

# L'entraînement des muscles inspiratoires en réhabilitation respiratoire...

# Contre...





Pas de conflit d'intérêt

# Question : quelle différence??



# L'entraînement des muscles inspiratoires et les recommandations

## Points clés

- Dans un stage de réentraînement musculaire, il est recommandé d'inclure un réentraînement des muscles inspiratoires chez les patients présentant une diminution objective de la force des muscles respiratoires (G1+).
- Il est proposé de réaliser un entraînement contre résistance à au moins 30 % de la pression inspiratoire maximale et d'utiliser les systèmes de type « à seuil » (G2+).

# L'entraînement des muscles inspiratoires et les recommandations

**A clinical practice guideline for physiotherapists treating patients with chronic obstructive pulmonary disease based on a systematic review of available evidence**

D. Langer, EJM Hendriks, C. Burtin, V. Probst, CP van der Schans, WJ Paterson, MCE Verhoef-de Wijk, RVM Straver, M. Klaassen, T. Troosters, M. Decramer, V. Ninane, P. Delguste, J. Muris and R. Gosselink  
*Clin Rehabil* 2009 23: 445 originally published online 23 April 2009  
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The online version of this article can be found at:  
<http://cre.sagepub.com/content/23/5/445>

- Il est recommandé de réaliser EMI chez des patients qui
  - se plaignent de dyspnée
  - ne peuvent suivre un programme de réentraînement à l'effort global

# Les effets de l'EMI

Eur Respir J 2011; 37: 416–425  
DOI: 10.1183/09031936.00031810  
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## REVIEW

Impact of inspiratory muscle training in patients with COPD: what is the evidence?

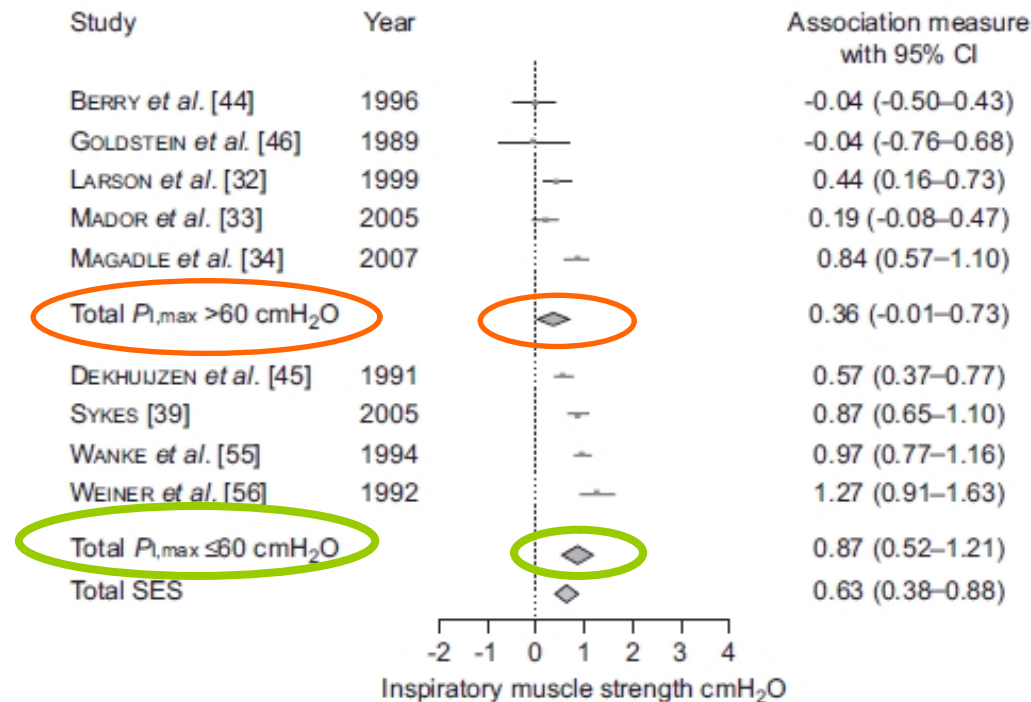
**R. Gosselink<sup>\*,#</sup>, J. De Vos<sup>\*,#</sup>, S.P. van den Heuvel<sup>†</sup>, J. Segers<sup>\*,#</sup>,  
M. Decramer<sup>\*,#</sup> and G. Kwakkel<sup>+</sup>**

