

SESSIONE: MORTE CARDIACA IMPROVVISA, CANALOPATIE E CARDIOMIOPATIE GENETICHE

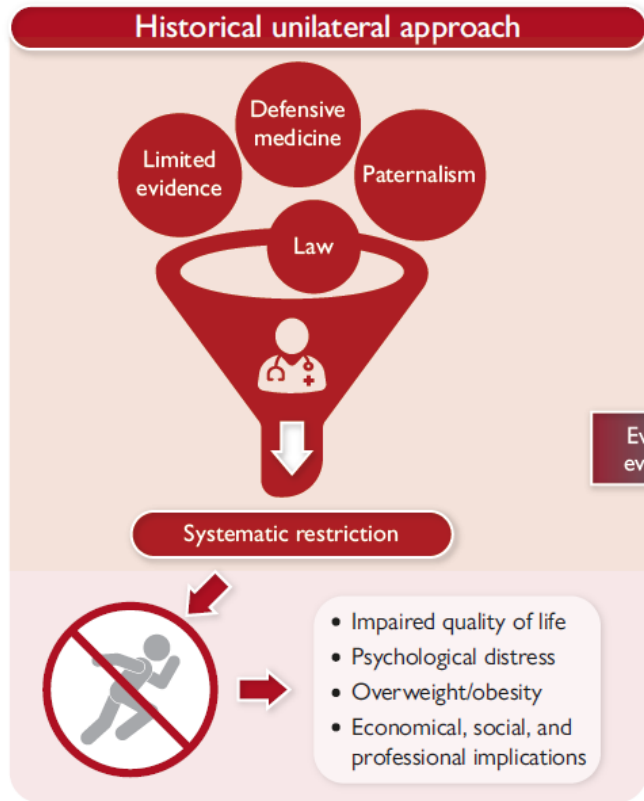
Safety, feasibility and effectiveness of two exercise programs in patients with hypertrophic cardiomyopathy

Francesco Borrelli, MD

Specialista in Medicina dello Sport e
dell'Esercizio Fisico

Master in Cardiologia dello Sport
Università degli Studi di Torino





Zampieri M, et al.
European Heart
Journal 2026



1st Author, Journal,

Study design and population

Main findings

Key messages

Limitations

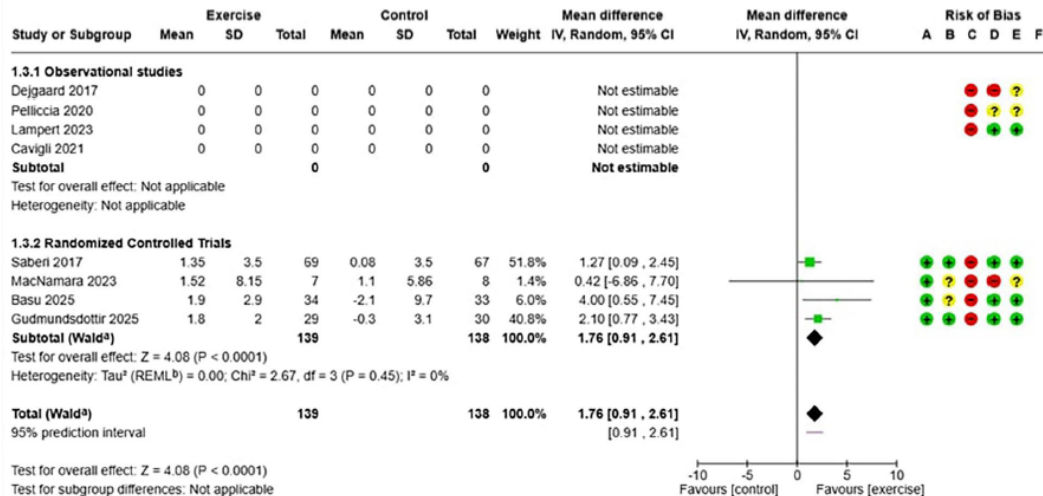


FIGURE 5

(on the top): forest plot which shows the mean difference in term of peak oxygen consumption (VO₂ peak) between exercise and control group before the training.

events.

Improved
diagnostic HCM
criteria.

Small sample. Adults only. No control
group. No gas exchange measurements.

Safety and efficacy of physical activity in hypertrophic cardiomyopathy patients: a systematic review and metaanalysis

Francesco Borrelli¹, Filippo Tarditi^{1*}, Alessandro Andreis²,
Barbara Mabritto³, Andrea Silvio Benso^{1,4} and Elisabetta Toso²

Exercise
safety and quality
in hypertrophic HCM.

Small sample. Short intervention. Adults
only. No vigorous activity. Not powered
for safety.

Exercise is feasible and
safe in patients under

Small sample. Adults only. Not powered for
safety. Improvements mostly attenuated
at 6 months.

