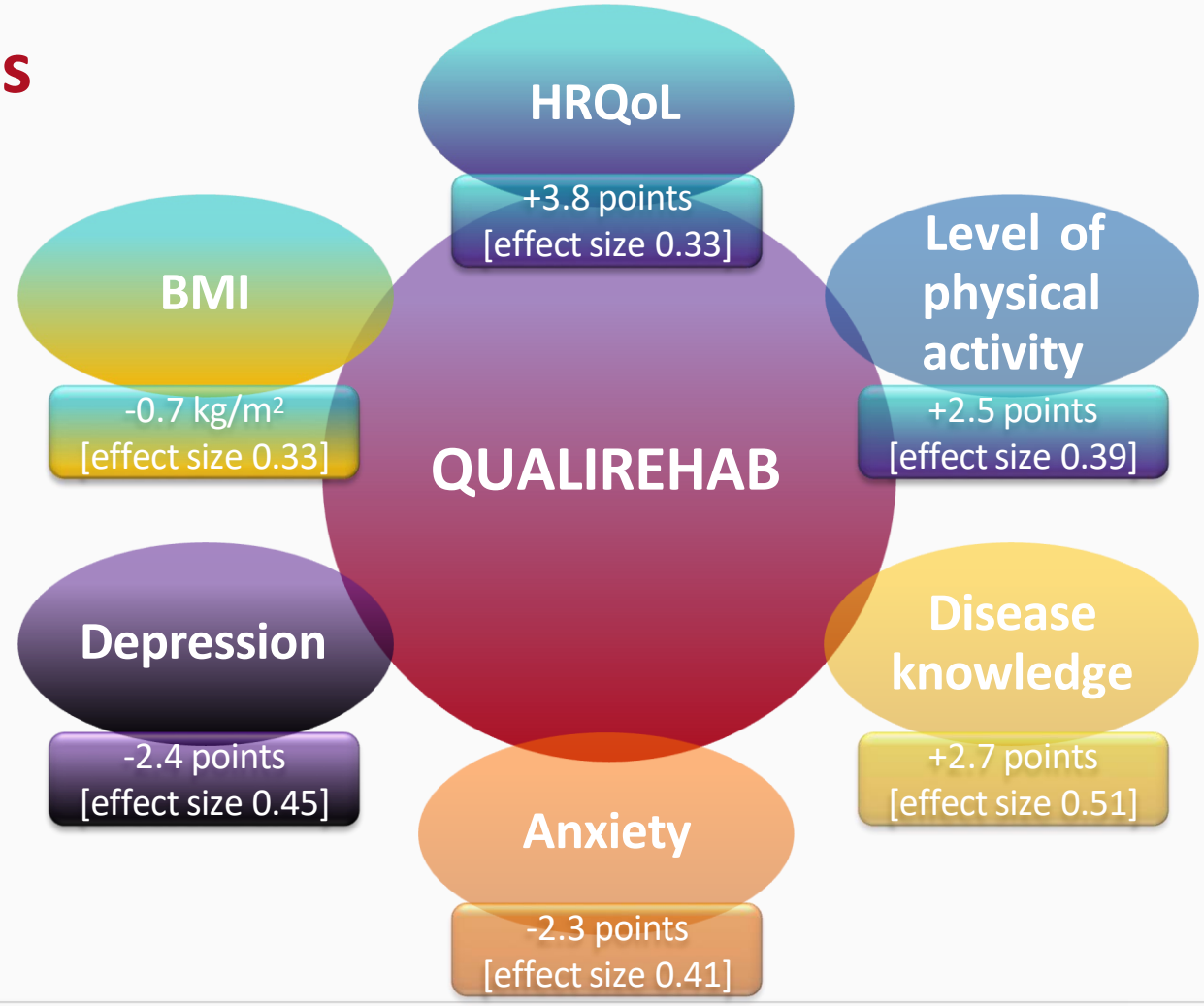
- N = 142 participants
- Mean age 17.4 ±3.4 years
- 52% female
- All types of CHD
- ≥ 1 cardiac surgery = 83%
- ≥ 1 intervention catheter = 44%
- Similar baseline group characteristics



