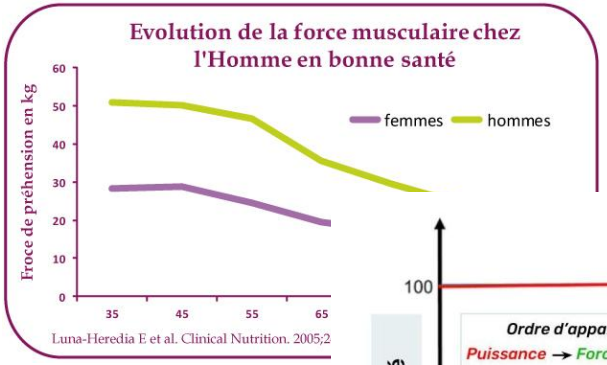
Visions nouvelles en prévention :

La musculation
la "sous-utilisée" de la prévention

Lamotte Michel PhD
HUBruxelles - Belgique

Conflits d’intérêts

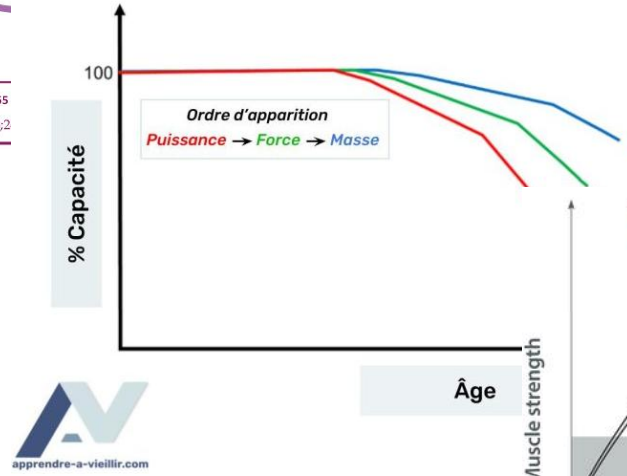
Aucun en relation à ce topo



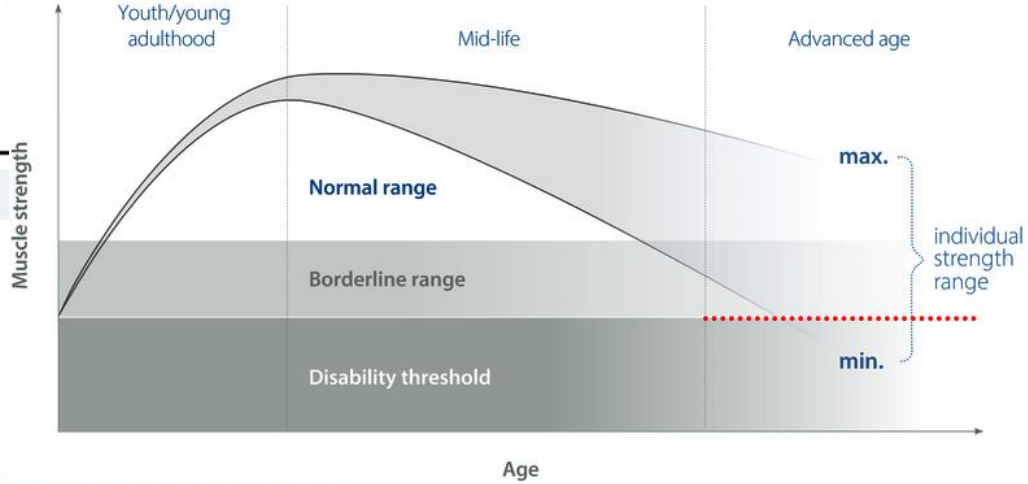
Fatalité ?

Masse : \ 1% / an

Force et puissance : \ 2-3 % / an



Action !



www.forumeuropeen.com

Musculation

- Les évidences sont là (cf dans quelques minutes)
- Sondage :
  - Est-ce prescrit ?
  - Est-ce utilisé ?
  - Sous quelle forme ?

The Journal of Nutrition, Health and Aging 29 (2025) 100401

Contents lists available at ScienceDirect

The Journal of Nutrition, Health and Aging

journal homepage: www.elsevier.com/locate/jnha

Review

Global consensus on optimal exercise recommendations for enhancing healthy longevity in older adults (ICFSR)

… Economic analyses underscore the cost benefits of exercise programs, justifying broader integration into health care for older adults. However, despite these benefits, exercise is far from fully integrated into medical practice for older people. Many healthcare professionals, including geriatricians, need more training to incorporate exercise directly into patient care, whether in settings including hospitals, outpatient clinics, or residential care…

Types d’entraînements (de besoins) et âge

The Journal of Nutrition, Health and Aging 29 (2025) 100401

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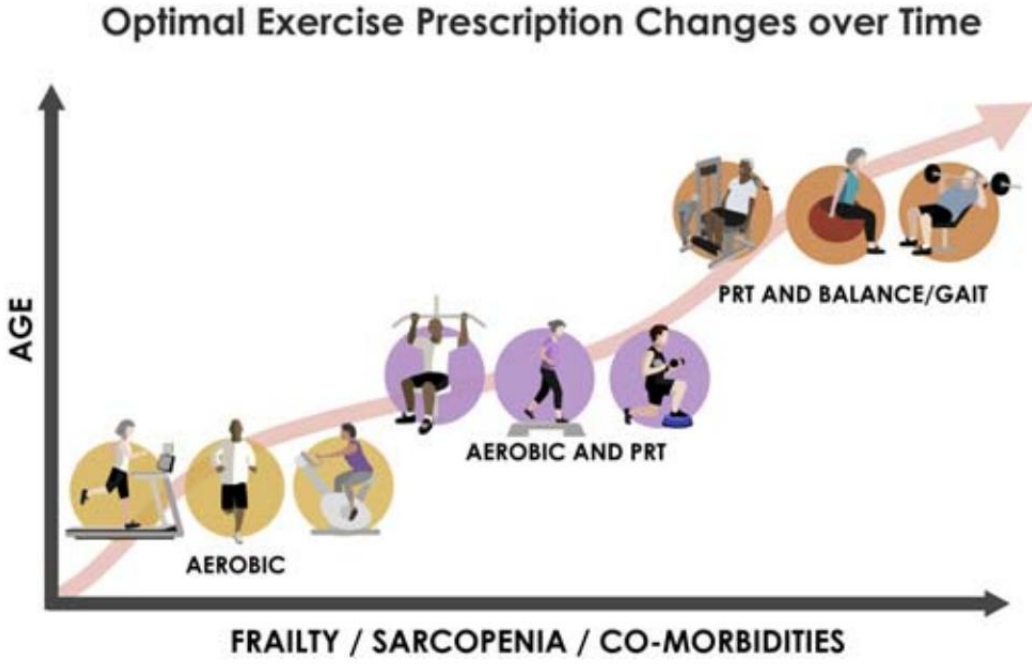
Review

Global consensus on optimal exercise recommendations for enhancing healthy longevity in older adults (ICFSR)



The Journal of Nutrition, Health and Aging 29 (2025) 100401

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journal homepage: www.elsevier.com/locate/jnha

Table 4
Exercise recommendations for optimal body composition for older adults.

Exercise recommendations	Decreased adipose tissue mass and visceral deposition	Increased muscle mass and strength	Increased bone mass and density and reduced fracture risk
Modality	Aerobic or resistance training	Resistance training	• Resistance training • High-impact activities (jumping using weighted vest during exercise) if tolerated by joints. Not recommended for people with vertebral osteoporosis • Balance training
Frequency	Aerobic: 3–7 days/week Resistance: 3 days/week	3 days/week	Resistance training: 3 days/week Balance training: up to 7 days/week
Volume	Aerobic: 30–60 min of continuous exercise using large muscle groups / session Resistance: 2–3 sets of 8–10 repetitions of 6–8 muscle groups	2–3 sets of 8–10 repetitions of 6–8 muscle groups	2–3 sets of 8–10 repetitions of 6–8 muscle groups 50 jumps per session for high impact[a] 2–3 repetitions of 5–10 different static and dynamic balance postures
Intensity	Aerobic: 60–75% of maximum exercise capacity (VO_2 max or maximum heart rate) or 13–14 on the Borg Scale of perceived exertion Resistance: 70–80% of maximum strength (one repetition maximum) exertion	70–80% of maximum capacity (one repetition maximum)	70–80% of maximum capacity (one repetition maximum) as load 5–10% of body weight in vest during jumps; jumps or steps of progressive height Practice the most difficult balance posture not yet mastered

[a] Thus far, proven only in premenopausal women and adolescents or when combined with resistance training/multi-modality exercise in older adults.

