La réadaptation chez l'insuffisant cardiaque :

Spécificités de la réadaptation chez l'insuffisant cardiaque

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Conflits d’intérêts

- Aucun

Insuffisance cardiaque

- Problème majeur global
- 64 millions de personnes dans le monde (Savarese, 2022)

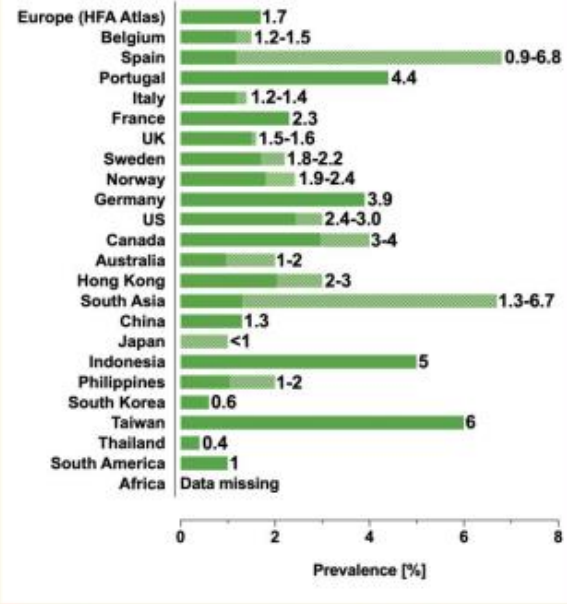


Figure 1 Prevalence of heart failure worldwide. HFA, Heart Failure Association; UK, United Kingdom; US, United States.

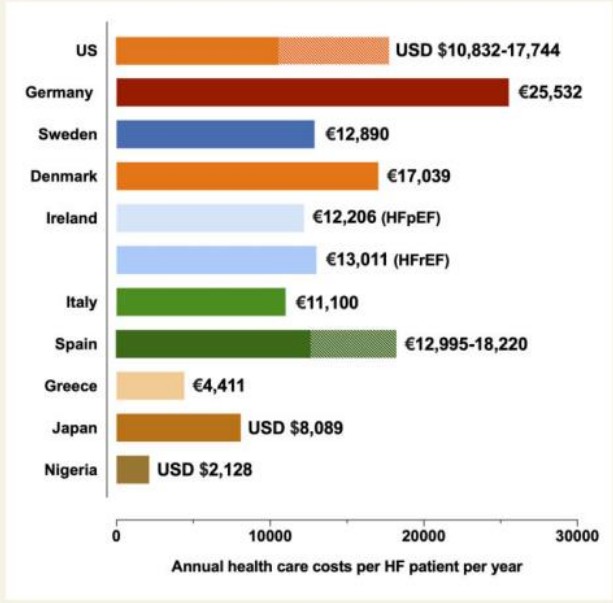


Figure 4 Health care costs of heart failure worldwide. HFpEF, heart failure with preserved ejection fraction; HFrEF, heart failure with reduced ejection fraction.

Phénotype IC et prédictions

- Depuis 2020, définition universelle de l'IC (Bozturk, EJHF)

HF with reduced EF (HFrEF):
- HF with LVEF ≤40%

HF with mildly reduced EF (HFmrEF):
- HF with LVEF 41–49%

HF with preserved EF (HFpEF):
- HF with LVEF ≥50%

HF with improved EF (HFimpEF):
- HF with a baseline LVEF ≤40%, a ≥10 point increase from baseline LVEF, and a second measurement of LVEF >40%

Figure 3 New classification of heart failure (HF) according to left ventricular ejection fraction (LVEF). EF, ejection fraction.

- 2020, HFrEF: 50% patients (Savarese, 2022)
- Années futures

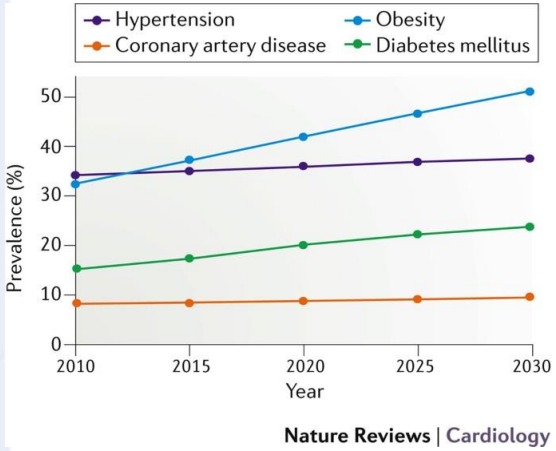
Prevalence

Prevalence 1-3% in general adult population

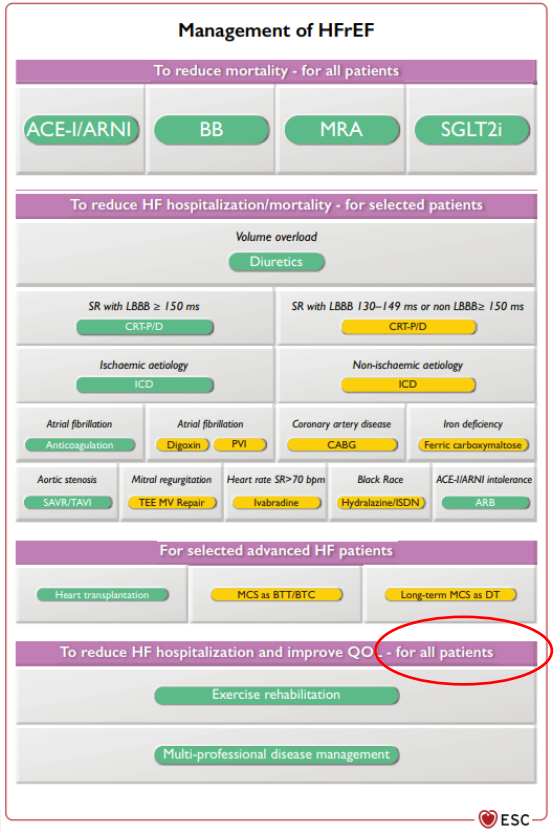
Overall prevalence ↑

Prevalence in HFrEF ↔

Prevalence In HFpEF ↑



Recommandations et réadaptation



POURTANT

10-30% des IC font de la revalidation!!
(Bozturk, 2021)

Indépendant du % de FE

Recommendations for exercise rehabilitation in patients with chronic heart failure

Recommendations	Class[a]	Level[b]
Exercise is recommended for all patients who are able in order to improve exercise capacity, QOL, and reduce HF hospitalization.[c 324–328,335–337]	I	A
A supervised, exercise-based, cardiac rehabilitation programme should be considered in patients with more severe disease, frailty, or with comorbidities.[95,324–327,338]	IIa	C

MAIS

Physical conditioning also improves exercise capacity and QOL.[332–335] No data on HFmrEF are available, but benefits observed in the other groups of HF should also apply to this group.

Qu'est-ce que un patient « chronic » ou « stable »?

ESC guidelines 2021, McDonagh

Commencement

- Patient stable ?
  - AHA : Patient à dose et traitement **optimal**, et pas de procédure ni hospitalisation <6 semaines
  - ESC : Symptômes et signes d'HF inchangés depuis 4 semaines
  - Mais surtout pas...

