Ergospirometri inom idrottsmedicin

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Idrottskardiologiskmottagning Karolinska

- Multidisciplinär kompetens
- Enbart remissfall, egenremiss
- Hjärtmottagning (anamnes, status, EKG, eko)
- Ronder/konsensus beslut/second opinion
- Utbildning

- Myokardit, post myokardit
- ACHD, träningsråd
- Infektioner, post infektion
- RTS
- mm

Vanliga frågeställningar:

- Patologisk EKG-fynd från hjärtscreening
- Idrottshjärta/kardiomyopati
- Ärftlighet, SCD
- Arytmi/synkope vid ansträngning

ESC European Society of Cardiology
European Heart Journal (2020) **00**, 1–80
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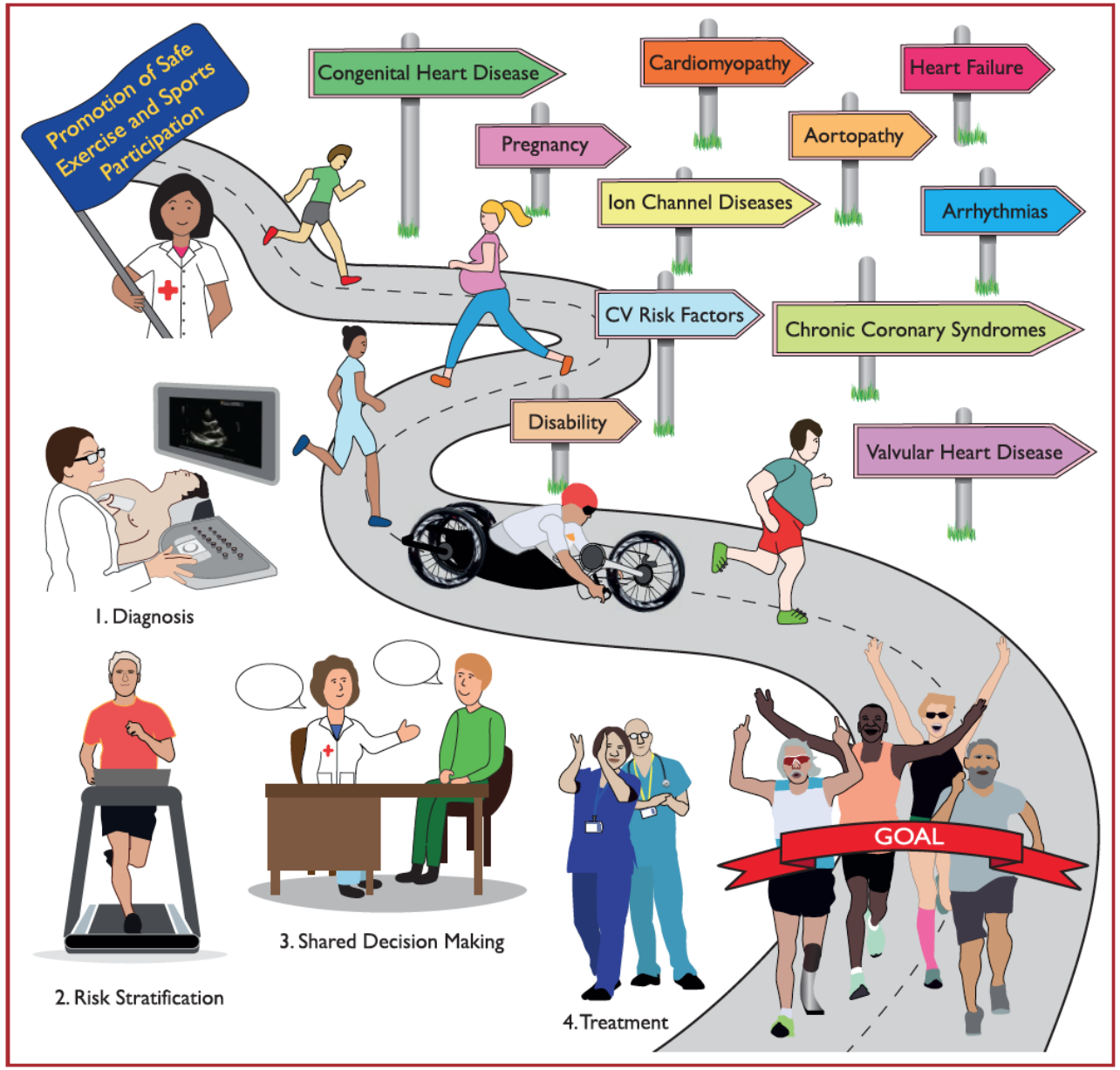
2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease

The Task Force on sports cardiology and exercise in patients with cardiovascular disease of the European Society of Cardiology (ESC)

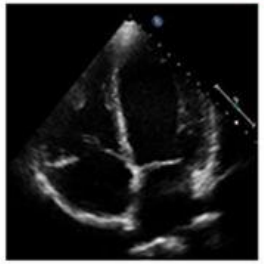
Authors/Task Force Members: Antonio Pelliccia* (Chairperson) (Italy), Sanjay Sharma* (Chairperson) (United Kingdom), Sabiha Gati (United Kingdom), Maria Bäck (Sweden), Mats Börjesson (Sweden), Stefano Caselli (Switzerland),

- Baslinjeundersökning för kardiovaskulär hälsa och nivå på prestationsförmågan
- Differential diagnos/er (DCM, HCM, PAH m fl)
- Symptom, arytmi, bltr-reaktion
- Riskstratifiering/prognos (ACHD)
- Individualiserad träningsintensitet
- Återgång till idrott (return to sports)