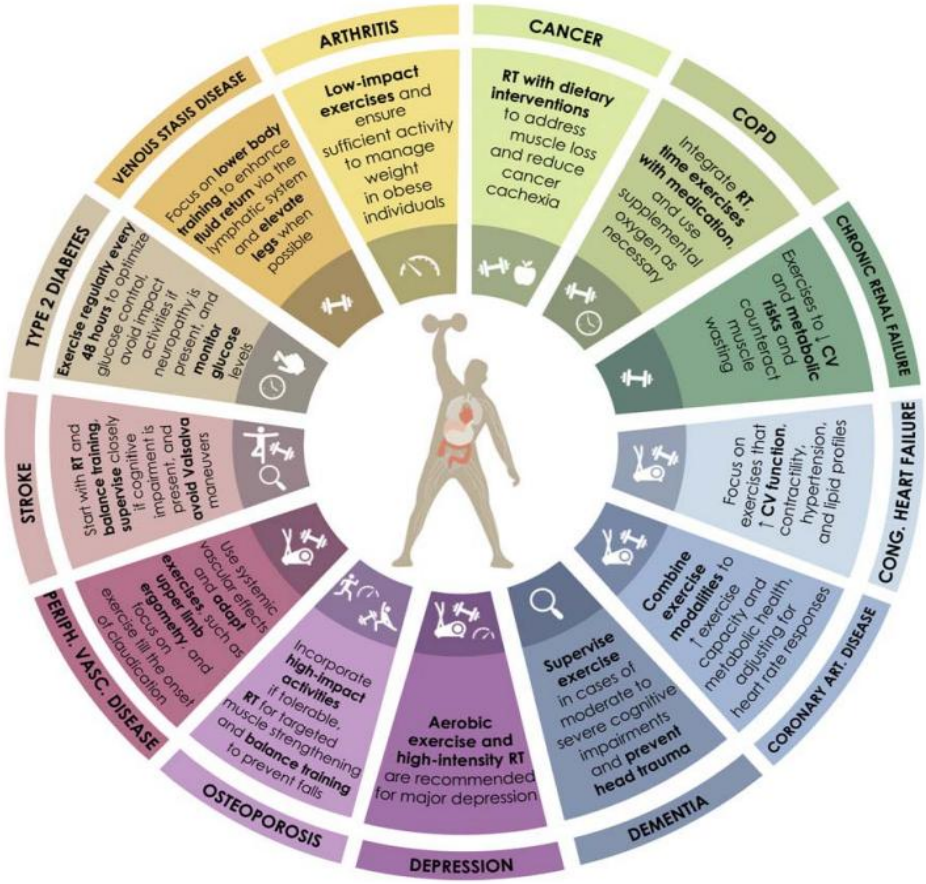
Le muscle, c'est bon pour tout !

The Journal of Nutrition, Health and Aging 29 (2025) 100401

Contents lists available at ScienceDirect

The Journal of Nutrition, Health and Aging

journal homepage: www.elsevier.com/locate/jnha



Prévention du risque de chute : constat

THE GERONTOLOGICAL SOCIETY OF AMERICA®

Journals of Gerontology: Medical Sciences
cite as: *J Gerontol A Biol Sci Med Sci*, 2019, Vol. 74, No. 10, 1650–1656
doi:10.1093/gerona/gly281
Advance Access publication December 14, 2018

OXFORD

Research Article

Lower Skeletal Muscle Mass at Admission Independently Predicts Falls and Mortality 3 Months Post-discharge in Hospitalized Older Patients

Esmee M. Reijnierse, PhD,[1] Sjors Verlaan, PhD,[2] Vivien K. Pham, BSc,[1] Wen Kwang Lim, MD, PhD,[1] Carel G. M. Meskers, MD, PhD,[3,4] and Andrea B. Maier, MD, PhD[1,3,*]

- 10 % des sujets âgés (> 70 ans) sont admis à l'hôpital annuellement (toutes causes)
- L'hospitalisation est associée à un risque plus élevé de chute et de décès après la sortie
  - À 3 mois : 19 % de chute, 13 % de décès
  - → facteurs prédictifs / chute : âge, masse musculaire, test cognitif
  - → facteurs prédictifs / décès : sexe (ho), masse musculaire, score nutrition

Prévention du risque de chute : action

Sherrington et al. International Journal of Behavioral Nutrition and Physical Activity (2020) 17:144
https://doi.org/10.1186/s12966-020-01041-3

International Journal of Behavioral Nutrition and Physical Activity

REVIEW Open Access

Evidence on physical activity and falls prevention for people aged 65+ years: systematic review to inform the WHO guidelines on physical activity and sedentary behaviour

Méta analyse, 25000 participants
Réduction du taux de chute = 28 %
Modalité = équilibre, fonctionnel et renforcement

Conclusions: Given the strength of this evidence, effective exercise programs should now be implemented at scale.

Les recommandations sont claires !

Tan *et al. European Review of Aging and Physical Activity* (2026) 23:8
https://doi.org/10.1186/s11556-025-00399-2

European Review of Aging and Physical Activity

REVIEW Open Access

Optimizing prescription of resistance training for body composition, muscle strength, and physical performance in older adults with sarcopenia: a systematic review and meta-analysis

Zhiyuan Tan[1*†], Yang Jiang[2†], Darren G Candow[3], Carlo Castagna[4], Xiaolong Wang[5] and Huakun Zheng[6]

Conclusion RT is a robust, evidence-based strategy for enhancing MS, functional performance, and body composition in sarcopenic older adults. Findings suggest approximate cumulative duration ranges (~ 1,043 min for MS and ~ 2,716 min for WA) that were associated with maximal gains in pooled analyses. These values should be interpreted as exploratory indicators supporting individualized programming within the FITT-VP framework. Clinicians and exercise practitioners should tailor intensity (60–80% 1RM), frequency, and progression to optimize adherence, effectiveness, and long-term functional outcomes in sarcopenia management.

Le renforcement : pour le muscle … et l'os

Calcified Tissue International (2024) 114:24–37
https://doi.org/10.1007/s00223-023-01146-4

REVIEW

The Interconnection Between Muscle and Bone: A Common Clinical Management Pathway

Cassandra Smith[1,2] · Marc Sim[1,2] · Jack Dalla Via[1] · Itamar Levinger[3,4] · Gustavo Duque[5,6]