Table 1 Contraindications to exercise testing and training in patients with stable heart failure

Absolute contraindications
Early phase after acute coronary syndrome (within 2 days)
Ongoing unstable angina
Uncompensated heart failure
Acute thrombophlebitis or recent embolism (pulmonary or systemic)
Active endocarditis
Acute myocarditis or pericarditis
Acute aortic dissection
Symptomatic severe aortic stenosis
Acute systemic illness or fever
Uncontrolled hypertension (≥ 180 mmHg systolic or ≥ 110 mmHg diastolic blood pressure at rest)
Uncontrolled sinus tachycardiac (resting heart rate > 120 beats.min^{-1})
Uncontrolled or life-threatening atrial or ventricular dysrhythmias (including new onset atrial fibrillation/flutter)
Third-degree atrioventricular block without pacemaker
Uncontrolled diabetes mellitus
Orthostatic drop in blood pressure (> 20 mmHg) with symptoms
Progressive worsening of exercise tolerance or dyspnea at rest or on exertion over previous 3–5 days
Significant ischemia at low work rates (< 2 METs or 50 Watts)
Relative contraindications (increased risk)
≥ 1.8 kg or 3 lbs increase in body mass over previous 1–3 days
Concurrent continuous or intermittent dobutamine therapy
Decrease in systolic blood pressure with exercise
New York Heart Association Functional Class IV
Complex ventricular arrhythmias at rest or appearing with exertion
Supine resting heart rate ≥ 100 beats.min^{-1}
Pre-existing comorbidities limiting exercise tolerance
Severe hypertrophic obstructive cardiomyopathy
Symptoms or indications of worsening heart failure
≥ 1.8 kg or 3 lbs increase in body mass over previous 1–3 days
Worsening dyspnea (on exertion or rest)
Excessive fatigue, lack of energy
Swelling of legs, abdomen
Productive cough
Increased urination, particularly at night (nocturia)
Difficulty sleeping due to breathing problems (orthopnea)
Difficulty concentrating
Shock from an implantable cardiac defibrillator

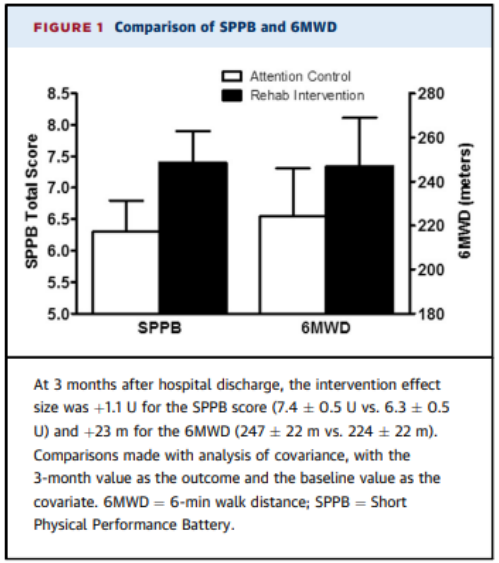
Adapted from American College of Sports Medicine [21], Piepoli et al. [20], Keteyian et al. [22], and Myers [7]
METs metabolic equivalents

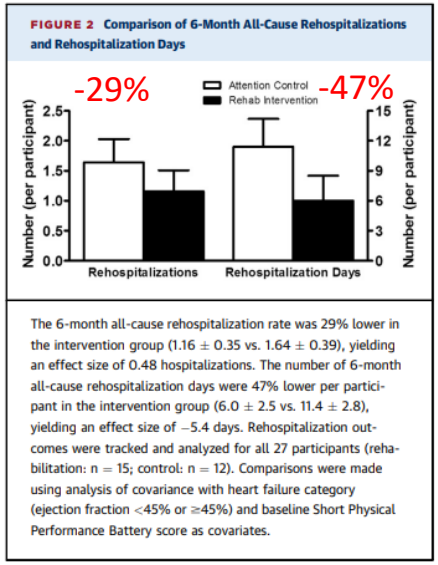
- Et attention à..

Place pour la réadaptation précoce? (PREPAC? ou en cardiologie)

2 études: REHAB-HF (JACC, 2017), ERIC-HF (2020)

- REHAB-HF: 27 patients HFPEF 60-98 ans, 12 semaines post sortie (équilibre, force, mobilité et endurance), 60min 3X/semaine, Semaine 1 et 2 à la maison (≤12 sur Borg) et semaine 2-12 (≥13-15 sur Borg pour endurance et 15-16 force)





Place pour la réadaptation précoce?

- ERIC-HF (2020), 100 patients, HFREF (ischémique et valvulaire)
- 5*/semaine (2X/jour) intra hospitalier
- Exclusion: inotrope, D+ précordiale, œdème pulmonaire <12H, SBP >180mHg ou <80mmHg, O_2 supp >3L/min, hypoglycémie <12H

Table 1. ERIC-HF protocol stages.

Stage	
I	Respiratory and callisthenic exercises performed in supine or orthostatic position
II	5 to 10 min on cycle ergometer
III	5 to 10 min walking
IV	10 to 15 min walking
V	10 to 15 min walking and 5 min climbing stairs (patients may stop for recovery)

Table 5. Safety parameters (692 sessions).

Adverse event	*N* (%)
Atrial fibrillation (rapid ventricular response)	12 (1.7%)
Decrease of SBP >10 mmHg	38 (5.4%)
Clinical worsening	0 (0%)
SPE ⩾8	57 (8.2%)
Precordial pain	0 (0%)

SBP: systolic blood pressure; SPE: subjective perception of effort.

Table 4. Comparison of outcomes.

Parameter	Training group	Control group	Difference	*P* value
Barthel at discharge	96±6	92±14	4	0.072
LCADL at discharge	12±4	16±7	4	0.003
6MWT	287.6±128.9	233.4±110.4	54.2	0.026

LCADL: London chest activity of daily living; 6MWT: six minute walking test.

Bénéfice de la revalidation: dernière revue Cochrane...

- Etudes randomisées contrôlées, IC, adultes, follow up à 6 mois
- 60 études, 8728 patients
- Nombreuses autres études où entrainements pas bien définis

Exercise-based cardiac rehabilitation for adults with heart failure – 2023 Cochrane systematic review and meta-analysis

Cal D. Molloy[1†], Linda Long[2], Ify R. Mordi[3], Charlene Bridges[4], Viral A. Sagar[5], Edward J. Davies[6], Andrew J.S. Coats[7], Hasnain Dalal[8], Karen Rees[9], Sally J. Singh[10], and Rod S. Taylor[11,12*†]

All-cause mortality	No. studies	ExCR	Control	Relative Risk (RR)* [95% confidence interval]	Interaction Test between delivery modes P-value ***
Centre	11	15/285	17/275	0.95 (0.48, 1.87)	
Home	10	30/761	36/752	0.86 (0.54, 1.39)	
Hybrid	14	55/912	59/879	0.96 (0.67, 1.38)	0.94
Overall	**35**	**100/1958**	**112/1906**	0.93 (0.71, 1.21)	
All-cause hospitalisation	**No. studies**	**ExCR**	**Control**	**Relative Risk (RR)* [95% confidence interval]**	**P-value*** **
Centre	5	19/123	21/123	0.83 (0.37, 1.86)	
Home	8	77/442	100/430	0.78 (0.59, 1.03)	
Hybrid	11	86/583	149/582	0.63 (0.46, 0.86)	0.55
Overall	**24**	**182/1148**	**270/1135**	0.69 (0.56, 0.86)	
MLWHF overall score	**No. studies**	**ExCR**	**Control**	**Mean difference (MD)** [95% confidence interval]**	**P-value*** **
Centre	4	-	-	-10.80 (-14.90, -6.70)	
Home	11	-	-	-6.90 (-11.30, -2.60)	
Hybrid	7	-	-	-6.40 (-11.80, -0.90)	0.31
Overall	**22**	**-**	**-**	-7.40 (-10.30, -4.50)	