Idrottshjärta

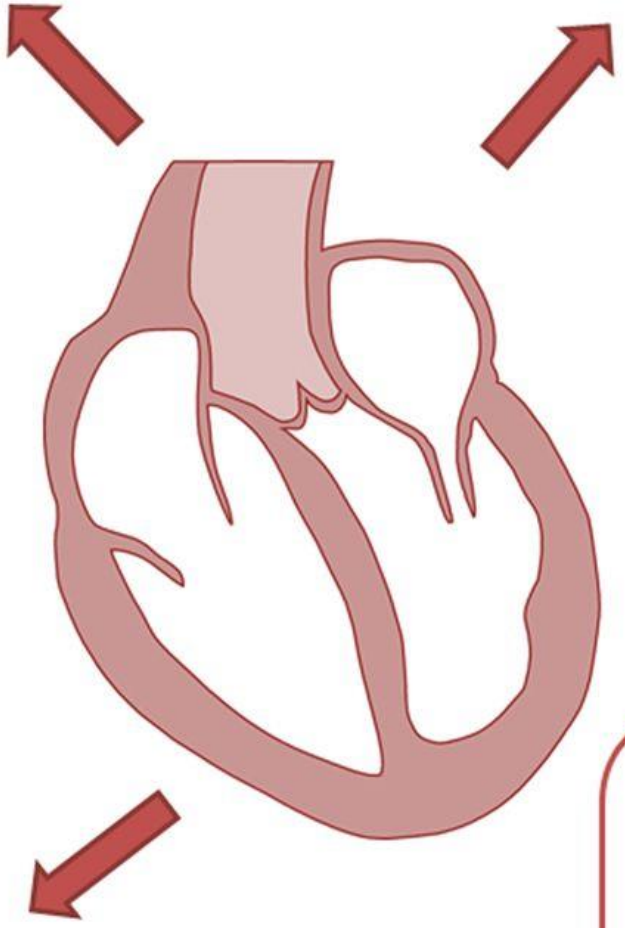
Structural changes



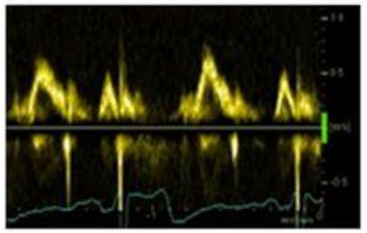
↑ LVWT 10-25%
↑ LV and RV cavity 15%
Bi-atrial dilatation

Electrical changes

Sinus bradycardia
Sinus arrhythmia
First degree AV block
Voltage LVH, and RVH
Incomplete RBBB
TWI in V1-V4 in black athletes