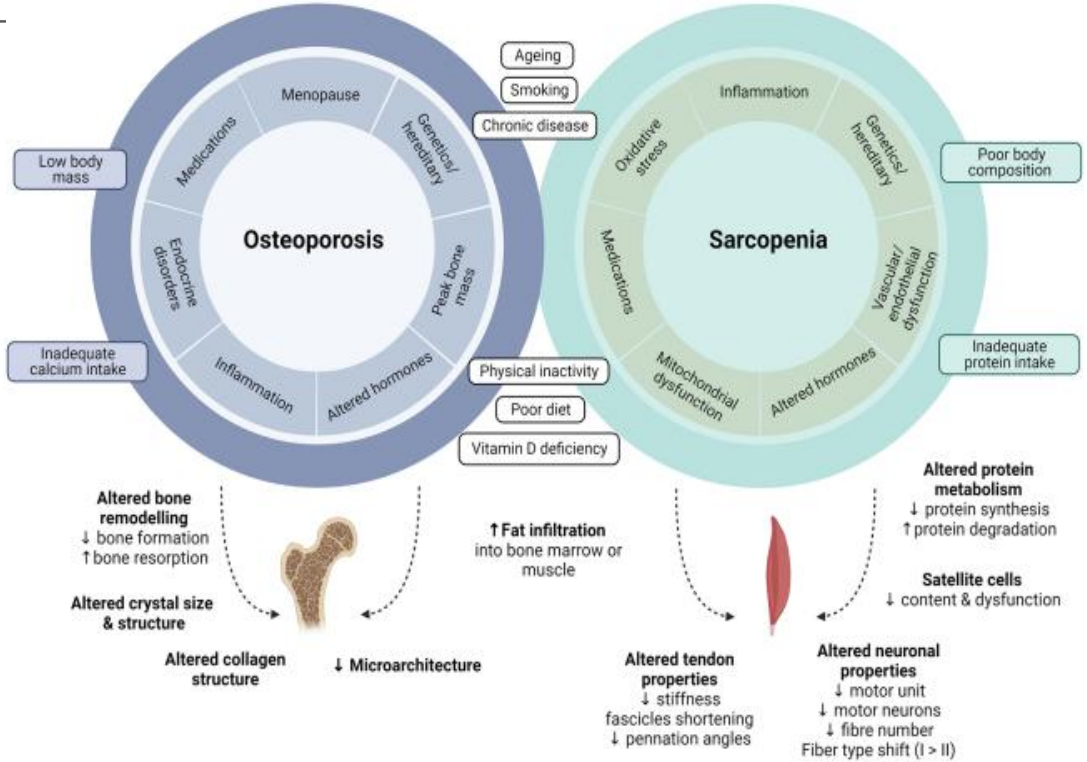


Fig. 1 A conceptual overview of the lifestyle and environmental factors (outer ring) as well as inherent contributors (inner ring) that increase the risk of osteoporosis and sarcopenia. Created with BioRender.com

Le renforcement : pour le muscle … et l'os

Sports Medicine (2022) 52:1939–1960
https://doi.org/10.1007/s40279-022-01675-2

SYSTEMATIC REVIEW

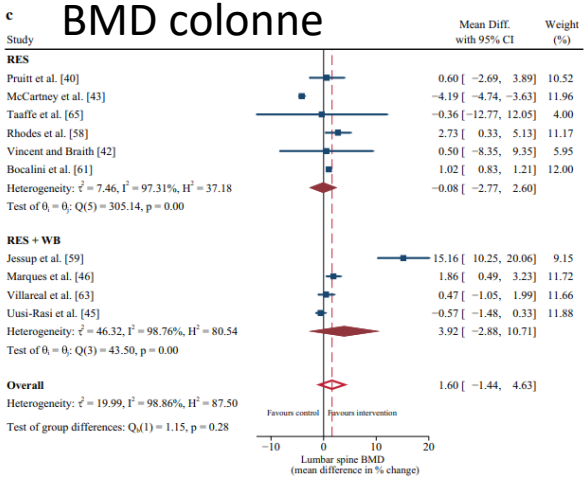
Progressive Resistance Training for Concomitant Increases in Muscle Strength and Bone Mineral Density in Older Adults: A Systematic Review and Meta-Analysis

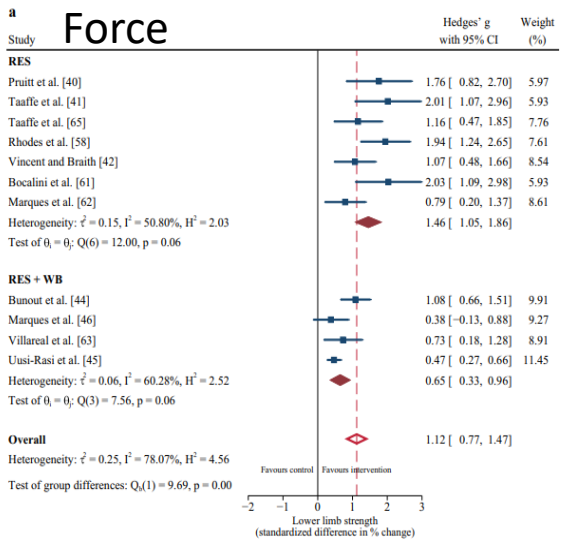
Steven J. O'Bryan[1] · Catherine Giuliano[1] · Mary N. Woessner[1] · Sara Vogrin[2,4] · Cassandra Smith[1,2,3] · Gustavo Duque[2,4] · Itamar Levinger[1,2,4]

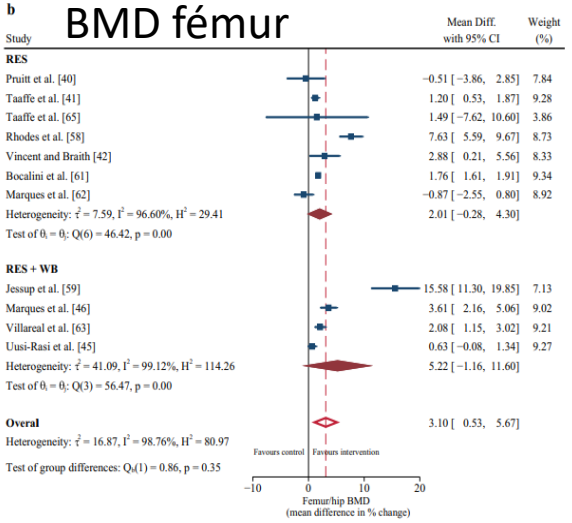
Fig. 6 (continued)

To maximize dual improvements in muscle and bone strength with progressive resistance training programs for older adults, it may be beneficial to complete three sessions per week, incorporate weight-bearing/impact loading exercises (e.g., jumping, stepping), perform one or two sets per exercise, and adopt a load corresponding to 75–80% 1 repetition maximum

780 études, 14 retenues







Densité osseuse : Effet intensité dépendant

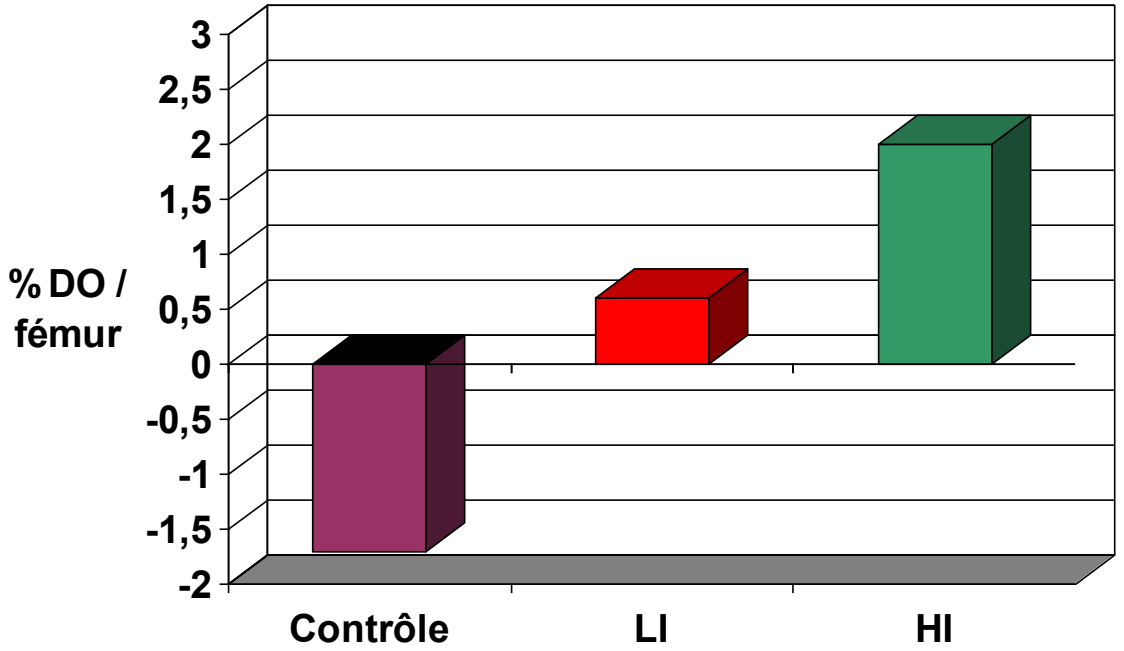
Resistance exercise and bone turnover in elderly men and women