- Effets positifs sur le risque d'hospitalisation et qualité de vie (à 6 mois et 1 an) mais pas sur la mortalité... (idem en centre ou téléreva)

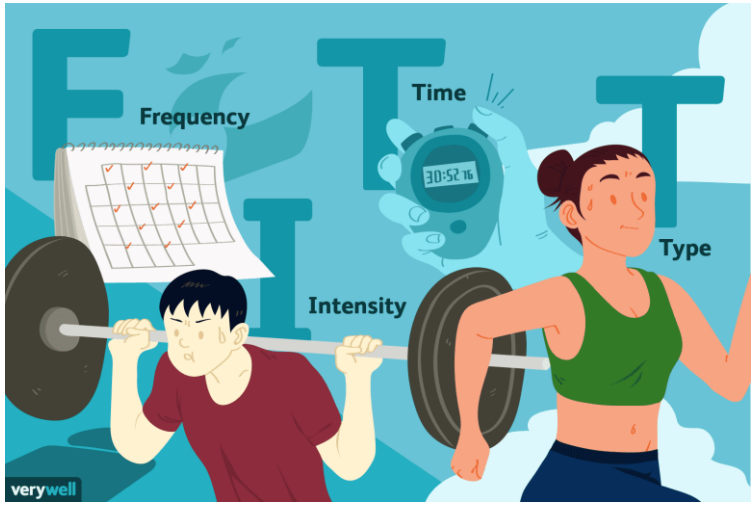
Explication partielle?

Table 1 Summary of included trial characteristics

	All trials ($n = 60$)	New trials in update ($n = 16$)	Centre-based trials ($n = 22$)	Home-based (digitally supported) trials ($n = 15$)	Hybrid trials ($n = 23$)
Population characteristics					
Male sex, %	78	59	79	68	73.5
Age, years, mean	63.3	63.9	61.7	64.9	64.5
HF type					
HFpEF included, *n* (%)	8 (13)	2 (25)	2 (9)	4 (27)	2 (9)
NYHA class IV, *n* (%)	15 (25)	8 (50)	6 (27)	4 (27)	5 (22)
Mean LVEF, %	32.3	32.2	33.2	32.3	29.1
Intervention characteristics					
ExCR type, *n* (%)					
Exercise only	42 (70)	11 (69)	16 (73)	10 (67)	16 (70)
Comprehensive	18 (30)	54 (31)	6 (27)	5 (33)	7 (30)
Aerobic only	42 (70)	10 (62)	16 (73)	10 (67)	11 (48)
Exercise type					
Aerobic and resistance	18 (30)	6 (38)	6 (27)	5 (33)	12 (52)
Exercise prescription					
Mean session duration, min	38	41	41.4	31.5	40.3
Session frequency, per week, mean	3.2	3.4	2.8	3.4	3.6
Programme length, weeks, mean	27	27	24.5	24.6	29.4
Follow-up, months, median	6	10	6	12	6
Study characteristics					
Publication year, *n* (%)					
1990 to 1999	5 (8)	0 (0)	3 (14)	0 (0)	2 (9)
2000 to 2009	22 (37)	0 (0)	9 (41)	3 (5)	10 (44)
2010 to 2019	26 (43)	9 (56)	9 (41)	10 (17)	7 (12)
2020 onwards	7 (12)	7 (43)	1 (2)	2 (3)	4 (30)
Study location, *n* (%)					
Europe	30 (50)	5 (8)	13 (59)	6 (10)	11 (48)
North America	16 (27)	4 (7)	4 (18)	5 (8)	7 (30)
Other	14 (23)	8 (13)	5 (23)	4 (7)	5 (22)
Single centre, *n* (%)	47 (78)	10 (63)	22 (100)	12 (80)	13 (57)

ExCR, exercise-based cardiac rehabilitation; HF, heart failure; HFpEF, heart failure with preserved ejection fraction, LVEF, left ventricular ejection fraction; NYHA, New York Heart Association.

Prescription d'entrainement



- **La reva ce n'est pas que du vélo ....**

Table 3 Recommendations for prescribing aerobic and resistance training in patients with heart failure

Training parameter	Initial prescription***	Optimal progression
Aerobic training		
Frequency	2–3 days/week	Moderate intensity: 3–7 days/week High intensity: 1–3 days/week
Intensity	40–50% VO_2R or HRR; 45–55% VO_2peak; RPE 11–12 Until 20 min duration is achieved May use short intervals if unable to maintain continuous exercise	Continuous: 70–80% VO_2R, or HRR; 75–85% VO_2peak; RPE 11–14 High-intensity intervals: 80–90% VO_2R, or HRR; 85–95% VO_2peak; RPE 15–17
Time (duration)	Session total: 15–30 min Work intervals: 20–30 s or longer (1–2 min) as tolerated	Session total: 45–60 min High-intensity intervals: 1–4 min interval duration (3–6 repeated bouts)
Type (mode)	Dynamic, rhythmic activities involving lower or upper body such as treadmill walking, cycling, and arm ergometer	Dynamic, rhythmic activities involving lower and/or upper body such as treadmill walking/jogging, cycling, rowing, stepper, elliptical, and arm ergometer
Resistance training		
Frequency	2–3 non-consecutive days/week	
Intensity	<30% 1-RM; RPE 11–12	40–70% 1-RM; RPE 12–15
Time (duration)	1–2 sets/day for each muscle group, 5–10 repetitions, 4–6 exercises	2–3 sets/day for each muscle group, 8–15 repetitions, 8–10 exercises
Type (mode)	Fixed weight machines, resistance bands, handheld weights, or bodyweight exercise. Commence with isolated muscles	Fixed weight machines, resistance bands, handheld weights, or bodyweight exercise
Inspiratory muscle training		
Frequency	Standard protocol: 6–7 days/week (twice daily) High-intensity protocol: 3–5 days/week	
Intensity	Standard protocol: 50% of PI_{max} High-intensity protocol: 20–30% PI_{max}	Standard protocol: 50% of PI_{max} High-intensity protocol: 40–70% PI_{max}
Time (duration)	Session total: 20–30 min Standard protocol: 30 breaths (twice daily) High-intensity protocol: 2 min of work, 1-min recovery, repeated 7 times	
Type (mode)	Pressure threshold device	

Adapted from Keteyian et al. [22], Piepoli et al. [53], Meyer [58], and the American College of Sports Medicine [21]

HRpeak, peak heart rate, *HRR* heart rate reserve, *MET* metabolic equivalent, *VO_2peak* peak oxygen uptake, *PI_{max}* maximal inspiratory mouth pressure, *RM* repetition maximum, *RPE* rating of perceived exertion 6–20 Borg scale

***Start at lower end of intensity ranges for deconditioned or high-risk patients

Importance de **tester** le patient

- EFX (gold standard):
  - Evaluation chronotrope pour prescription d'entrainement (%HRRes; %VO_2;…)
  - Evaluation du RR d'hospitalisation et mortalité (VO_2max, pente $VEVCO_2$,…)