Functional changes

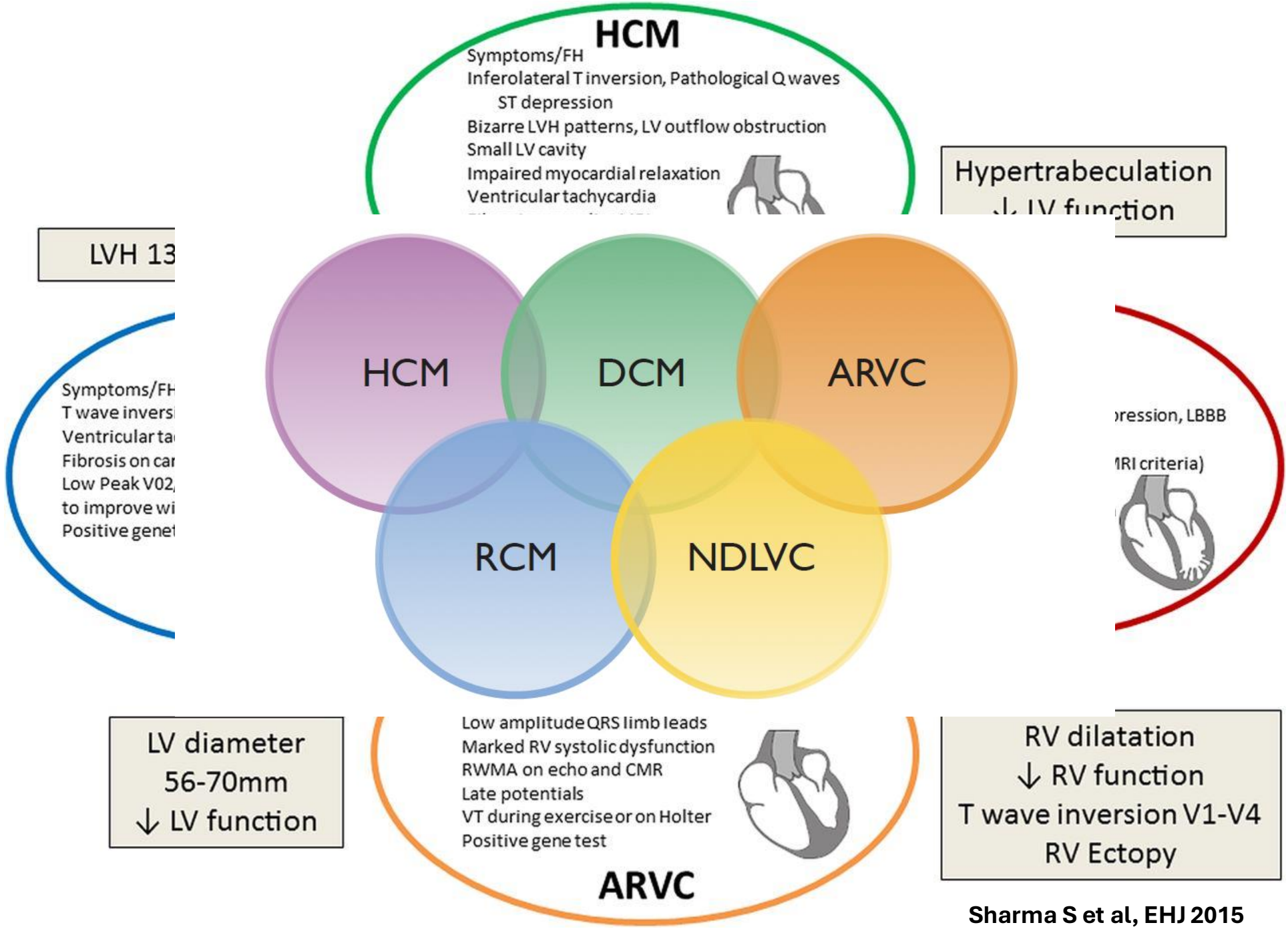


Functional changes
↑ diastolic filling
E' >9 cm/s
E/E' <6
S' >9
↑ Stroke volume

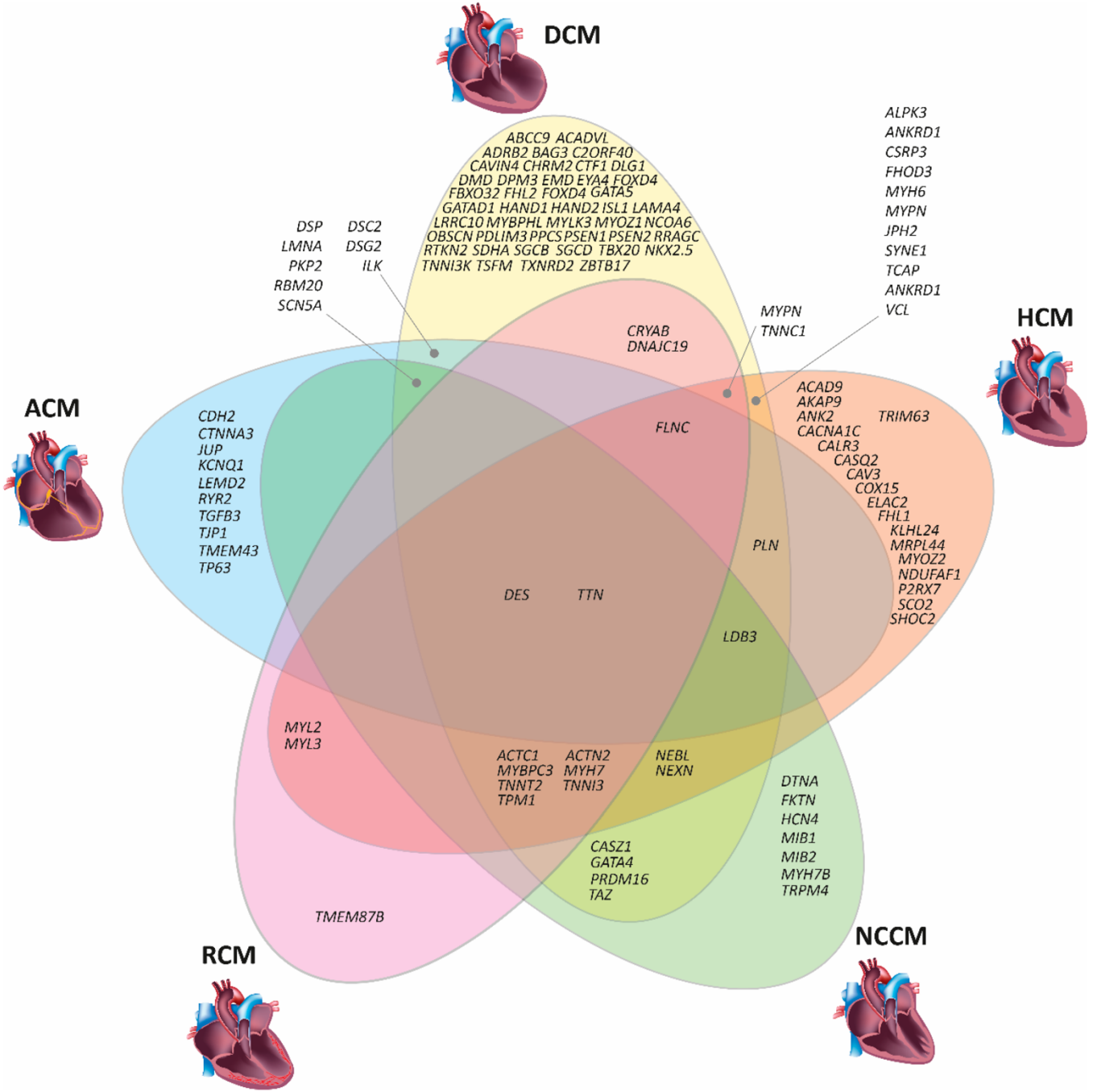
Peripheral changes

↑ skeletal muscle fibres
↑ capillary conductance
↑ oxidative capacity
↑ mitochondrial enzymes
↑ 0_2 Peak consumption