KEVIN R. VINCENT and RANDY W. BRAITH

62 femmes saines (60-83 ans)

6 mois d'entraînement, 3x/sem, 12 exercices

- **Gr contrôle**
- **LI : 13 rép à 50 %**
- **HI : 8 rép à 80 %**



Densité osseuse : Effet intensité dépendant

High versus Low-Intensity Resistance Training on Bone Mineral Density and Content Acquisition by Postmenopausal Women with Osteopenia: A Randomized Controlled Trial

2023

Fatemeh Eslamipour[1], Mehdi Gheitasi[1]*, Fariborz Hovanloo[1], Zohreh Yaghoubitajani[1]

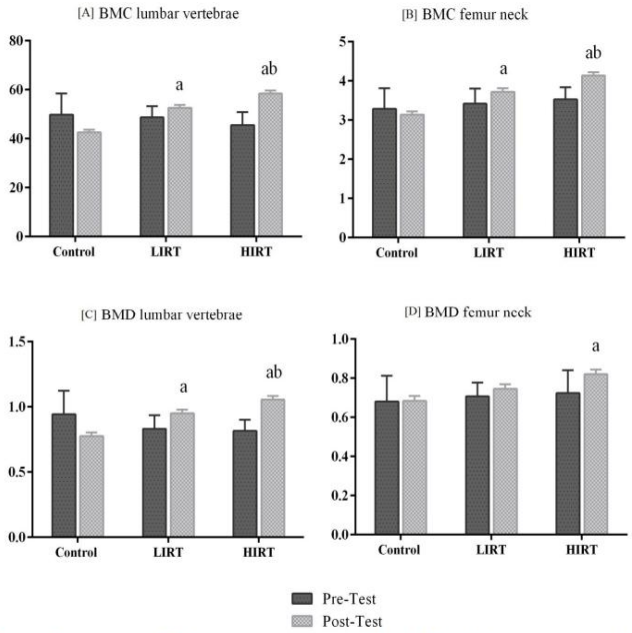


Figure 3. The results of the Bonferroni post-hoc test for BMC (Bone Mineral Content) lumbar vertebrae (A), femur neck (B), and BMD (Bone Mineral Density) lumbar vertebrae (C) and femur neck (D).
[a]$P \leq 0.05$ significant difference with the control group. [b]$P \leq 0.05$ significant difference with the LIRT group.

45 femmes 50-60 ans
BMD par Dexa

16*40%1RM
8*80%1RM

→ **Z-score, en gros gains X2 !**

Densité osseuse : Effet intensité dépendant

A comparison of different exercise intensities for improving bone mineral density in postmenopausal women with osteoporosis: A systematic review and meta-analysis

Bone report 2022

Takashi Kitagawa [a,*], Kaede Hiraya [a], Takumi Denda [a], Shuhei Yamamoto [b]

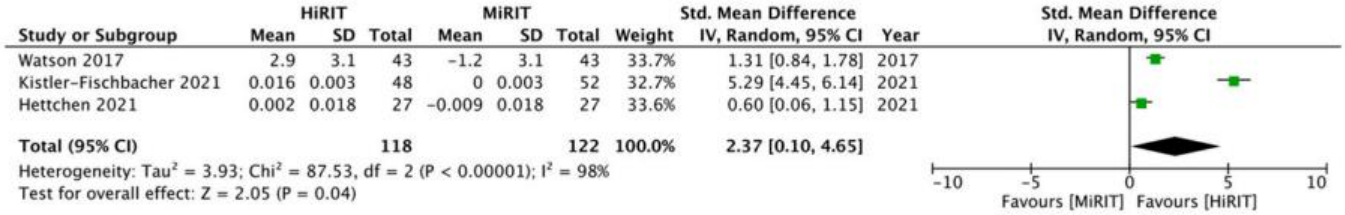


Fig. 3. Forest plots of meta-analyses of the effects of an exercise intervention on the bone mineral density of the lumbar spine.

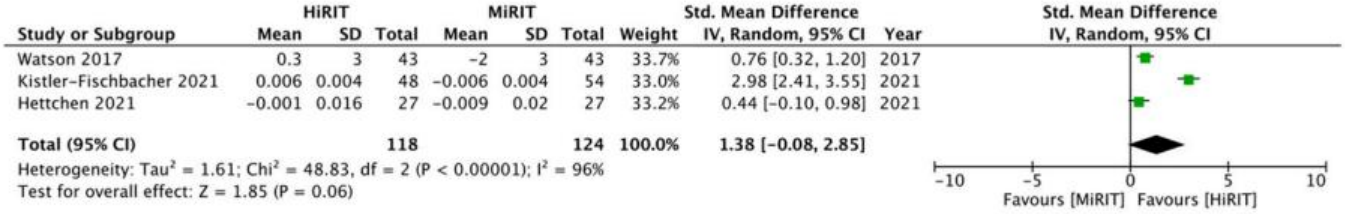


Fig. 4. Forest plots of meta-analyses of the effects of an exercise intervention on the bone mineral density of the femoral neck.

Densité osseuse : Effet mode dépendant

Differential effects of strength versus power training on bone mineral density in postmenopausal women: a 2-year longitudinal study

Simon von Stengel, Wolfgang Kemmler, Dirk Lauber, Willi A Kalender, Klaus Engelke

Br J Sports Med 2007;41:649–655. doi: 10.1136/bjsm.2006.033480

53 femmes, âge 58, modalité Force (ST) versus Puissance (PT)
(poids total mobilisé équivalent), F-up 2 ans

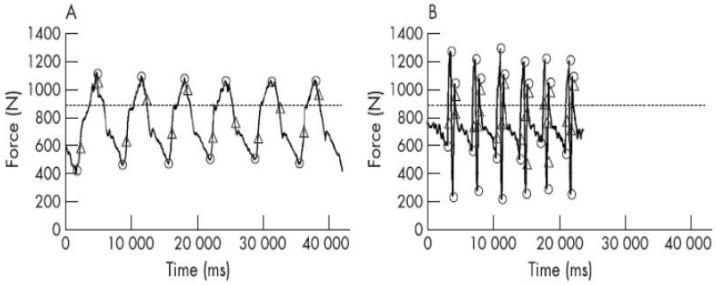


Figure 1 Characteristic force–time curves for strength training (A) and power training (B). The maxima and minima of each repetition are marked by small circles. Maximal loading and unloading rates are marked for each repetition by small triangles. The dashed line indicates the force due to body weight.