TABLE 1 Clinical Stratification for Patients With HF

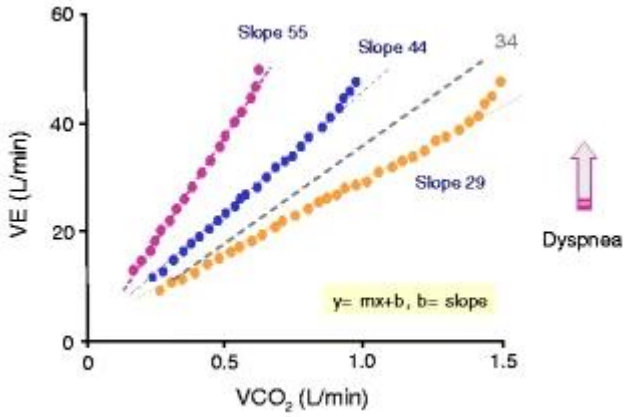
Primary CPET Variables			
VE/Vco_2 Slope	**Peak Vo_2**	**EOV**	**$P_{ET}CO_2$**
Ventilatory Class I VE/Vco_2 slope <30.0	Ventilatory Class A Peak Vo_2 >20.0 ml·kg^{-1}·min^{-1}	Not Present	Resting $P_{ET}CO_2$ ≥33.0 mm Hg 3-8 mm Hg increase during ET
Ventilatory Class II VE/Vco_2 slope 30.0-35.9	Ventilatory Class B Peak Vo_2 = 16.0-20.0 ml·kg^{-1}·min^{-1}		
Ventilatory Class III VE/Vco_2 slope 36.0-44.9	Ventilatory Class C Peak Vo_2 = 10.0-15.9 ml·kg^{-1}·min^{-1}	Present	Resting $P_{ET}CO_2$ <33.0 mm Hg <3 mm Hg increase during ET
Ventilatory Class IV VE/Vco_2 slope ≥45.0	Ventilatory Class D Peak <10.0 ml·kg^{-1}·min^{-1}		

Standard ET Variables		
Hemodynamics	**ECG**	**HRR**
Rise in systolic BP during ET	No sustained arrhythmias, ectopic foci, and/or ST-segment changes during ET and/or in recovery	>12 beats at 1 min recovery
Flat systolic BP response during ET	Altered rhythm, ectopic foci, and or ST-segment changes during ET and/or in recovery: did not lead to test termination	≤12 beats at 1 min recovery
Drop in systolic BP during ET	Altered rhythm, ectopic foci, and/or ST-segment changes during ET and/or in recovery: led to test termination	

Patient Reason for Test Termination		
Lower extremity muscle fatigue	Angina	Dyspnea

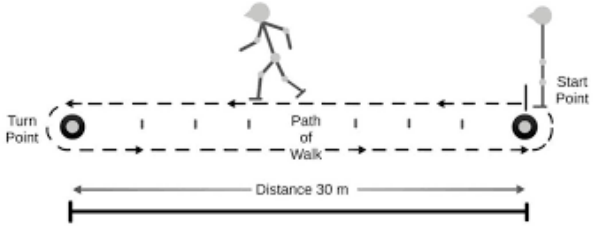
Interpretation

- All variables in green: excellent prognosis in the next 1-4 years (≥90% event-free)
  - Maintain medical management and retest in 4 years
- Greater number of CPET and standard ET variables in red/yellow/orange indicative of progressively worse prognosis.
  - All CPET variables in red: risk for major adverse event extremely high in next 1-4 years (>50%)
- Greater number of CPET and standard ET variables in red/yellow/orange indicative of increasing HF disease severity.
  - All CPET variables in red: expected significantly diminished cardiac output, elevated neurohormones, higher potential for secondary PH.
- Greater number of CPET and standard ET variables in red/yellow/orange warrants strong consideration of more aggressive medical management and surgical options.

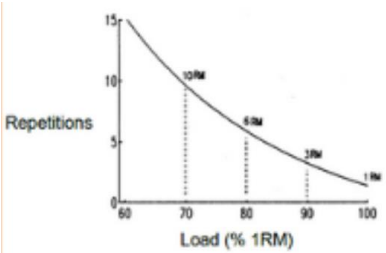


Importance de **tester** le patient

- Si pas de EFX:
  - TDM6 acceptable pour RR hospitalisation et mortalité (Forman, 2012)
  - Mais patient à son rythme et peut induire sous-estimation de la FC =>…

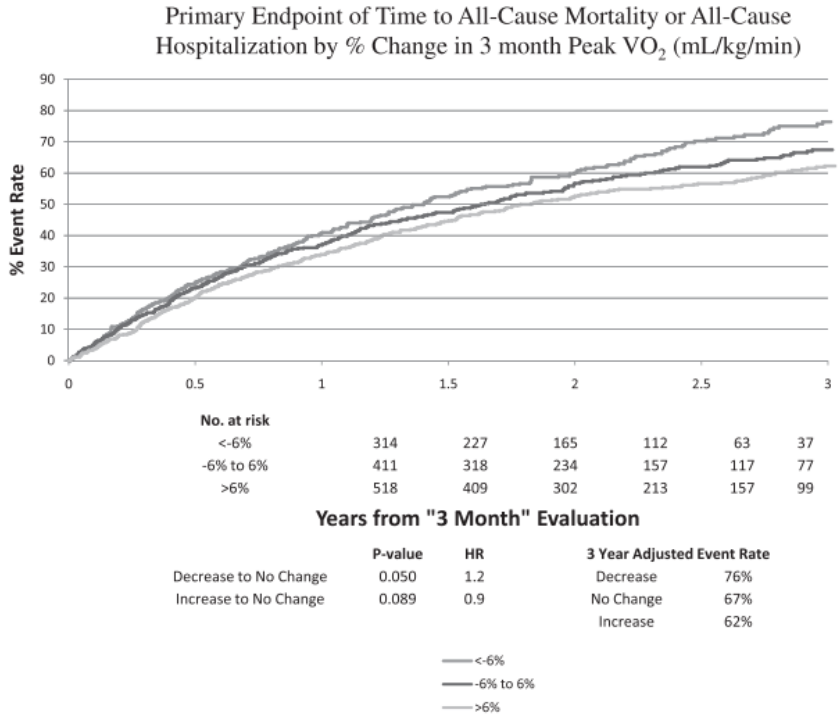


- Evaluation musculaire 1RM mesurée ou 1RM estimée (<10RM)
  - 1RM = Poids Soulevé * (1 + Nombre de Répétitions/30). (Epley)
  - Ex: 80 kg 10 repet, 1RM=107kg



Importance de **l'intensité**

- Augmentation de la VO_2max => +6% = -7% mortalité et -8% hospitalisation (HF-Action Trial) (Swank, 2012 Circulation).



Importance de **l'intensité**

- Intensité est le paramètre le + important pour augmenter VO_2 (Uddin, 2016)
- + 10% intensité => +1 ml/min/kg

Predictors of exercise capacity following exercise-based rehabilitation in patients with coronary heart disease and heart failure: A meta-regression analysis

Jamal Uddin[1,2], Ann-Dorthe Zwisler[2], Christian Lewinter[3], Mohammad Moniruzzaman[4], Ken Lund[5], Lars H Tang[6,7,8] and Rod S Taylor[2,9]

Table 3. Predictors of exercise capacity following exercise-based rehabilitation; univariable and multivariable meta-regression ($N = 34$ comparisons).