Sharma S et al, EHJ 2015



Sharma S et al, EHJ 2015



Int. J. Mol. Sci. **2019**, *20*(18), 4381

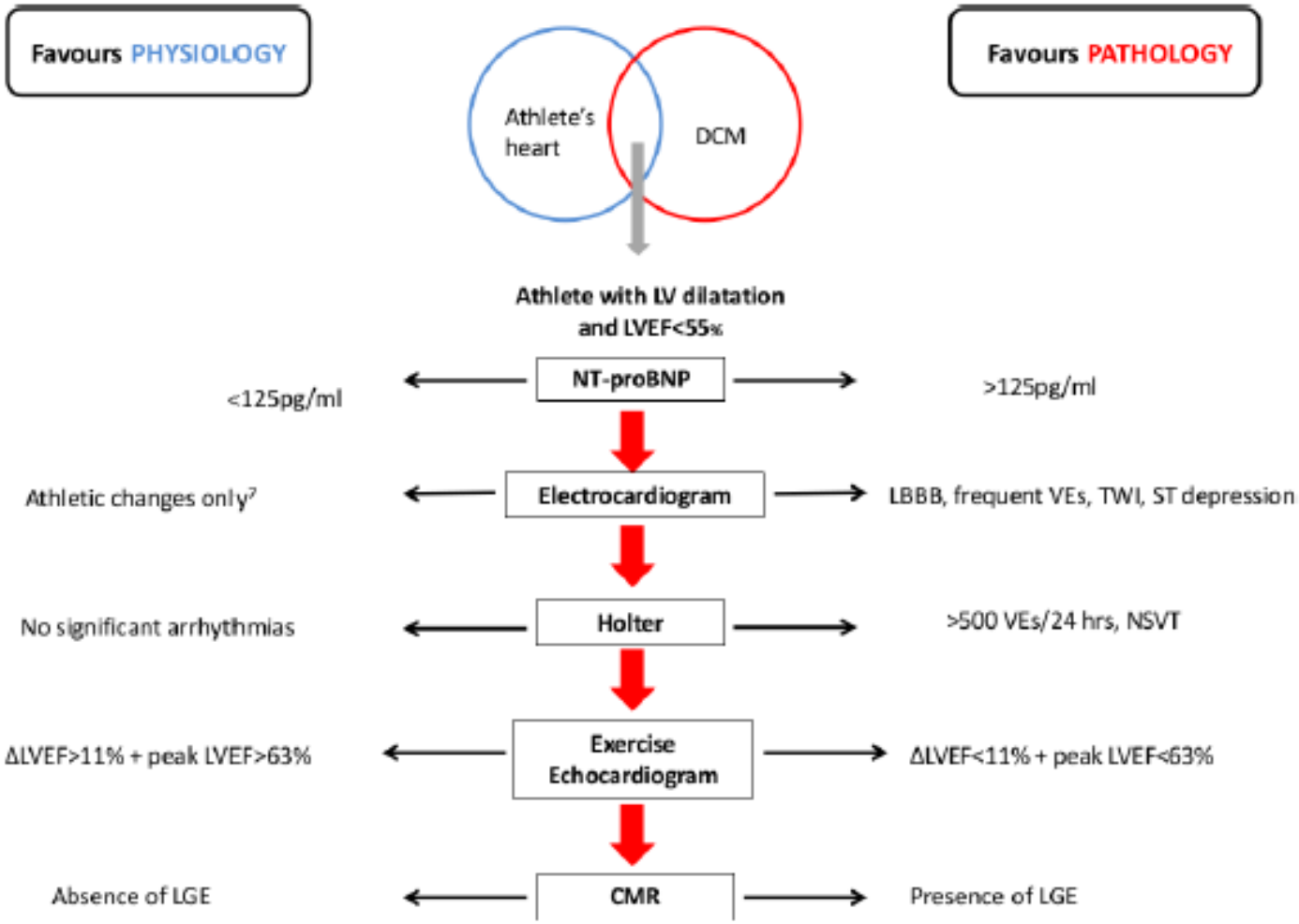
ORIGINAL RESEARCH

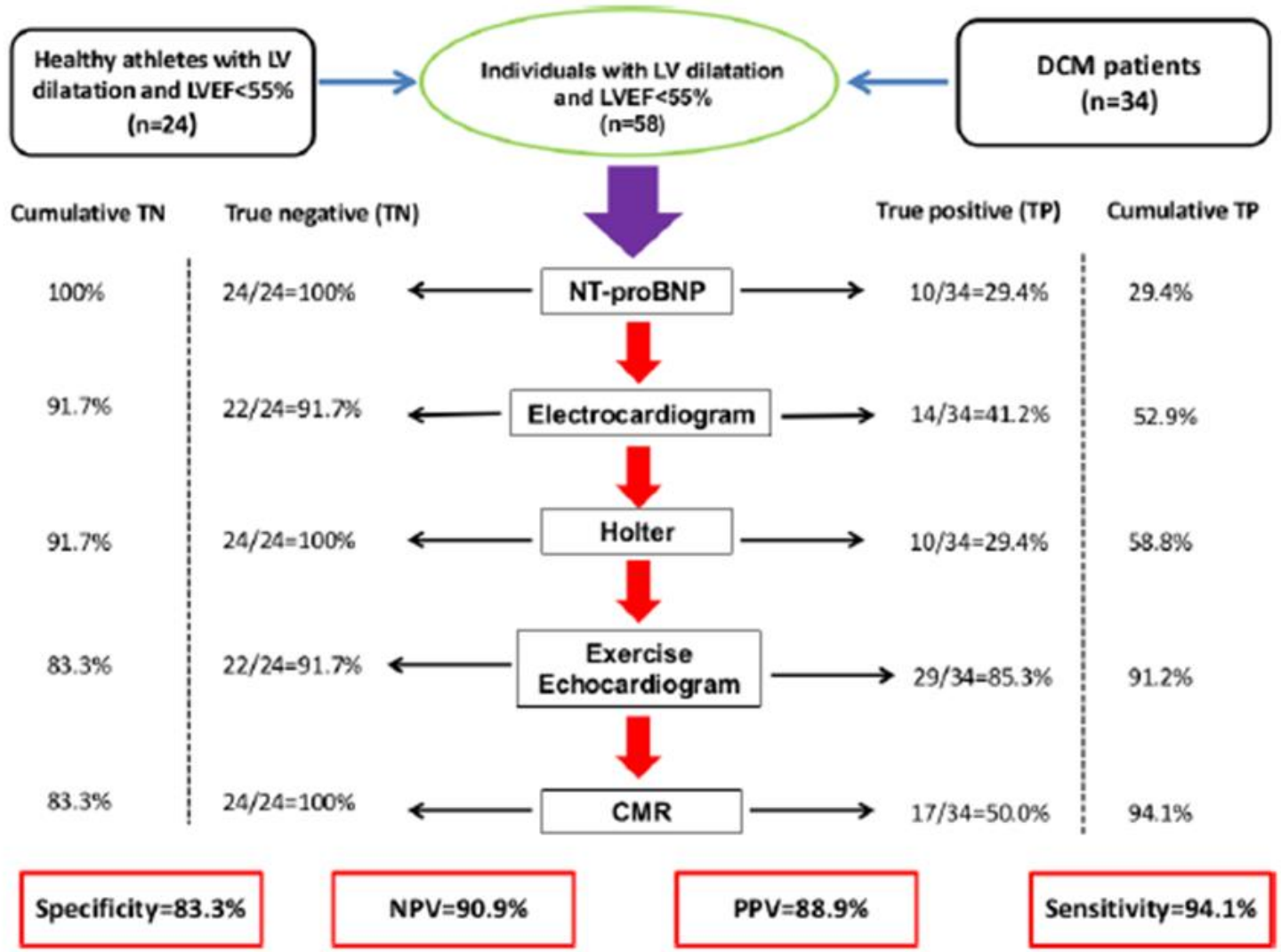
Differentiation between athlete's heart and dilated cardiomyopathy in athletic individuals