ARVC, arrhythmogenic right ventricular cardiomyopathy; ESC, European Society of Cardiology; HCM, hypertrophic cardiomyopathy; ICD, implantable cardioverter defibrillator; LV, left ventricle; LVEDV, left ventricular end-diastolic volume;



Table 2 Key recommendations for exercise p

Optimal targets

Frequency and duration

- From 150–300 min per week
- All sessions must be preceded

Intensity

Progression

Frequency

Duration

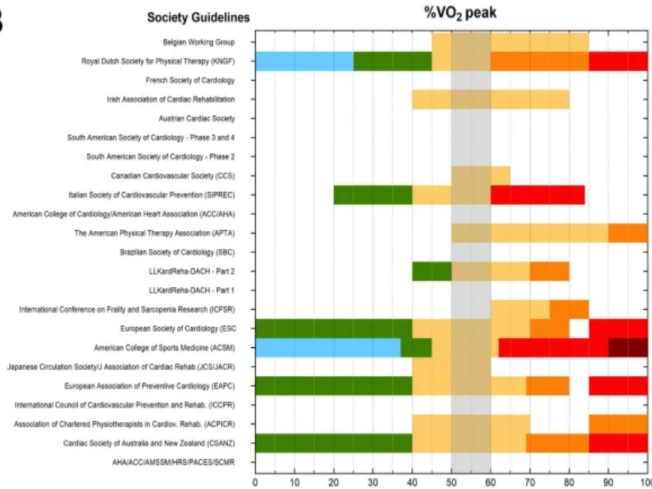
Intensity

Advancing Aerobic Exercise Training Intensity Prescription in Health and Disease Beyond Standard Recommendations: A Call to Action

Dominique Hansen^{# 1 2 3}, Gerson Cipriano Junior^{# 4 5}, Juliana Goulart Prata Oliveira Milani^{6 5},
Mauricio Milani^{6 7 5}, Tin Gojevic^{6 8}, Felipe V C Machado^{6 8}, Tim Kambic⁹,
Thijs M H Eijssvogels¹⁰, Marco Bonifazi¹¹, Paul Dendale^{# 7 8}, Flavio D'Ascenzi^{# 12}

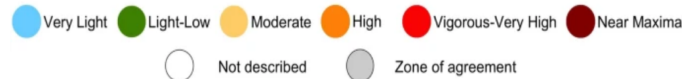
ing on weekly volume
isting about 5 min

B

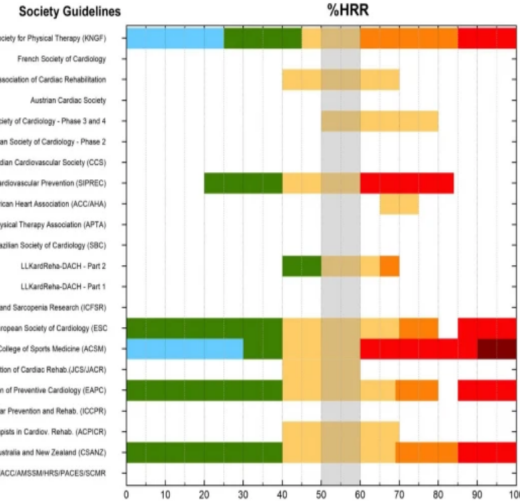


and clinical characteristics

- The patient should stay
- duration about 40 s), ir



Society Guidelines



te velocity (set

avigli, et Al. Prescribing,
and titrating exercise in
; with hypertrophic
myopathy for prevention
of morbidity: Ready for
me, *European Journal
of Preventive Cardiology*, 2021



Journal of the American Heart Association

ORIGINAL RESEARCH

Randomized Controlled Trial of Moderate- and High-Intensity Exercise Training in Patients With Hypertrophic Cardiomyopathy: Effects on Fitness and Cardiovascular Response to Exercise

James P. MacNamara , MD, MSCS; Katrin A. Dias , PhD; Christopher M. Hearon , Jr, PhD; Erika Ivey , MS; Vincent A. Delgado, MD; Sophie Saland , BA; Mitchel Samels, MS; Michinari Hieda , MD, PhD; Aslan T. Turer, MD, MHS, MBA; Mark S. Link , MD; Satyam Sarma , MD; Benjamin D. Levine , MD



European Society
of Cardiology

European Heart Journal (2025) 00, 1–13
<https://doi.org/10.1093/eurheartj/ehae919>

CLINICAL RESEARCH

Heart failure and cardiomyopathies

High intensity exercise programme in patients with hypertrophic cardiomyopathy: a randomized trial