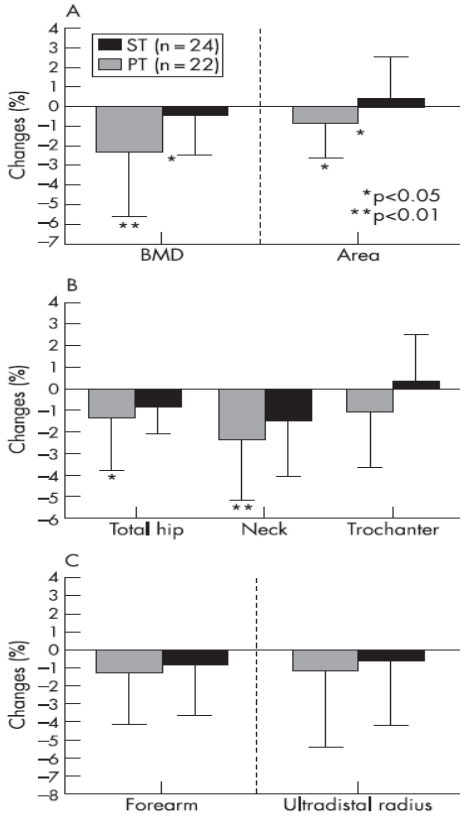
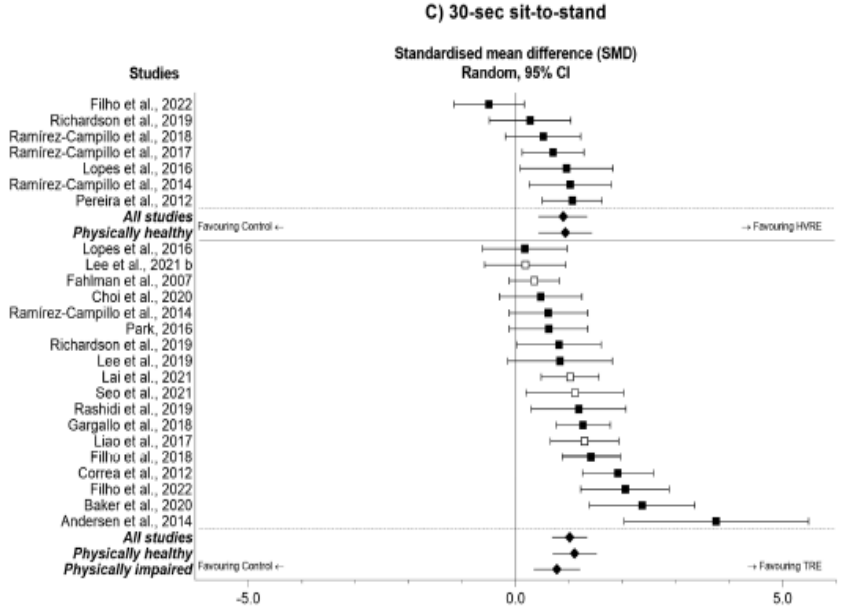


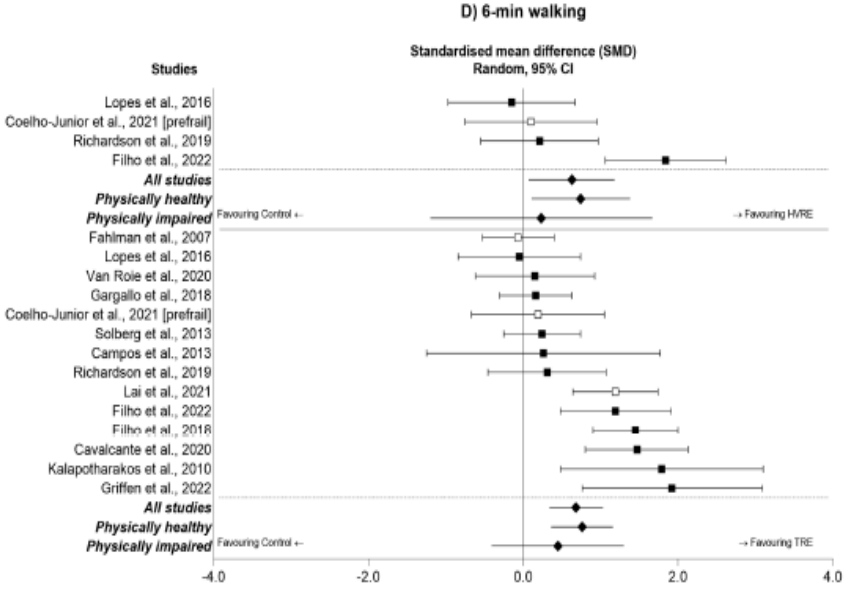
Figure 3 Percentage changes in bone mineral density (BMD), measured by dual *x*-ray absorptiometry, between baseline and year 2 at (A) the lumbar spine (L1–L4), (B) the proximal femur and (C) the forearm in the strength training (ST) and power training (PT) group. Values are mean (SD). Significant between-group differences are marked with asterisks.

Améliorations fonctionnelles

Does High-Velocity Resistance Exercise Elicit Greater Physical Function Benefits Than Traditional Resistance Exercise in Older Adults? A Systematic Review and Network Meta-Analysis of 79 Trials 2023

Pedro Lopez, MSc,[1,2,*,✉] Anderson Rech, PhD,[3] Maria Petropoulou, PhD,[4] Robert U. Newton, PhD, DSc,[1,2] Dennis R. Taaffe, PhD, DSc,[1,2] Daniel A. Galvão, PhD,[1,2] Douglas J. P. Turella, BSc,[3] Sandro R. Freitas, PhD,[5] and Régis Radaelli, PhD[5,6]



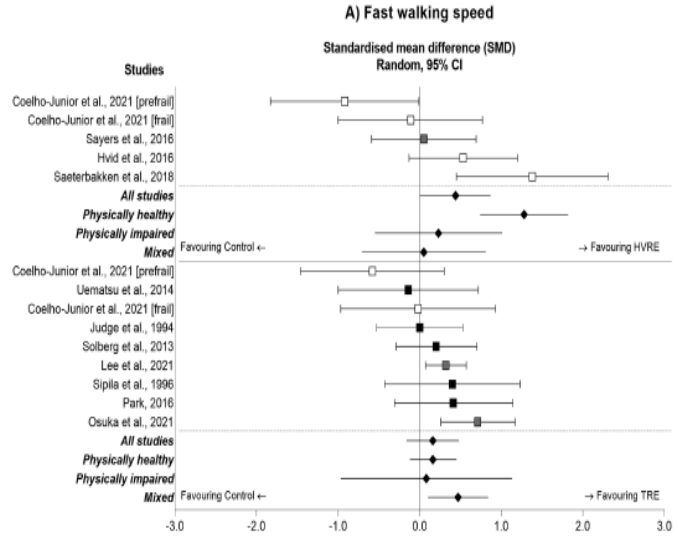


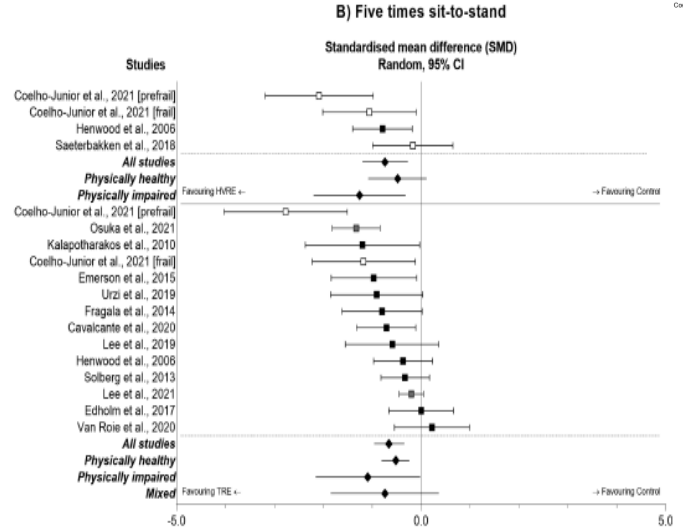
Améliorations fonctionnelles : *« faire c'est bien, bien faire, c'est mieux ! »* (Fr Carré)

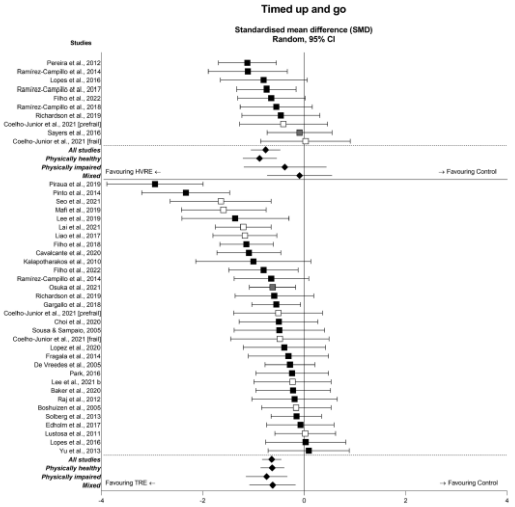
Does High-Velocity Resistance Exercise Elicit Greater Physical Function Benefits Than Traditional Resistance Exercise in Older Adults? A Systematic Review and Network Meta-Analysis of 79 Trials 2023