Lynne Martina Millar ,[1] Zephryn Fanton,[1] Gherardo Finocchiaro,[1] Gabriel Sanchez-Fernandez,[1] Harshil Dhutia,[1] Aneil Malhotra,[1,2] Ahmed Merghani,[1] Michael Papadakis,[1] Elijah R Behr,[1] Nick Bunce,[1] David Oxborough,[3] Matthew Reed [1] Jamie O'Driscoll,[4] Maria Teresa Tome Esteban ,[1] Andrew D'Silva,[1] Gerry Carr-White,[5] Jessica Webb,[5,6] Rajan Sharma,[1] Sanjay Sharma [1]

2019

Methods Thirty-five asymptomatic active males with DCM, 25 male athletes in the 'grey zone' and 24 male athletes with normal LV ejection fraction underwent N-terminal pro-brain natriuretic peptide (NT-proBNP) measurement, ECG and exercise echocardiography. Grey-zone athletes and patients with DCM underwent cardiovascular magnetic resonance (CMR) and Holter monitoring.





Cardiopulmonary exercise testing

There were no significant differences in cardiopulmonary parameters between either athletic group and both achieved superior results compared with patients with DCM (online supplementary table 2). A significant proportion (n=25; 71.4%) of patients with DCM had a normal pVO_2[15] with seven (20%) achieving a pVO_2 of >120% predicted. Of these seven, all had ventricular arrhythmias on Holter and six had the late enhancement on CMR.

ESC European Society of Cardiology
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ORIGINAL PAPER

Indexing cardiac volumes for peak oxygen uptake to improve differentiation of physiological and pathological remodeling: from elite athletes to heart failure patients

Jon Magne Letnes [1,2]*, Bjarne Martens Nes [1,2], Knut Asbjørn Rise Langlo [1,3], Inger-Lise Aamot Aksetøy[1,4,5], Kari Margrethe Lundgren [1], Knut Skovereng [6], Øyvind Sandbakk[6], Ulrik Wisløff [1], and Håvard Dalen [1,2,7]

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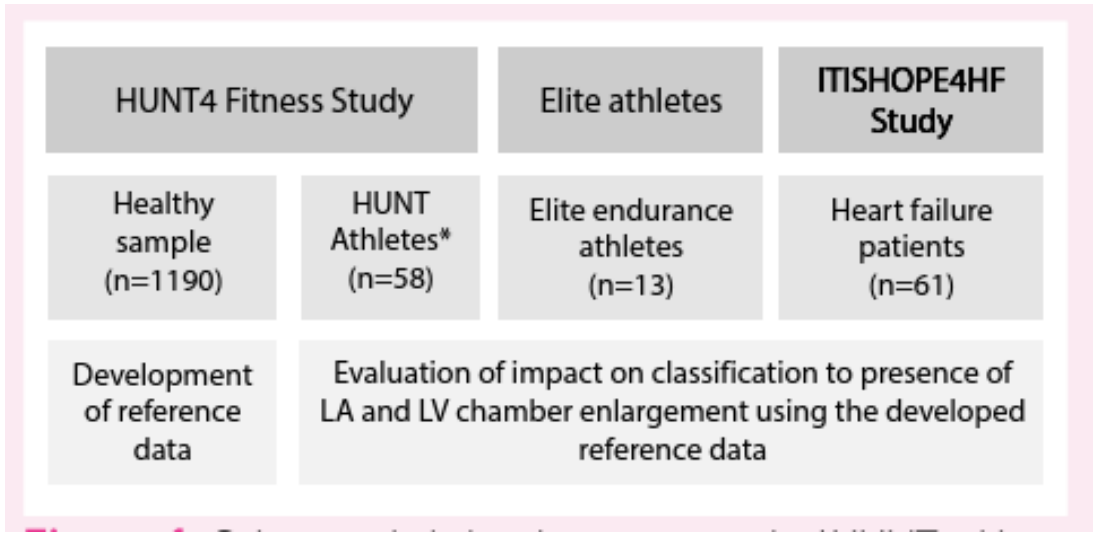