	Univariable analysis Coefficient (95% CI) *P*-value	Multi-variable analysis Coefficient (95% CI), *P*-value
Patients characteristics		
Aetiology (CHD vs HF)	−0.61 (−2.18–0.97), 0.44	1.19 (−1.66–4.05), 0.39
Gender (percentage male)	0.05 (0.01–0.09), 0.01	0.05 (−0.04–0.14), 0.28
Mean age (years)	−0.18 (−0.29–−0.07), 0.002	−0.14 (−0.33–0.06), 0.15
Mean baseline VO_2max (ml/kg.min^{-1})	0.27 (0.11–0.43), 0.002	0.27 (−0.07–0.60), 0.11
Study characteristics		
Intervention type (exercise only vs comprehensive CR)	−0.29 (−1.76–1.18), 0.69	−0.22 (−2.75–2.30), 0.85
Intervention settings (centre vs home vs both)	−0.74 (−1.71–0.23), 0.13	−0.72 (−1.93–0.49), 0.23
Centre (single vs multi)	0.11 (−1.70–1.93), 0.90	−0.54 (−3.11–2.02), 0.66
Intervention characteristics		
Exercise start time (< 3 months vs ≥ 3 months)	1.43 (−0.16–3.03), 0.08	0.48 (−2.05–3.01), 0.70
Follow-up duration (months)	−0.01 (−0.04–0.02), 0.50	−0.03 (−0.08–0.01), 0.13
Exercise intensity (%VO_2max or %HRmax)	0.09 (0.01–0.19), 0.05	0.17 (0.01–0.32), 0.04
Exercise dose[a]	0.00006 (−0.003–0.004), 0.76	−4.86 (−0.004–0.004), 0.98
Publication date	−0.65 (−1.43–0.13), 0.10	1.25 (−0.27–2.77), 0.10
Study location (Europe vs North America vs both vs other)	−0.76 (−1.62–0.10), 0.08	−0.34 (−1.69–1.02), 0.61
Random sequence generation (low risk of bias vs not low risk of bias)	0.50 (−1.11-2.10), 0.53	1.34 (−2.03–4.73), 0.41
Random sequence concealment (low risk of bias vs not low risk of bias)	0.42 (−1.48–2.32), 0.66	−1.58 (−5.83–2.68), 0.45

[a]Calculated as the overall number of weeks of training × mean number of sessions per week × mean duration of sessions in minutes.

Importance de **l'intensité**

- Meta-analyse
- 54 études
- VO_2max mesurée et description de l'intensité d'effort.

Intensity	VO_2max change (%)
High intensity	+23 (3.3 ml/min/kg)
Vigorous	+8
Moderate	+13
Low	+7

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Exercise training program characteristics and magnitude of change in functional capacity of heart failure patients☆

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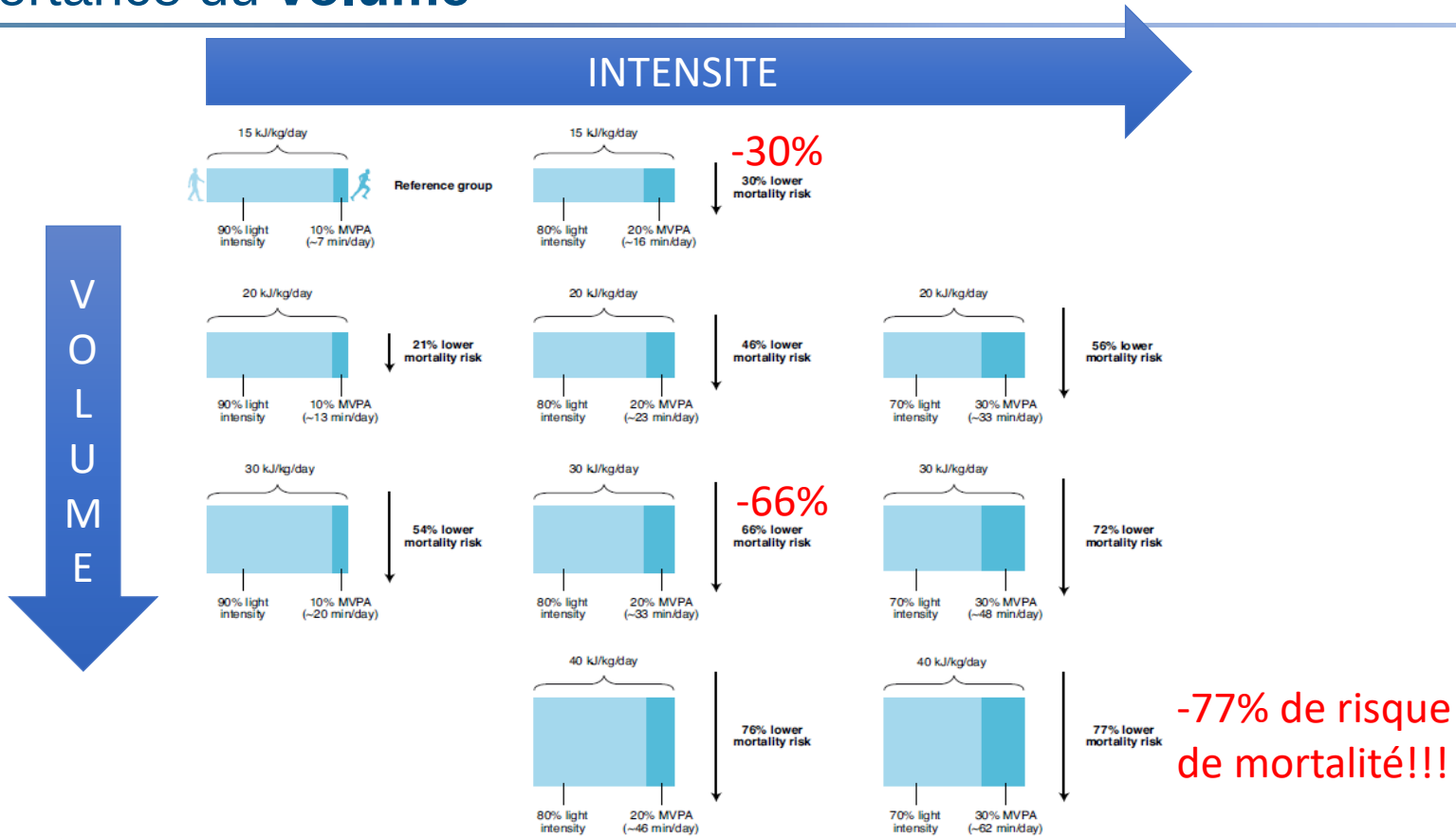
Intensity category	Objective measures	Subjective measures	Descriptive measures
SEDENTARY	< 1.6 METs < 40% HR_{max} < 20% HRR < 20% VO_{2max}	RPE (C): < 8 RPE (C-R): < 1	• activities that usually involve sitting or lying and that have little additional movement and a low energy requirement
LIGHT	1.6 < 3 METs 40 < 55% HR_{max} 20 < 40% HRR 20 < 40% VO_{2max}	RPE (C): 8-10 RPE (C-R): 1-2	• an aerobic activity that does not cause a noticeable change in breathing rate • an intensity that can be sustained for at least 60 minutes
MODERATE	3 < 6 METs 55 < 70% HR_{max} 40 < 60% HRR 40 < 60% VO_{2max}	RPE (C): 11-13 RPE (C-R): 3-4	• an aerobic activity that is able to be conducted whilst maintaining a conversation uninterupted • an intensity that may last between 30 and 60 minutes
VIGOROUS	6 < 9 METs 70 < 90% HR_{max} 60 < 85% HRR 60 < 85% VO_{2max}	RPE (C): 14-16 RPE (C-R): 5-6	• an aerobic activity in which a conversation generally cannot be maintained uninterupted • an intensity that may last up to about 30 minutes
HIGH	≥ 9 METs ≥ 90% HR_{max} ≥ 85% HRR ≥ 85% VO_{2max}	RPE (C): ≥ 17 RPE (C-R): ≥ 7	• an intensity that generally cannot be sustained for longer than about 10 minutes

Importance du **volume**



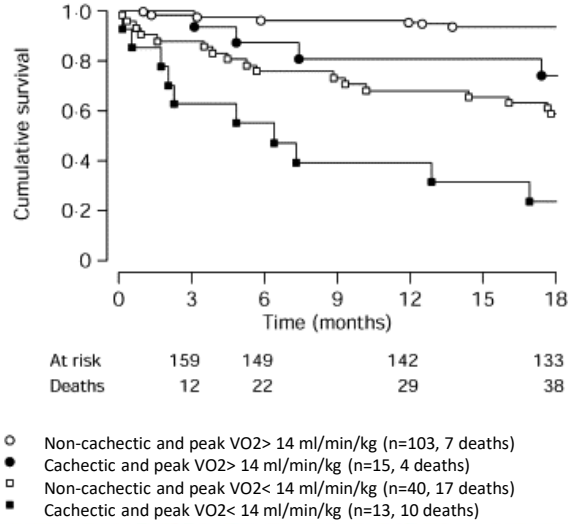
-77% de risque de mortalité!!!