Pedro Lopez, MSc,[1,2,*,✉] Anderson Rech, PhD,[3] Maria Petropoulou, PhD,[4] Robert U. Newton, PhD, DSc,[1,2] Dennis R. Taaffe, PhD, DSc,[1,2] Daniel A. Galvão, PhD,[1,2] Douglas J. P. Turella, BSc,[3] Sandro R. Freitas, PhD,[5] and Régis Radaelli, PhD[5,6]

High velocity RT = « le plus vite possible »







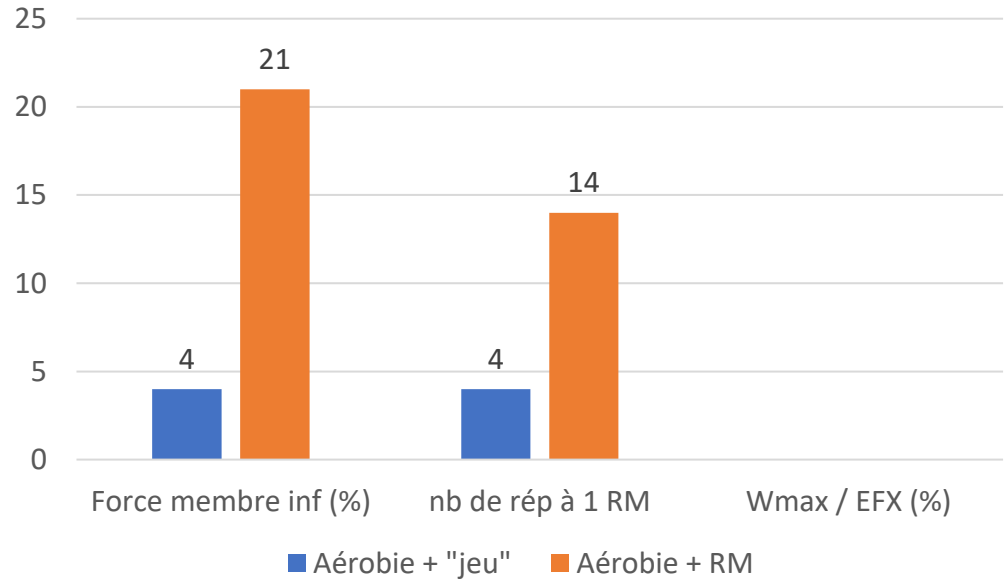
Un mot de la réadaptation en cardiologie

www.forumeuropeen.com

Usefulness of Weightlifting Training in Improving Strength and Maximal Power Output in Coronary Artery Disease

Am. J Cardiol 1991

Neil McCartney, PhD, Robert S. McKelvie, MD, David R. S. Haslam, MSc, and Norman L. Jones, MD



CAD, 52 ans, 10 sem, randomisé

Usefulness of Weightlifting Training in Improving Strength and Maximal Power Output in Coronary Artery Disease

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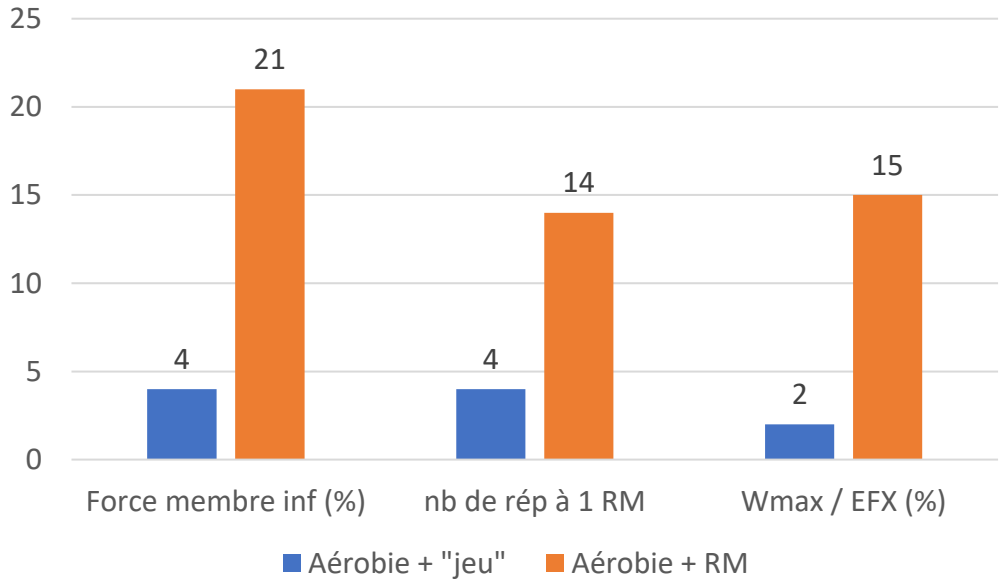


Temps jusqu'à épuisement :

604'' → 672'' (+11 %)

541'' → 1128'' (+109 %)

CAD, 52 ans, 10 sem, randomisé

The Benefit of Graded Physical Exercise in Chronic Heart Failure*

Michel Koch, M.D.; H. Douard, M.D.; and J-P Broustet, M.D.

Chest 1992

Wmax : + 34 % versus NS
Force : 77 → 112 Kg
Q de V : + 63 % versus + 4%

L'hypothèse périphérique

INVITED REVIEW

Chronic Obstructive Pulmonary Disease and Chronic Heart Failure

TWO MUSCLE DISEASES?

Troosters, Thierry PT, PhD; Gosselink, Rik PT, PhD; Decramer, Marc MD, PhD

ELSEVIER

International Journal of Cardiology 130 (2008) 3 – 10

International Journal of Cardiology

www.elsevier.com/locate/ijcard

Review

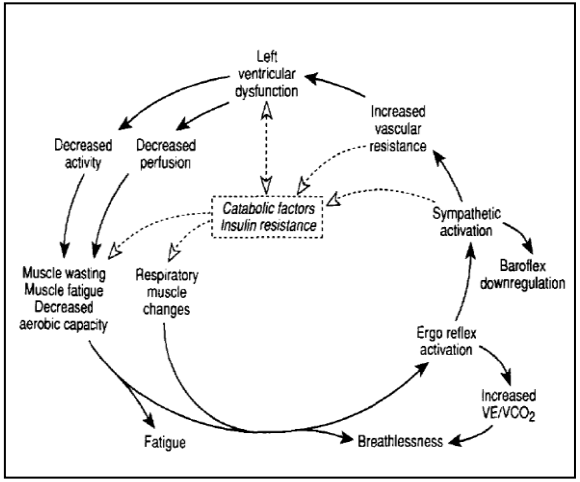
Cardiovascular and ventilatory control during exercise in chronic heart failure: Role of muscle reflexes

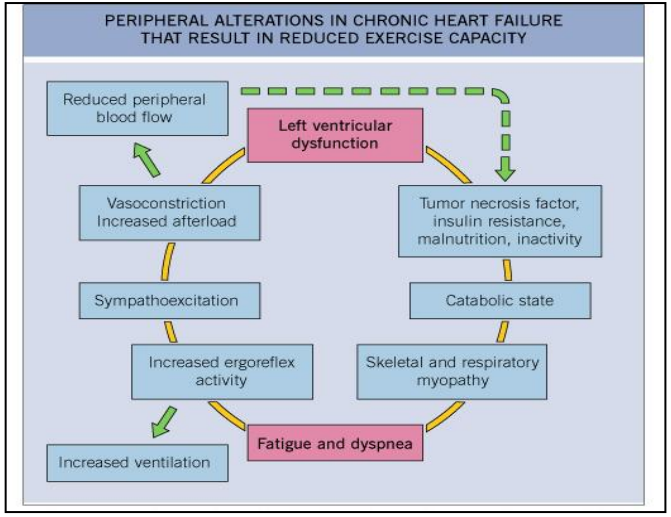
Massimo F. Piepoli [a,b], Konstantinos Dimopoulos [b], Alberto Concu [c], Antonio Crisafulli [c,*]

HEART REVIEW

Origin of symptoms in chronic heart failure

A L Clark





Différentes modalités

Am Heart J. 2017 March ; 185: 130–139. doi:10.1016/j.ahj.2016.12.012.