Table 1 General characteristics

Characteristic	HUNT, $n = 1190$	HUNT athletes, $n = 58$	Elite athletes, $n = 13$	Heart failure patients, $n = 61$
Age (years)	58 (12)	54 (12)	23 (5)	68 (11)
Women	691 (58%)	18 (31%)	1 (7.7%)	10 (16%)
Body mass (kg)	76 (13)	74 (12)	77 (8)	85 (23)
BMI (kg/m^2)	25.6 (3.4)	23.8 (2.6)	23.5 (1.5)	27.9 (4.9)
BSA (m^2)	1.88 (0.20)	1.90 (0.19)	1.98 (0.13)	2.02 (0.21)
Fat-free mass (kg)	54 (11)	60 (11)	69 (8)	NA
Systolic BP (mmHg)	128 (18)	124 (18)	124 (9)	121 (20)
Diastolic BP (mmHg)	75 (9)	75 (9)	69 (4)	73 (13)
Resting heart rate (b.p.m.)	65 (10)	58 (12)	55 (11)	70 (13)
Current smoker	41 (3.5%)	0 (0%)	NA	7 (11%)
PA above recommendations	422 (36%)	41 (72%)	NA	NA
Peak oxygen uptake (L/min)	2.84 (0.83)	3.71 (0.89)	5.37 (0.51)	1.51 (0.51)
Peak oxygen uptake (mL/kg/min)	37 (9)	49 (8)	70 (4)	18 (5)
Peak oxygen pulse (mL O_2/beat)	16.4 (4.6)	21.1 (4.9)	27.4 (2.9)	12.2 (3.6)
Respiratory exchange ratio	1.11 (0.05)	1.11 (0.04)	1.09 (0.06)	1.03 (0.09)
Peak heart rate (b.p.m.)	174 (14)	177 (11)	194 (10)	124 (19)
Ventilation (L/min)	100 (29)	122 (28)	195 (29)	61 (17)
$EqVO_{2peak}$ (L/L/min)	33.0 (4.0)	31.3 (4.0)	36.2 (3.5)	38.9 (8.0)
$EqVCO_{2peak}$ (L/L/min)	30.2 (3.5)	28.7 (3.4)	33.2 (3.4)	36.6 (6.9)
LVEDV biplane 2D (mL)	108 (30)	134 (34)	197 (22)	176 (72)
LVEDV 3D (mL)	115 (29)	136 (27)	192 (19)	NA
LV EF biplane 2D (%)	60.5 (4.3)	60.2 (4.9)	54.3 (4.4)	34.9 (11.4)
LAVmax MOD 2D (mL)	54 (19)	65 (23)	98 (29)	108 (3
LAVmax 3D (mL)	56 (15)	66 (14)	85 (18)	NA

Numbers are mean (SD); *n* (%).
BMI, body mass index; BP, blood pressure; BSA, body surface area; EF, ejection fraction; $EqVCO_2$, ventilatory equivalent for carbon dioxide; $EqVO_2$, v
LAVmax, left atrial maximal volume; LV, left ventricle; LVEDV; left ventricle end-diastolic volume; MOD, method of discs; PA, physical activity.

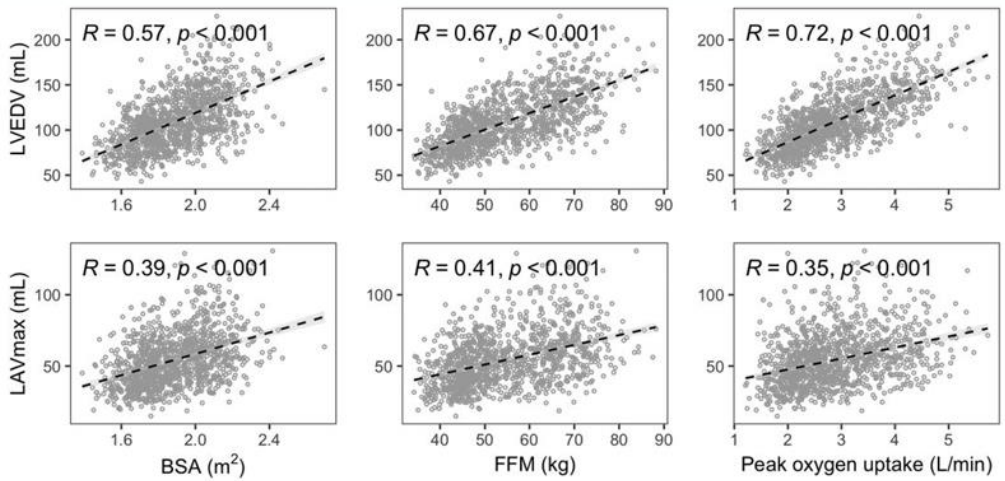


Figure 2 Scatter plots and Pearson's correlation coefficients for left ventricular end-diastolic volume (LVEDV) and left atrial maximal volume (LAVmax) vs. body surface area (BSA), fat-free mass (FFM), and absolute peak oxygen uptake (VO_{2peak}).