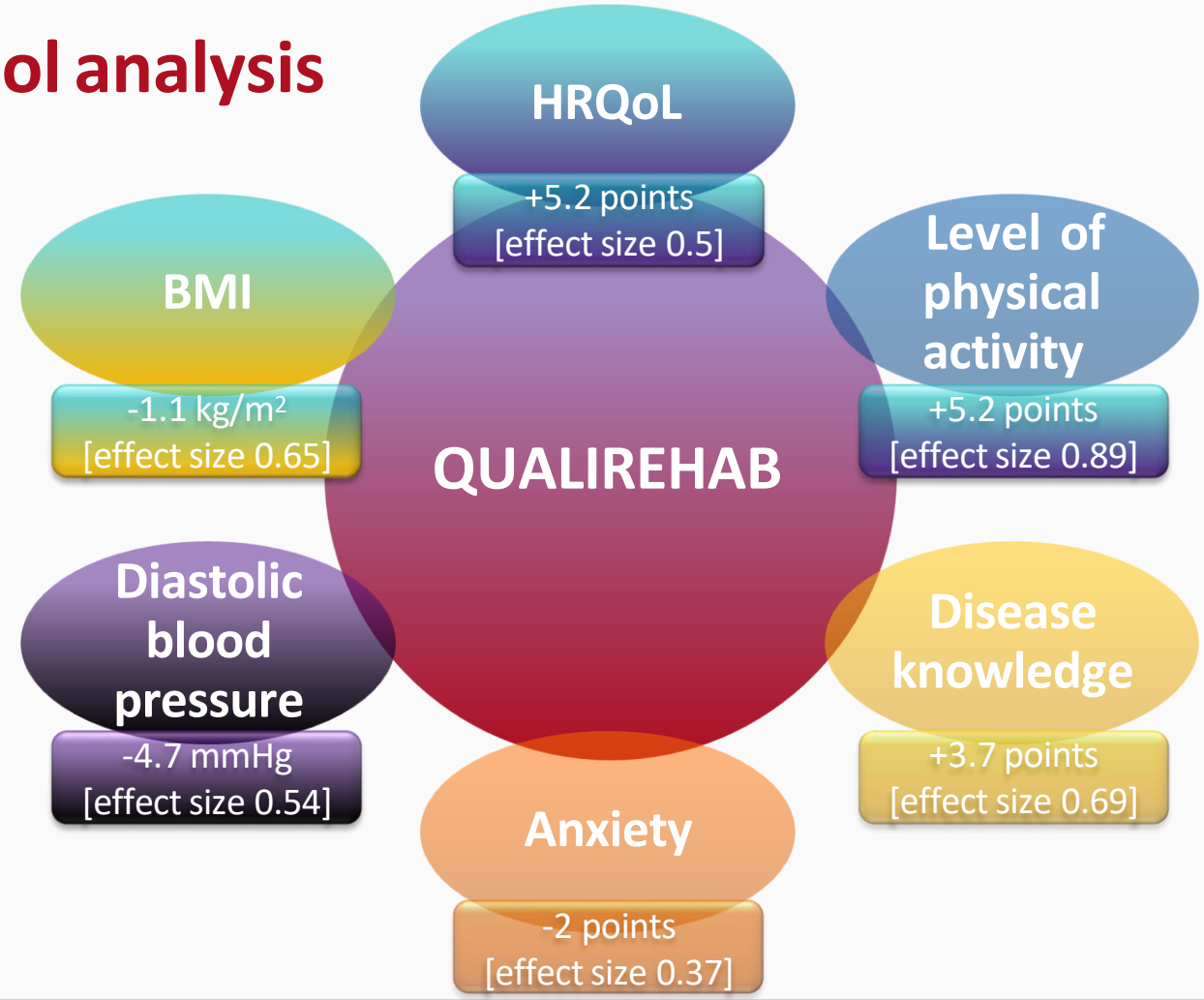
Positive change in the primary outcome: HRQoL total PedsQL™ score from baseline to 12 months