Fig. 1 | **Higher levels of physical activity are associated with a lower risk of mortality.** Strain et al. used data from accelerometers to study the association between physical activity and risk of mortality in 96,476 partcipants from the UK Biobank[2]. For a 70-kg person, 15 kJ kg^{-1} per day ('15 kJ/kg/day'; top row) is ~250 kcal per day; 20 kJ kg^{-1} per day is ~335 kcal per day; 30 kJ kg^{-1} per day is ~500 kcal per day; and 40 kJ kg^{-1} per day is ~670 kcal per day. All MVPA information in parentheses (min/day) is for physical activity above an intensity of 3 METs, equivalent to walking at 4 km per hour (2.5 mph).

Gill et coll 2020

Importance de **la musculation**

- IC: Myopathie avec moins de fibres 1 (lente et oxydative), diminution capacité oxydative et densité mitochondriale
- Présence sarcopénie (personnes âgées et femmes++)
- => force, puissance et endurance musculaire réduite (et tolérance d'effort)
- => Impact sur la VO_2max, QOL, hospitalisation,...



THE LANCET

Wasting as independent risk factor for mortality in chronic heart failure 1997

Stefan D Anker, Piotr Ponikowski, Susan Varney, Tuan Peng Chua, Andrew L Clark, Katharine M Webb-Peploe, Derek Harrington, Wolfgang J Kox, Philip A Poole-Wilson, Andrew J S Coats

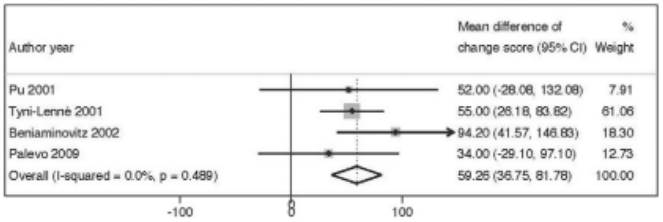
Importance de **la musculation**

- Effet +: Distance de marche (6MWD), capacité physique (VO2max) et QOL, sans effets délétère sur remodelage VG ou NT-proBNP

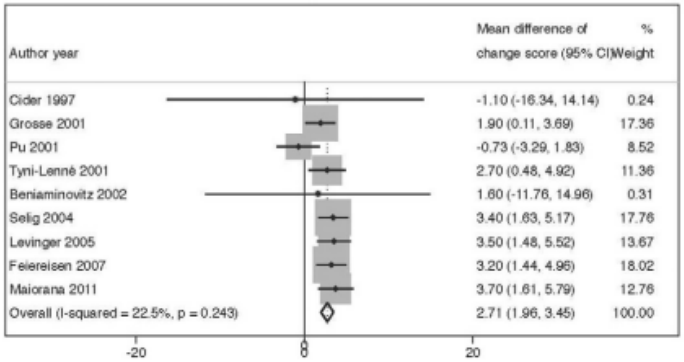
The effects of resistance training on muscle strength, quality of life and aerobic capacity in patients with chronic heart failure — A meta-analysis

Catherine Giuliano [a,b], Amalia Karahalios [c], Christopher Neil [a,b,e], Jason Allen [a,b], Itamar Levinger [a,b,d,]

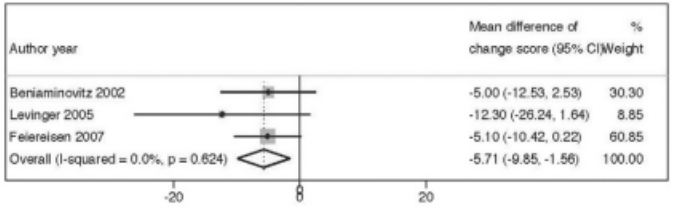
6MWD



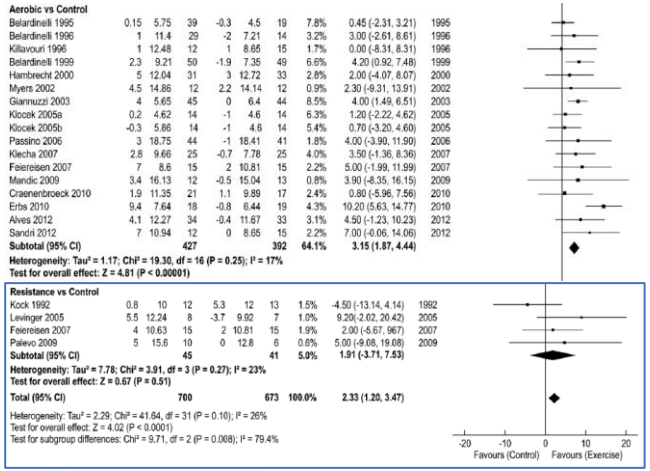
VO_2max



QOL



LVEF



Importance de **la musculation**

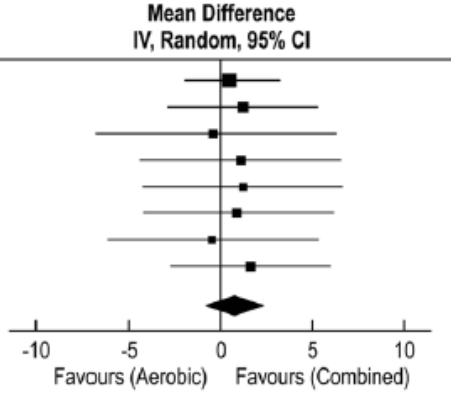
- Entrainements combinés semble + efficace que aérobie seul (Bozturk, 2021)