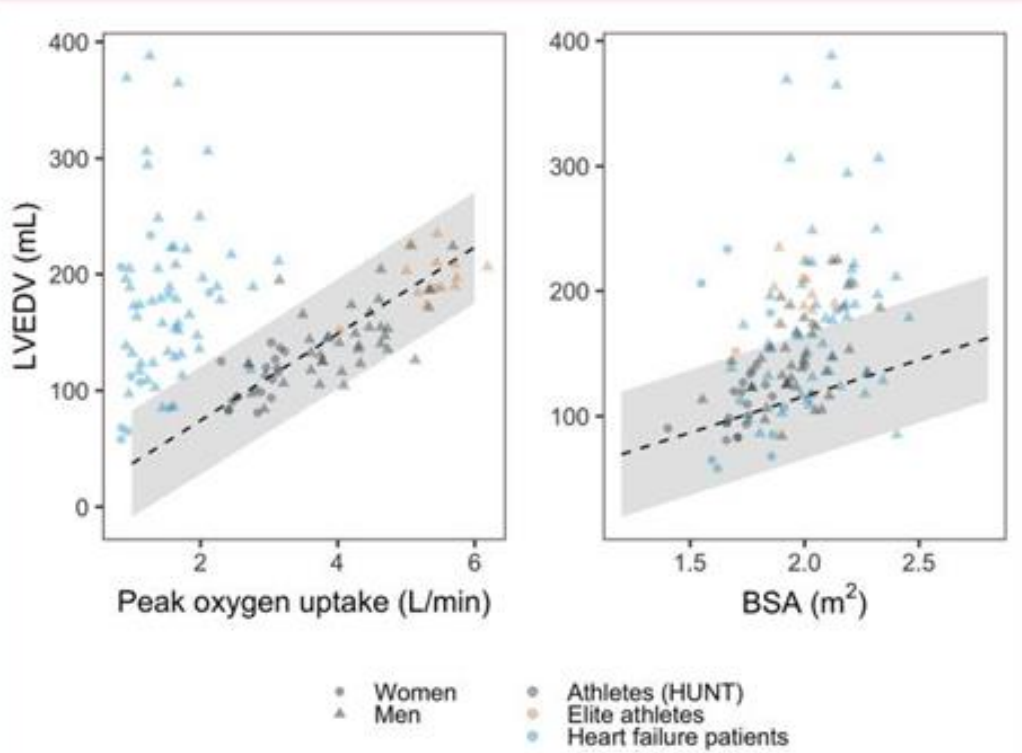


Figure 3 Left ventricular end-diastolic volume (LVEDV) in relation to absolute peak oxygen uptake (VO_{2peak}) and body surface area (BSA), showing how athletes and heart failure patients are effectively differentiated by assessing LVEDV in relation to VO_{2peak}, compared to BSA.

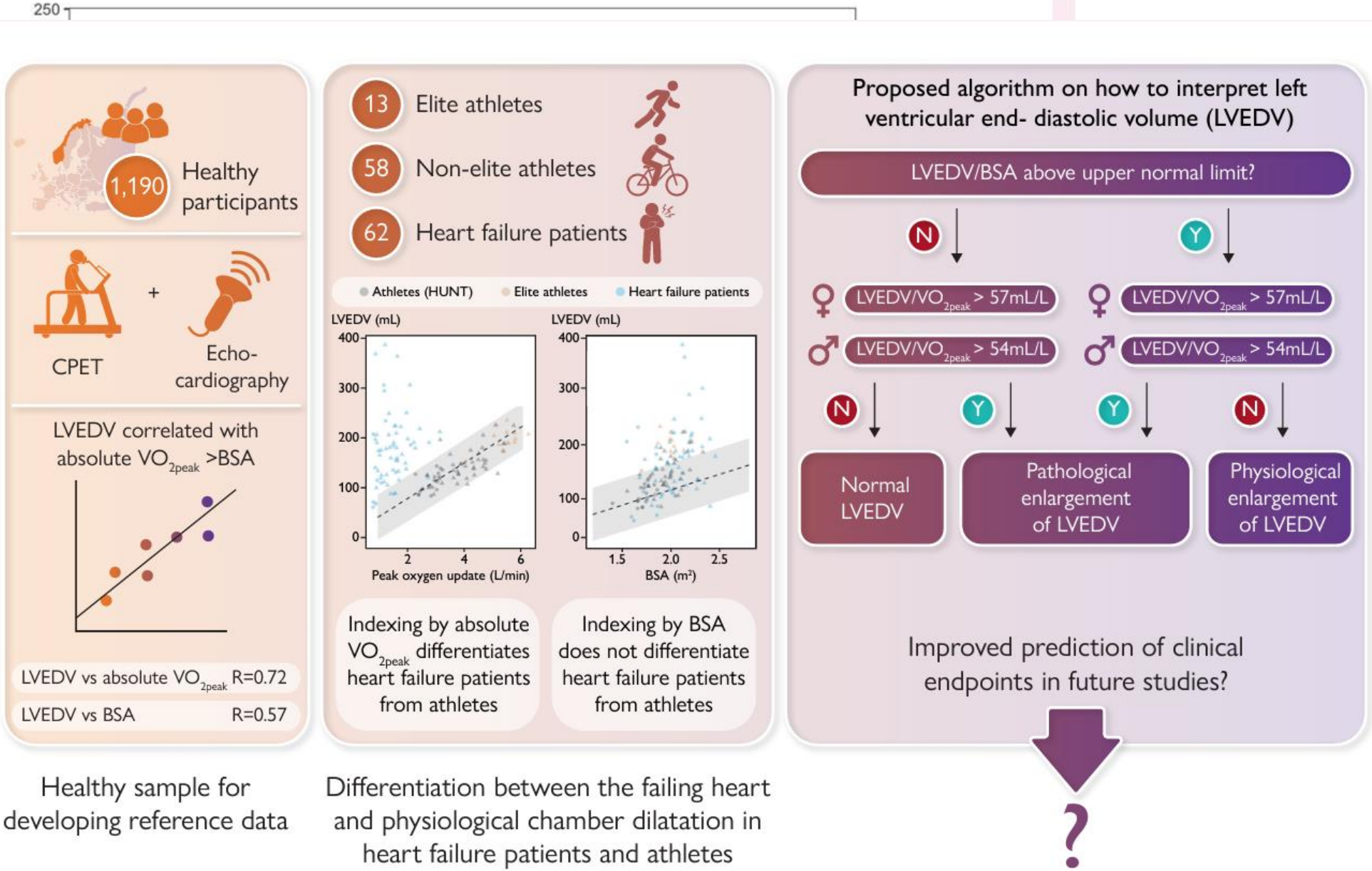


Figure 4 Comp
healthy normal sub
95% prediction int

Engblom *et al. Journal of Cardiovascular Magnetic Resonance* 2010, **12**:74
http://www.jcmr-online.com/content/12/1/74

Journal of Cardiovascular Magnetic Resonance

RESEARCH Open Access

Peak oxygen uptake in relation to total heart volume discriminates heart failure patients from healthy volunteers and athletes

Henrik Engblom[1], Katarina Steding[1], Marcus Carlsson[1], Henrik Mosén[1], Bo Hedén[1], Torsten Buhre[2], Björn Ekmehag[3], Håkan Arheden[1*]