Joyee Basu ^{1,2,*}, Dimitra Nikolettou¹, Chris Miles ^{1,2}, Hamish MacLachlan^{1,2}, Gemma Parry-Williams^{1,2}, Fred Tilby-Jones¹, Paulo Bulleros^{1,2}, Zephryn Fanton^{1,2}, Claire Baker¹, Shane Purcell^{1,2}, Carmen Lech^{1,2}, Tracy Chapman^{1,2}, Peter Sage^{1,2}, Shams Wahid^{1,2}, Nabeel Sheikh³, Shruti Jayakumar¹, Aneil Malhotra^{1,2,4,5}, Tracey Ketepe-Arachi^{1,2}, Belinda Gray ^{1,2}, Gherardo Finocchiaro^{1,2}, Gerald Carr-White³, Elijah Behr ^{1,2}, Maite Tome^{1,2}, Jamie O'Driscoll^{2,6}, Irina Chis Ster¹, Sanjay Sharma ^{1,2}, and Michael Papadakis^{1,2}





CPET, blood sampling,
body composition,
echo-electro cardiogram



Resistance + cardiorespiratory training:
2 sessions per week



CPET, blood sampling,
body composition,
echo-electro cardiogram

- ❑ 24 patients recruited (1 dropout)
- ❑ Prospective observational two-group study
- ❑ Group 1: AT (MICT) at VT1 + Resistance training + coordination and flexibility
- ❑ Group 2: HIIT at VT2 + Resistance training + coordination and flexibility
- ❑ 2 sessions/week, 60'/session (30' aerobic, 20' strength, 10' flexibility)
- ❑ Continuous monitoring: HR, RPE, blood pressure, SpO2

SAFETY

FEASIBILITY

EFFICACY



✓ No MACE events

- ☐ CA
- ☐ IMA
- ☐ ICTUS

✓ No major arrhythmic events

- ☐ TVNS
- ☐ TVS

○ 12 months follow-up



ADHERENCE

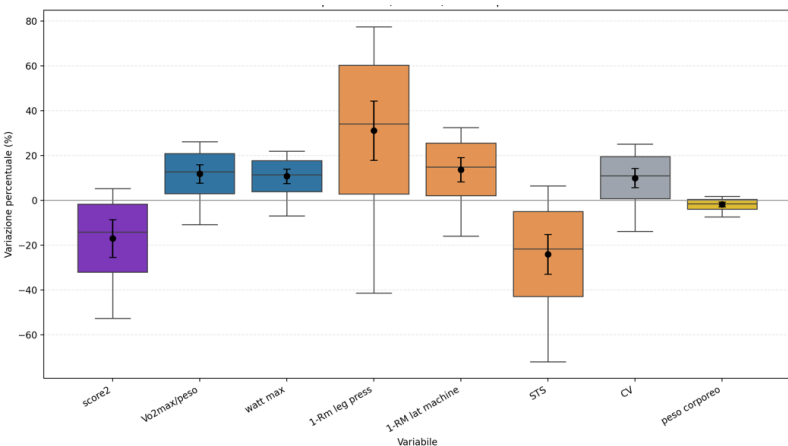
- Mean 78%
- Median 84%
- IQR 63-92%
- Mean number of completed sessions 14.8/19



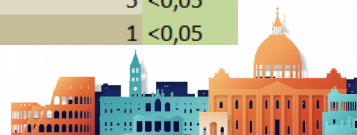
RETENTION

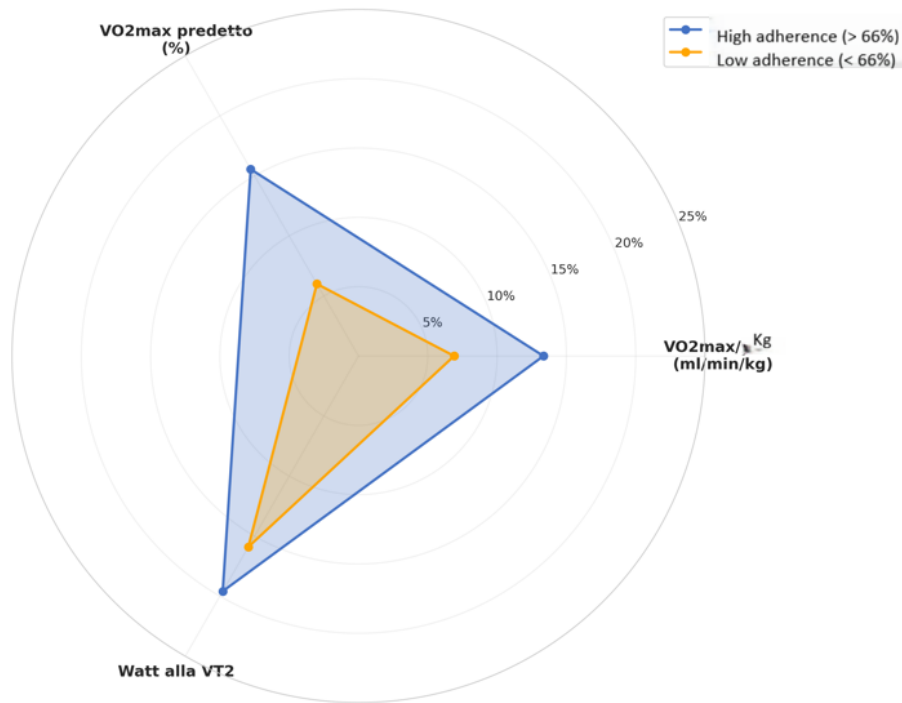
- 1/23 discontinued 1 month before the end
- 2/23 discontinued 2 wks before the end
- 20/23 ended the exercise program