VO_2max

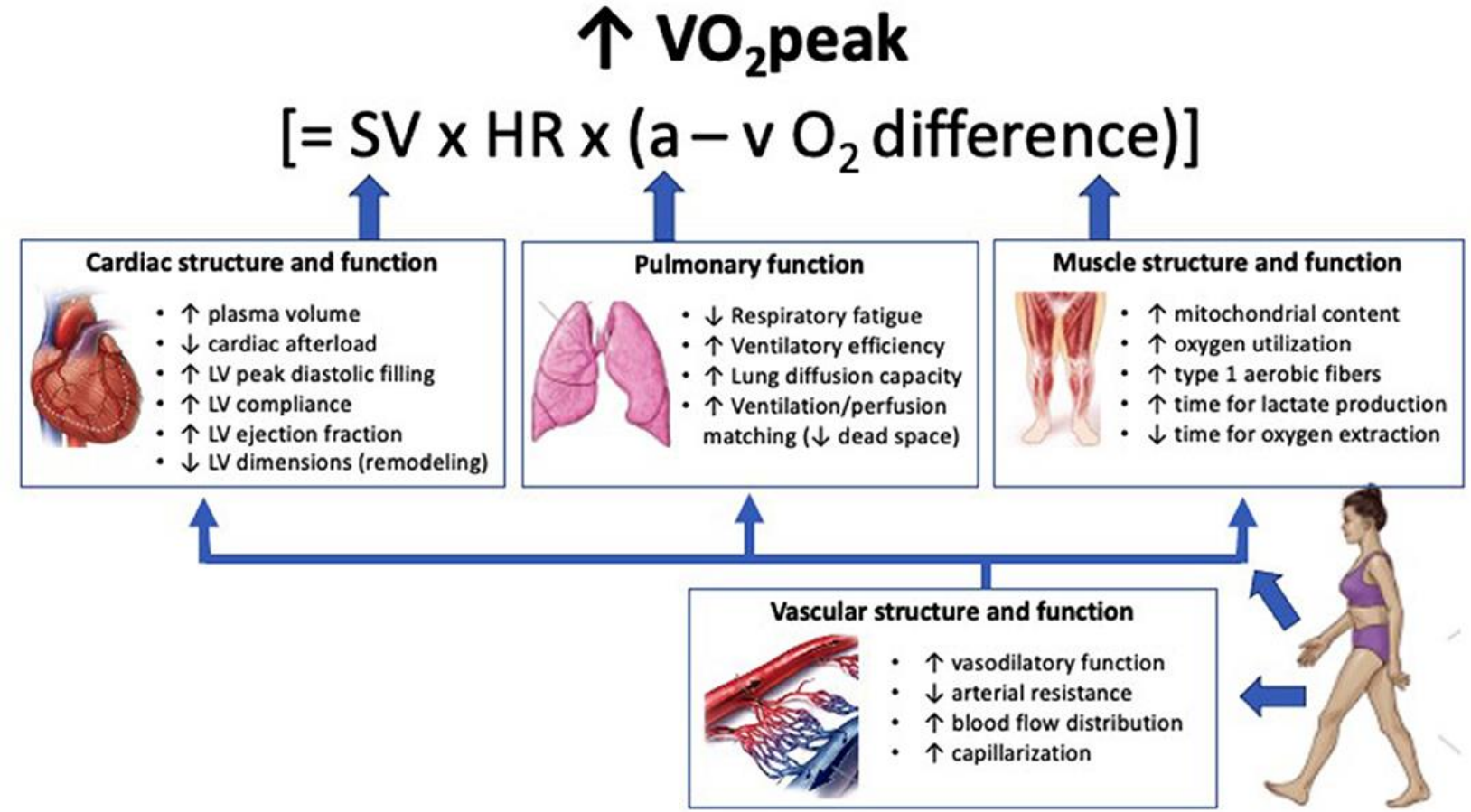
B

Study or Subgroup	Combined Mean	Combined SD	Combined Total	Aerobic Mean	Aerobic SD	Aerobic Total	Weight	Mean Difference IV, Random, 95% CI	Year
Feiereisen 2007	2	3.32	15	1.6	4.15	15	33.7%	0.40 (-2.29, 3.09)	2007
Beckers 2008	2.1	6.87	28	1	8.76	30	14.9%	1.10 (-2.94, 5.14)	2008
Mandic 2009	1.7	7.5	12	2.1	9.06	12	5.5%	-0.40 (-7.05, 6.25)	2009
Bouchla 2010	2.3	6.78	10	1.3	5.6	10	8.2%	1.00 (-4.45, 6.45)	2010
Anagnostakou 2011	2.6	8.7	14	1.5	5.44	14	8.4%	1.10 (-4.27, 6.47)	2011
Laoutaris 2013	2.8	8.09	13	1.9	5.45	14	8.9%	0.90 (-4.34, 6.14)	2013
Keast 2013	1.7	9.88	27	2.2	11.46	27	7.5%	-0.50 (-6.21, 5.21)	2013
Georgantas 2014	2.8	8	22	1.3	6.3	20	13.0%	1.50 (-2.84, 5.84)	2014
Total (95% CI)			**141**			**142**	**100.0%**	**0.69 (-0.87, 2.25)**	

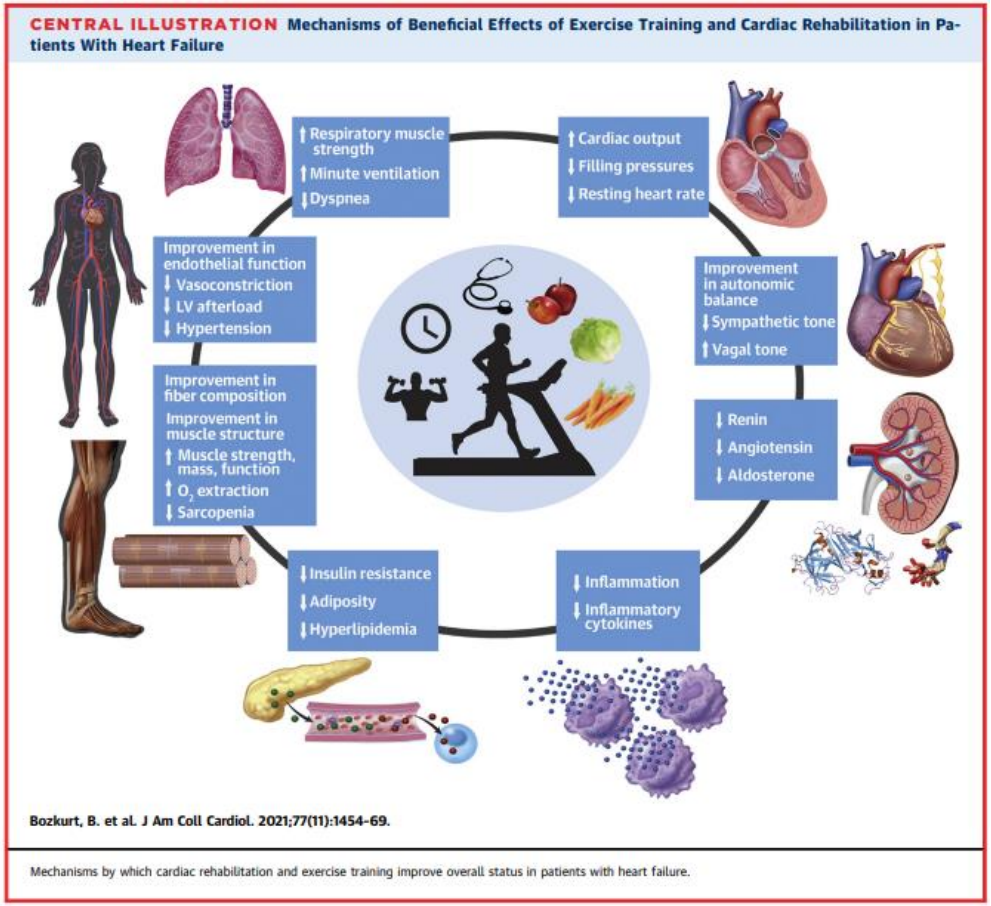
Heterogeneity: Tau² = 0.00; Chi² = 0.53, df = 7 (P = 1.00); I² = 0%
Test for overall effect: Z = 0.86 (P = 0.39)



Amélioration de la VO2max



Bénéfices revalidation chez HFREF



Mechanisms by which cardiac rehabilitation and exercise training improve overall status in patients with heart failure.