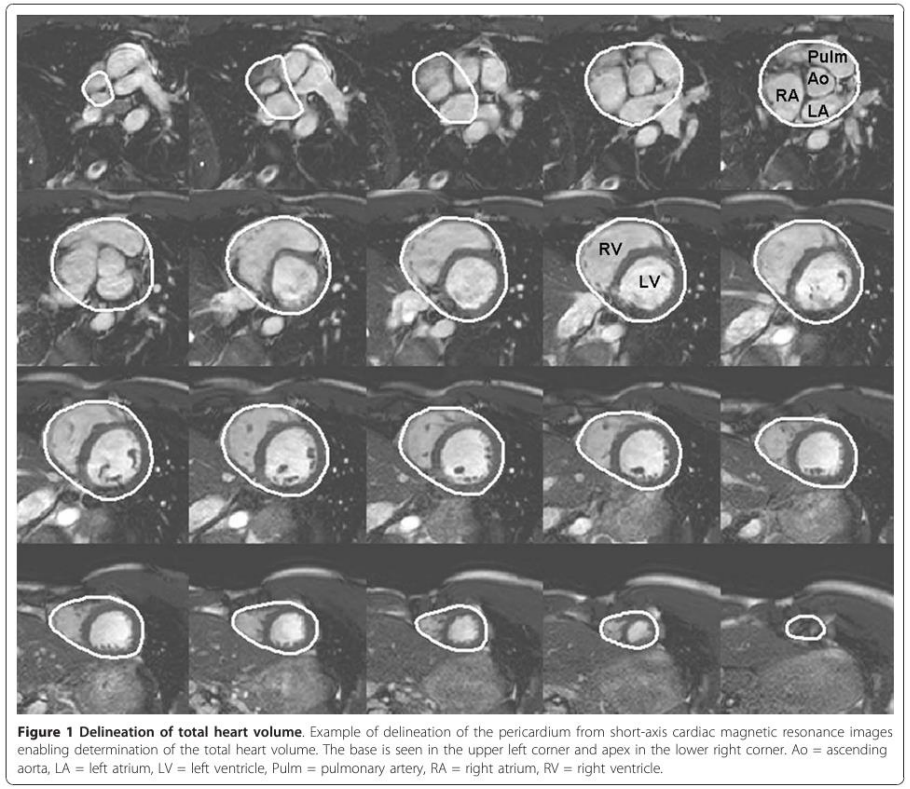
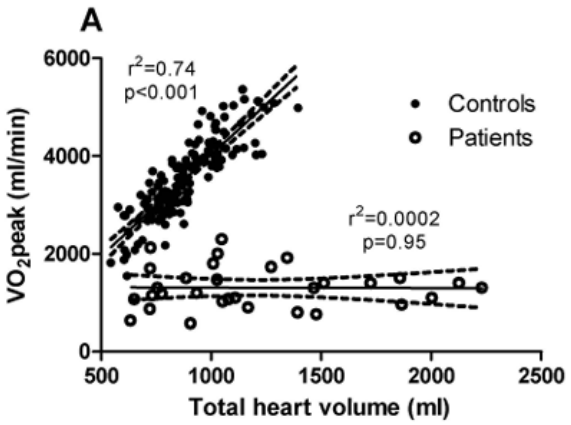
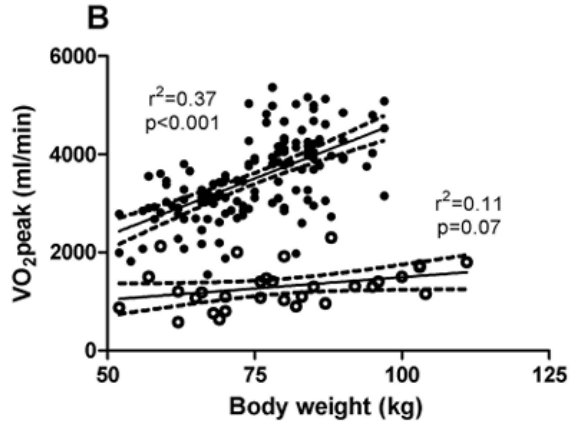
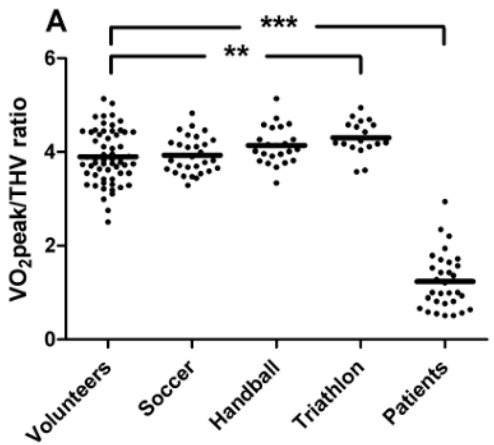
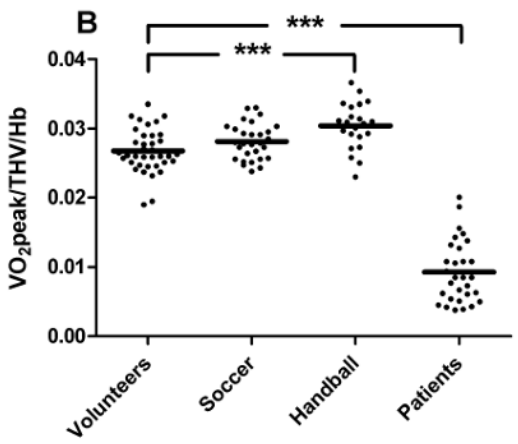


Figure 1 Delineation of total heart volume. Example of delineation of the pericardium from short-axis cardiac magnetic resonance images enabling determination of the total heart volume. The base is seen in the upper left corner and apex in the lower right corner. Ao = ascending aorta, LA = left atrium, LV = left ventricle, Pulm = pulmonary artery, RA = right atrium, RV = right ventricle.









Tack för uppmärksamheten!

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