Variabile	media ± DS T0	media ± DS T1	var. media	P_Value
Score2	4,1 ± 2,1	3,4 ± 1,8	-0,7	<0,001
MECKI score	0,20 ± 0,3	0,16 ± 0,20	-0,04	<0,05
PAS (mmHg)	126 ± 14	116 ± 15	-10	<0,001
PAD (mmHg)	80 ± 10	75 ± 9	-5	<0,001
Watt alla VT2	114 ± 53	136 ± 67	22	<0,001
Watt max	152 ± 69	168 ± 76	16	<0,001
Vo2max/peso (ml/min/kg)	25,1 ± 9,5	28,1 ± 10,7	3	<0,001
Vo2 max predetto (%)	91 ± 24	102 ± 27	11	<0,001
Vo2max (ml/min)	1908 ± 762	2102 ± 837	194	<0,001
Polso O2	14,3 ± 4,8	20,7 ± 26,3	6,4	<0,001
FC alla VT2 (b/m)	114 ± 19	120 ± 20	6	<0,05
1-RM alla leg press (kg)	71 ± 29	94 ± 49	23	<0,001
1-RM alla lat machine (kg)	41 ± 21	47 ± 20	6	<0,001
STS time (s)	8,07 ± 4,42	6,27 ± 2,66	-1,8	<0,001
Handgrip arto dominante (kg)	34 ± 13	36 ± 13	2	<0,05
Capacità vitale (L)	3,88 ± 1,10	4,28 ± 1,29	0,4	<0,001
Massima ventilazione volontaria (L)	112,1 ± 38,1	123,6 ± 45,2	11	<0,05
peso corporeo (kg)	77 ± 17,1	75,7 ± 16,7	-1,3	<0,05
massa grassa del core(kg)	12,1 ± 5,6	11,6 ± 5,4	-0,5	<0,05
E/e' laterale	8 ± 2	6 ± 2	-2	<0,05
gradiente max LVOT (mmHg)	7 ± 4	11 ± 8	5	<0,05
Riduzione motivazione	8,6 ± 3,8	9,6 ± 4,2	1	<0,05





Participants with high adherence ($\geq 66\%$) showed substantially greater improvements in all cardiovascular parameters, especially in VO2max measures.



Radar $\Delta\%$ AT vs HIIT

HR at VT1

Lateral E/e'

Left atrial volume / BSA

1-RM leg press

Body weight

Body fat mass

LDL

Total cholesterol

HDL

VO2max / body weight

Max power (Watts)

HR max

— AT $\Delta\%$
— HIIT $\Delta\%$
- - - Zero line

- MICT and HIIT seem to induce distinct cardiovascular and metabolic adaptations
- MICT appears more effective for body composition and lipid profile optimization
- HIIT appears to preferentially improve muscular performance and functional capacity



TAKE HOME MESSAGES

- No MACE -> **exercise can be implemented safely in these patients**
- Adherence >70% -> **acceptable therapeutic strategy**
- Exercise improves CRF, strength and CV risk -> **inclusion in standard care**
- Adherence >66% predicts greater benefits -> **compliance**
- HIIT and MICT seem to induce different adaptations -> **personalization**
- Resistance training appears to be safe and crucial in our prescription



“

For decades, exercise in HCM was viewed mainly as a problem. Today, we are starting to view exercise as a therapeutic opportunity.”



NOT EXERCISE
WITHOUT
EVALUATION.



NOT EXERCISE
WITHOUT
PRESCRIPTION.



BUT PRECISION
EXERCISE
MEDICINE.

“

And perhaps the greatest risk for some HCM patients is no longer exercise itself... but inactivity.”



IMPROVE
FUNCTION



ENHANCE
QUALITY OF LIFE



REDUCE
RISK



SUPPORT
WELL-BEING



MOVE WITH
PURPOSE

EVALUATE. PERSONALIZE. PRESCRIBE. EMPOWER.

EXERCISE IS MEDICINE. INACTIVITY IS THE RISK.” 



Grazie per l'attenzione