Effets HFPEF exercice

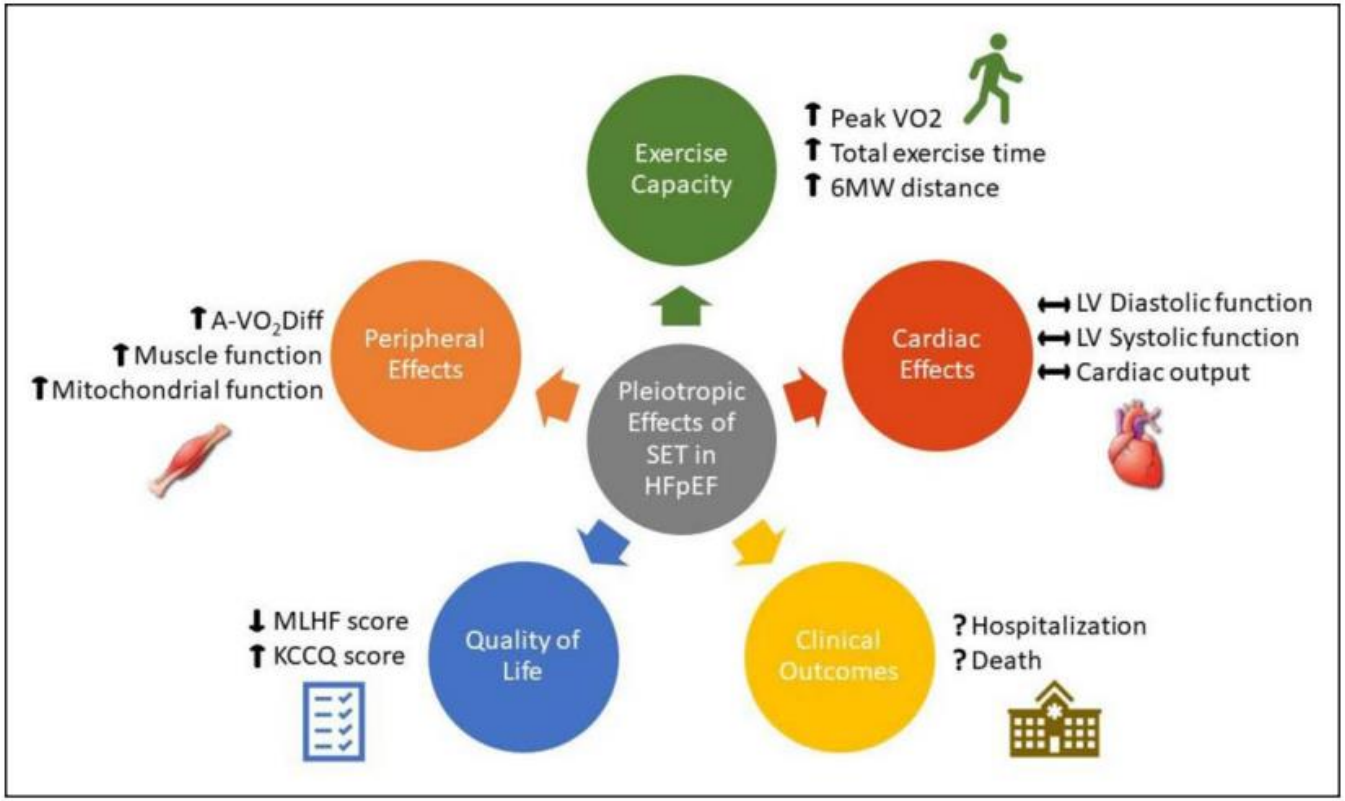
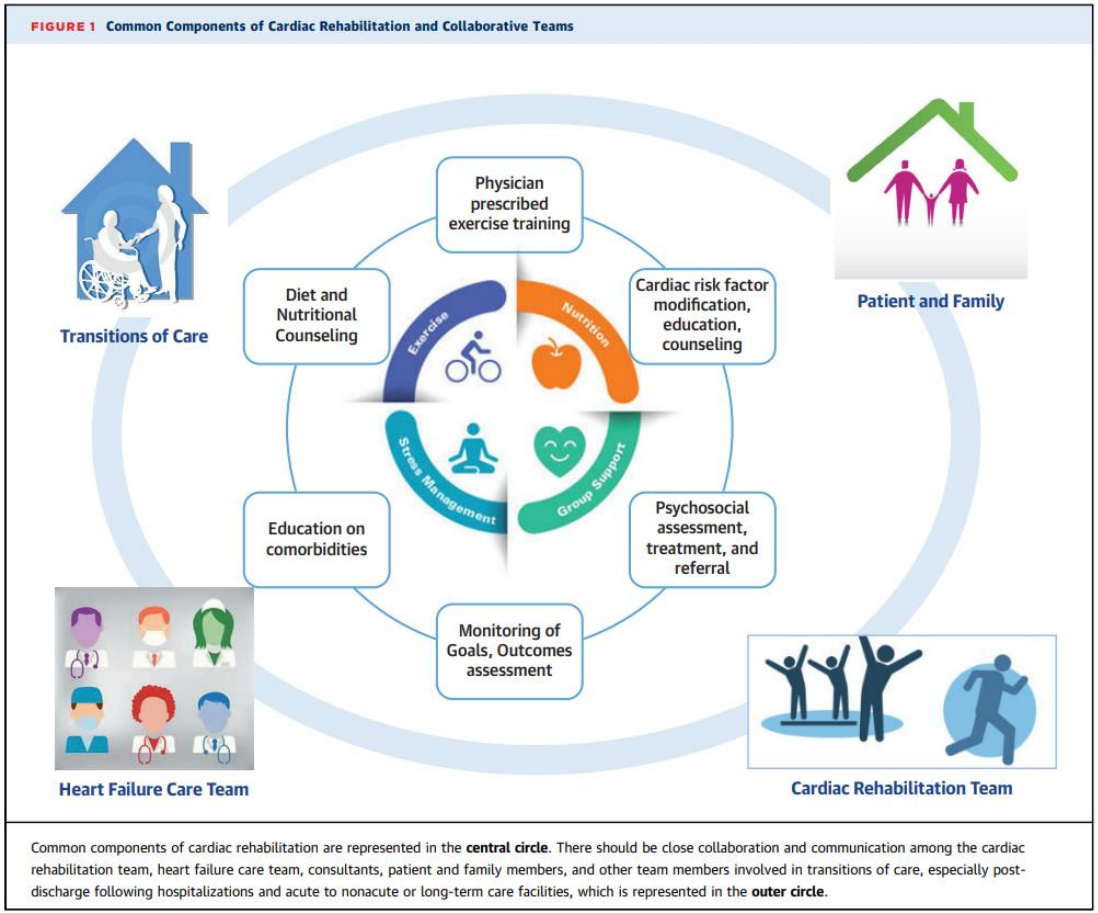


Figure 1. Pleiotropic effects of SET in chronic HFpEF.
A-V̇o$_2$Diff indicates arteriovenous O_2 difference; HFpEF, heart failure with preserved ejection fraction; KCCQ, Kansas City Cardiomyopathy Questionnaire; LV, left ventricular; MLHF, Minnesota Living With Heart Failure Questionnaire; and SET, supervised exercise training.

Ça marche que si....



Conclusion

- Prévalence de l'IC en constante augmentation (HFPEF ++)
- Importance du sens clinique journalier et du suivi (Contre-indication,…)
- Importance de tester les patients (EFX, TDM6, 1RM,…)
- Importance de l'intensité
- Importance du volume
- Importance de la muscu (surtout chez plus faible, sarcopénie)

MERCI POUR VOTRE ATTENTION

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