ITT analysis

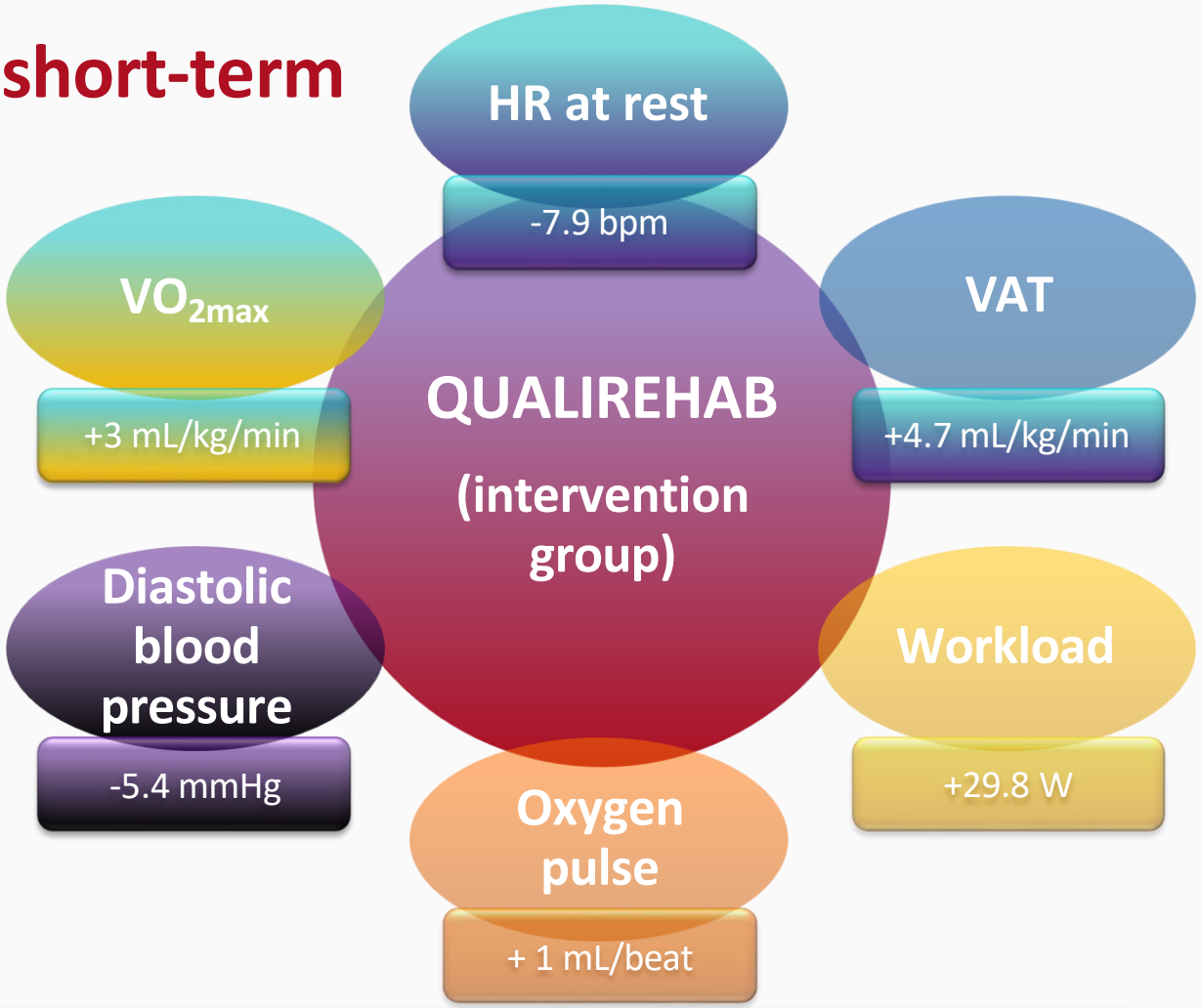


Per protocol analysis

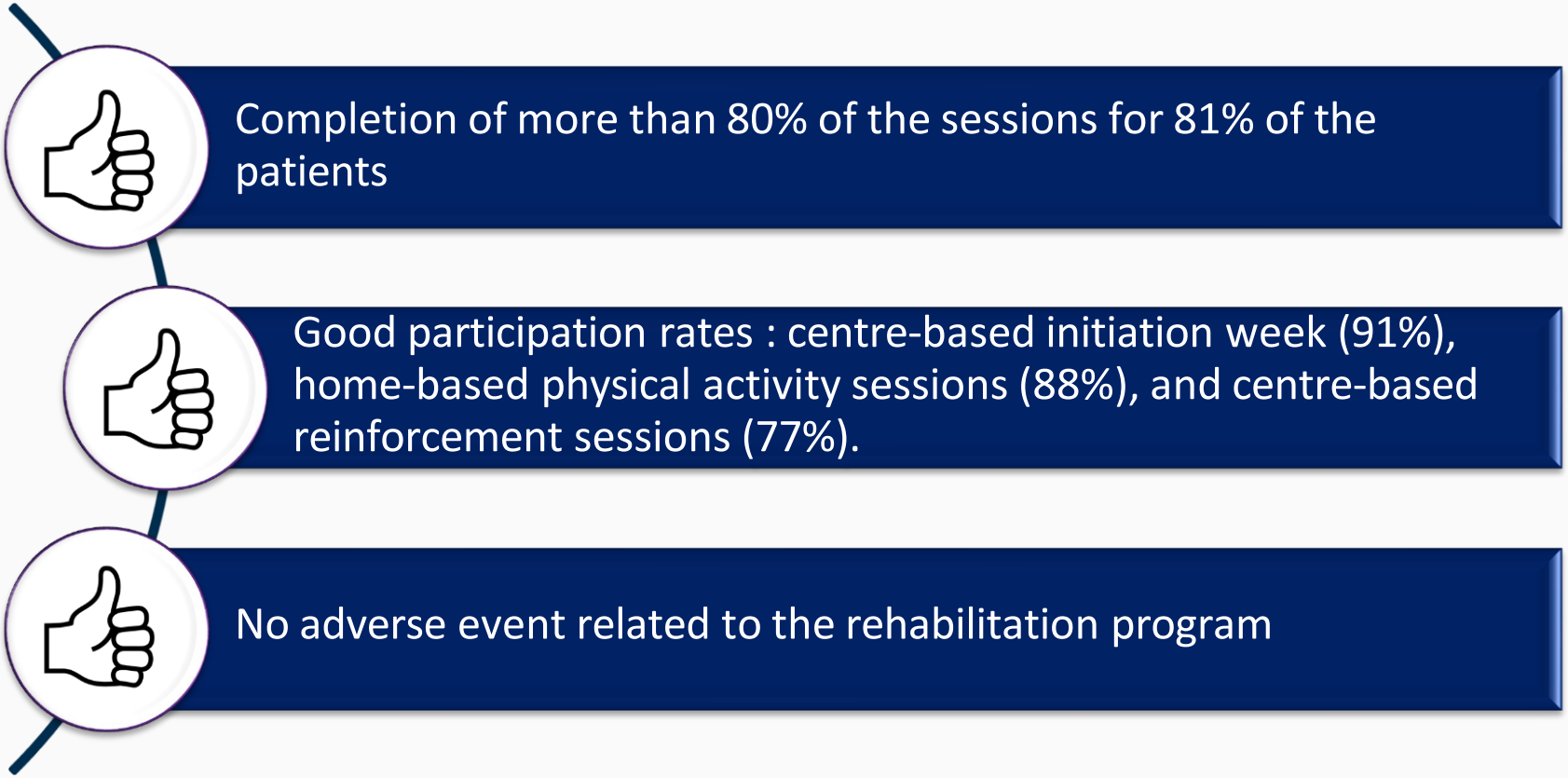


Significant short-term effects

12-week end of program assessment

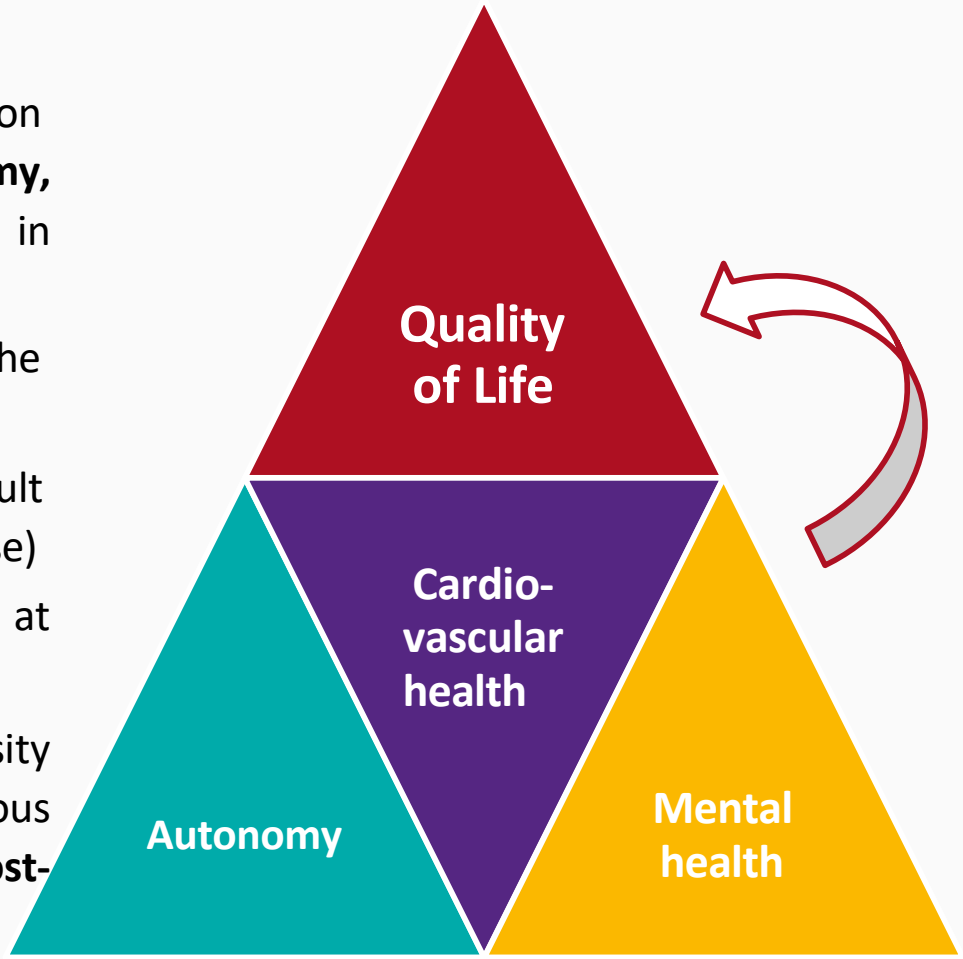


Acceptability and safety of the intervention

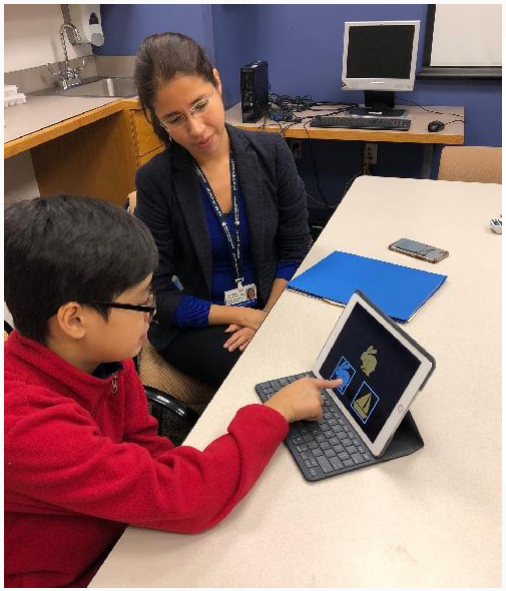


Conclusions

- The QUALIREHAB early hybrid cardiac rehabilitation program improved **HRQoL, patient autonomy, cardiovascular health, and mental health** in adolescents and young adults with CHD.
- Landmark to implement **prevention programs** in the usual care of young patients with CHD.
- Applicable to other paediatric diseases with adult cardiovascular risk (childhood cancer, kidney disease)
- Main limit: VO_{2max} increase at week-12 but not at 12-month follow-up.
- Future programs could combine high-intensity exercise, exercise progress monitoring, various patterns of training (i.e., exergame), and **post-rehabilitation support**.



The QUALINEUROREHAB RCT: a home-based neuro-cardiac rehabilitation program



QUALI
NEURO REHAB

"Mens sana in corpore sano"

EUROPEAN JOINT PROGRAMME
RARE DISEASES
Joint Transnational Call