Rehabilitation Therapy in Older Acute Heart Failure Patients (REHAB-HF) Trial: Design and Rationale

Gordon R. Reeves, MD, MPT[*], David J. Whellan, MD, MHS[*], Pamela Duncan, PT, PhD[†], Christopher M. O'Connor, MD[‡], Amy M. Pastva, PT, PhD[||], Joel D Eggebeen, MS[#], Leigh Ann Hewston, PT, Med[§], Timothy M. Morgan, PhD[†], Shelby D. Reed, PhD[††], W. Jack Rejeski, PhD[**], Robert J. Mentz, MD[††], Paul B. Rosenberg, MD[††], and Dalane W. Kitzman, MD[†] on behalf of the REHAB-HF Trial Investigators

Performance Levels for Strength, Balance, Mobility and Endurance

	Level 1	Level 2	Level 3	Level 4
Strength: Rise from chair without hand support	unable	at least once	5 times in > 15 but <60 seconds	5 times in ≤ 15 seconds
Balance: Standing	unable with feet together for 10 seconds	with feet together for 10 seconds	unsupported and reach forward 10 inches	on 1 leg for 10 seconds
Endurance: Continuous walking	< 2 minutes	≥ 2 but < 10 minutes	≥ 10 but < 20 minutes	≥ 20 minutes
Mobility: Gait speed	≤ 0.4 m/s	> 0.4 but ≤ 0.6 m/s	> 0.6 but ≤ 0.8 m/s	> 0.8 m/s

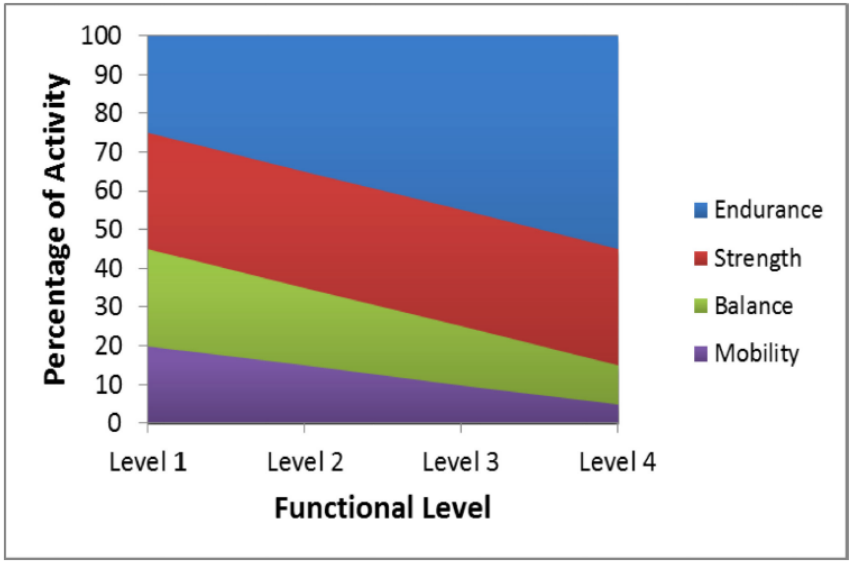


Figure 1.
Approximate percent of exercise time in each physical function domain based on functional level.

Musculation

- Les évidences sont là
- Sondage :
  - Est-ce prescrit ?
  - Est-ce utilisé ?
  - Sous quelle forme ?

Retour à la prévention (primaire)

Cahier des charges : amélioration de la fonction

- Recruter toutes les unités motrices :
    - en pratique : charges : 40 – 80 %
    - jusqu'à épuisement
    - exécution rapide (volonté)
- Exercices fonctionnels
- Progression

Cahier des charges : amélioration de la fonction

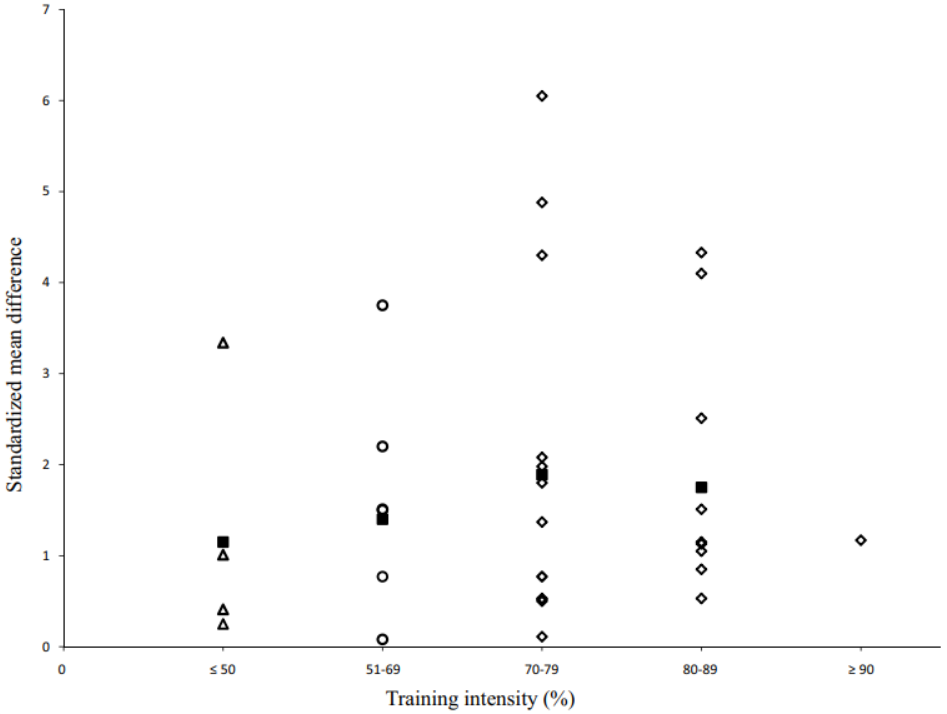
Sports Med (2015) 45:1693–1720
DOI 10.1007/s40279-015-0385-9

SYSTEMATIC REVIEW

Dose–Response Relationships of Resistance Training in Healthy Old Adults: A Systematic Review and Meta-Analysis

Ron Borde[1] · Tibor Hortobágyi[2,3] · Urs Granacher[1]

Modalités « idéales » / gains de force
70-79 % 1-RM
60 sec récup
2-3 séries
7 à 9 répétitions



Cahier des charges : contraintes hémodynamiques

- Charges 3 * 10 répétitions
- Exécution rapide
- Récupération entre les séries : 1 minutes
- Pas de Valsalva

Dynamic strength training intensity in cardiovascular rehabilitation: is it time to reconsider clinical practice? A systematic review

Dominique Hansen[1,2,3], Ana Abreu[4], Patrick Doherty[5] and Heinz Völler[6,7]

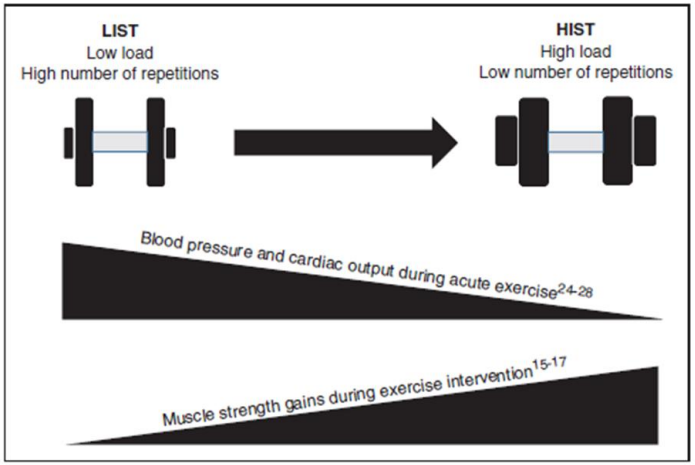


Figure 2. High versus low-intensity strength training in cardiovascular disease: expected acute and chronic physiological effects based on the current literature.
LIST: low-intensity strength training; HIST: high-intensity strength training.

Conclusions

- Les besoins évoluent avec l'âge
  - Muscle
  - Capital osseux
  - Fonctionnalité
  - (Effet potentiel sur la VO2)
- Il faut partir d'une évaluation (EFX, tests de force, tests fonctionnels)
- Il faut prescrire
- Il faut **bien** prescrire !

Circulation Reports
Circ Rep 2025; **7:** 1062–1070
doi:10.1253/circrep.CR-25-0090

ORIGINAL ARTICLE
Cardiac Rehabilitation

Association Between Bottle-Opening Ability and Muscle Weakness in Patients With Coronary Artery Disease

Kodai Ishihara, PT, PhD; Kazuhiro P. Izawa, PT, PhD; Masahiro Kitamura, PT, PhD; Masato Ogawa, PT, PhD; Yuji Kanejima, PT, PhD; Yoshitaka Naito, OT; Tomoyuki Morisawa, PT, PhD; Ikki Shimizu, MD, PhD

Conclusions: The ability to open plastic bottles was independently associated with handgrip strength and pinch strength in patients with CAD. Evaluating the ability to open plastic bottles may be a simple and practical tool for assessing muscle weakness in patients with CAD.

Merci de votre attention !

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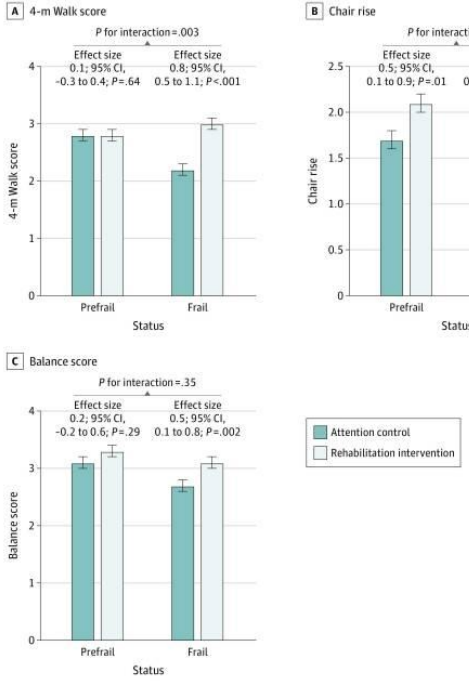
Frailty and Effects of a Multidomain Physical Rehabilitation Intervention Among Older Patients Hospitalized for Acute Heart Failure

A Secondary Analysis of a Randomized Clinical Trial

JAMA 2023

Ambarish Pandey, MD, MSCS, [1] Dalane W. Kitzman, MD, [2,3] M. Benjamin Nelson, MS, [2] Amy M. Pastva, PT, MA, PhD, [4] Pamela Duncan, PT, PhD, [5] David J. Whellan, MD, [6] Robert J. Mentz, MD, [7] Haiying Chen, PhD, [8] Bharathi Upadhya, MD, [2] and Gordon R. Reeves, MD, MPT [9]



→ Ce sont les plus faibles qui s'améliorent le plus (pas RM spécifique)

Table 1. Performance Levels for Strength, Balance, Mobility and Endurance

	Level 1	Level 2	Level 3	Level 4
Strength: Rise from chair without hand support	unable	at least once	5 times in > 15 but <60 sec.	5 times in ≤ 15 sec.
Balance: Standing	unable with feet together for 10 sec.	with feet together for 10 sec.	unsupported and reach forward 10 in.	on 1 leg for 10 sec.
Endurance: Continuous walking	< 2 minutes	≥ 2 but < 10 minutes	≥ 10 but < 20 minutes	≥ 20 minutes
Mobility: Gait speed	≤ 0.4 m/sec.	> 0.4 but ≤ 0.6 m/sec	> 0.6 but ≤ 0.8 m/sec.	> 0.8 m/sec.

Prévention du risque de chute : constat

REVIEW

Journal of Cachexia, Sarcopenia and Muscle 2019; **10**: 485–500
Published online 16 April 2019 in Wiley Online Library (wileyonlinelibrary.com) **DOI:** 10.1002/jcsm.12411

Sarcopenia and its association with falls and fractures in older adults: A systematic review and meta-analysis

Suey S.Y. Yeung[1,2†], Esmee M. Reijnierse[2†], Vivien K. Pham[2], Marijke C. Trappenburg[3,4], Wen Kwang Lim[2], Carel G.M. Meskers[5] & Andrea B. Maier[1,2*]

Conclusions

This systematic review and meta-analysis highlights the positive association between sarcopenia, falls, and fractures. These findings are independent of study design, population, sex, sarcopenia definition, continent, and study quality. This strengthens the need to invest in studies evaluating sarcopenia prevention and intervention programmes on its effect on falls and fractures.

Le renforcement : pour le muscle … et l'os

Sports Medicine (2022) 52:1939–1960
https://doi.org/10.1007/s40279-022-01675-2

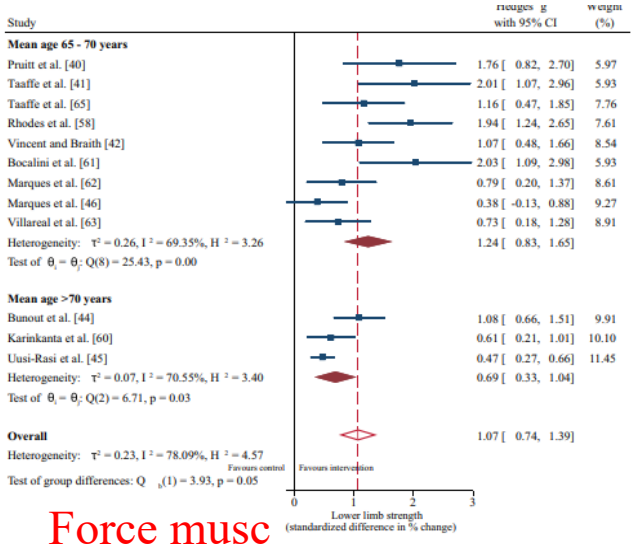
SYSTEMATIC REVIEW

Progressive Resistance Training for Concomitant Increases in Muscle Strength and Bone Mineral Density in Older Adults: A Systematic Review and Meta-Analysis

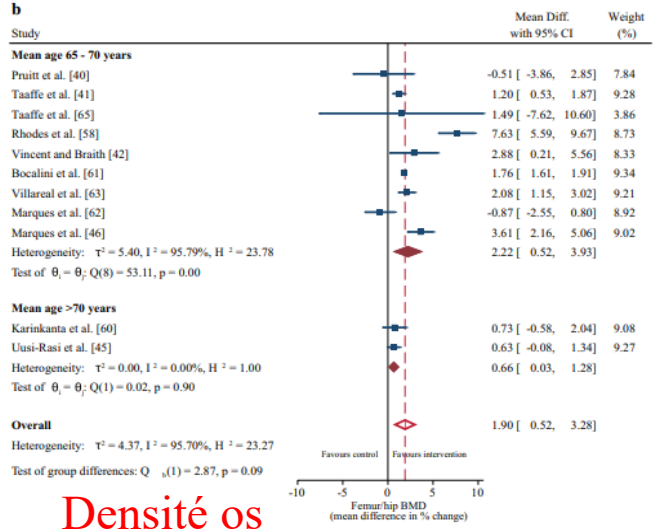
Steven J. O'Bryan[1] · Catherine Giuliano[1] · Mary N. Woessner[1] · Sara Vogrin[2,4] · Cassandra Smith[1,2,3] · Gustavo Duque[2,4] · Itamar Levinger[1,2,4]

To maximize dual improvements in muscle and bone strength with progressive resistance training programs for older adults, it may be beneficial to complete three sessions per week, incorporate weight-bearing/impact loading exercises (e.g., jumping, stepping), perform one or two sets per exercise, and adopt a load corresponding to 75–80% 1 repetition maximum

780 études, 14 retenues



Force musc



Densité os