# Les effets de l'EMI associé à un programme de réentraînement global

## Sur la force des muscles inspiratoires

REVIEW: INSPIRATORY MUSCLE TRAINING IN COPD

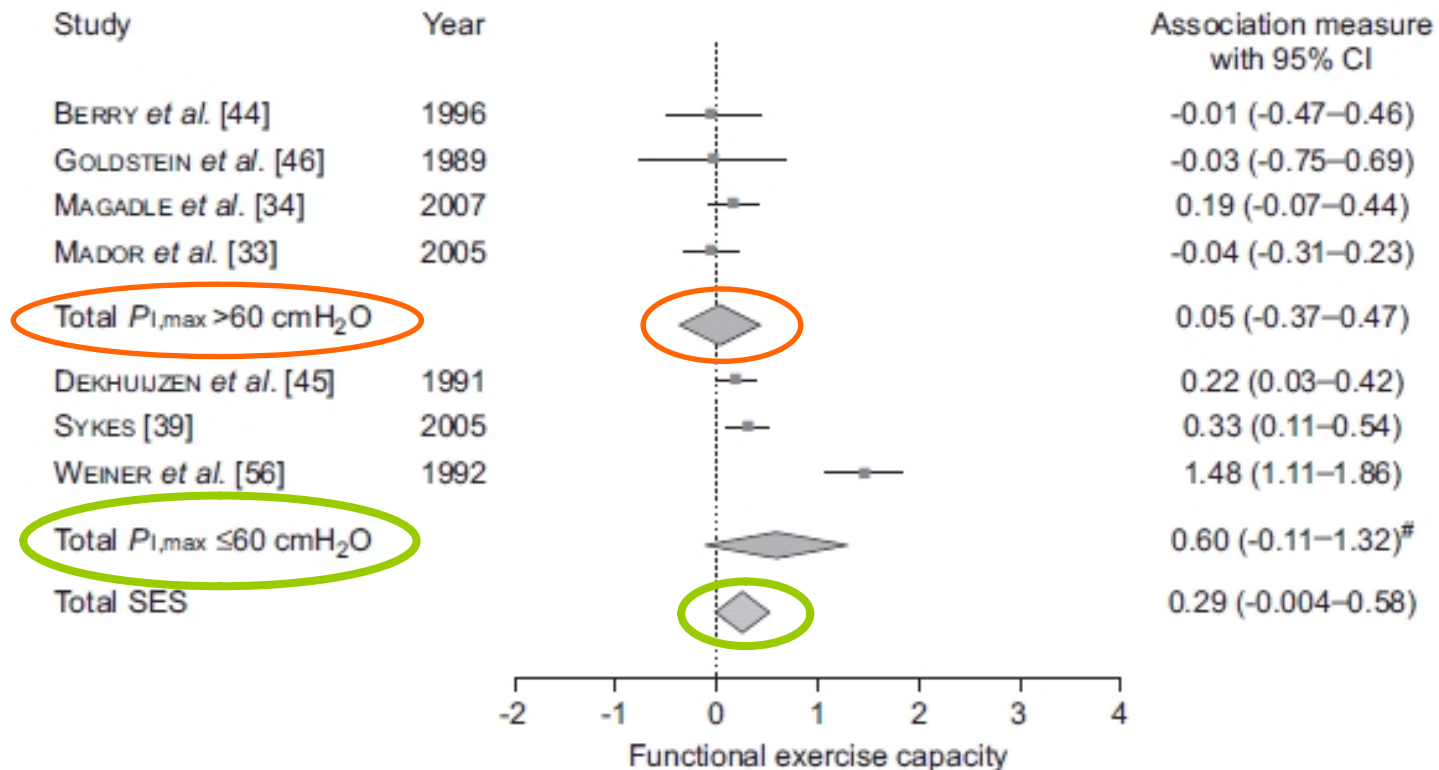
R. GOSSELINK ET AL.



**FIGURE 2.** Effect of general exercise reconditioning (GER) plus inspiratory muscle training versus GER alone on inspiratory muscle strength.  $P_{i,max}$ , maximal inspiratory pressure.

# Les effets de l'EMI associé à un programme de réentraînement global

## Sur la capacité à l'exercice



. Effect of general exercise reconditioning (GER) plus inspiratory muscle training versus GER alone on functional exercise performance. *F* ssure. #: result from random effects model.



# Les effets de l'EMI associé à un programme de réentraînement global

## Sur la dyspnée

subgroup analysis of trials adding IMT to a GER programme showed **no significant effects on the Borg dyspnoea score** (SES -0.32, 95% CI -0.70–0.06;  $p=0.10$ ) and **CRQ dyspnoea score** (SES -0.06, 95% CI -0.78–0.66;  $p=0.88$ ).

## Sur la qualité de vie

-0.14–0.33; -0.01 points;  $p=0.42$ ). **No effects on these items were found when performing the subgroup analysis of IMT+GER versus GER.** Meta-analyses could not be performed on other measurements of quality of life (see online supplementary material).

# L'objectif d'une technique kinésithérapique

Eur Respir J 2011; 37: 236–237  
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## PRO AND CON EDITORIALS

### The case against inspiratory muscle training in COPD

M.I. Polkey\*, J. Moxham<sup>#</sup> and M. Green\*

➤ Diminution des capacités physiques

PR itself. We suggest that future studies do not attempt to measure inspiratory muscle strength or endurance but that the primary measure should reflect a patient focused outcome, such as a field walking test or physical activity monitoring.

# L'entraînement des muscles inspiratoires et les recommandations

## **An Official American Thoracic Society/European Respiratory Society Statement: Key Concepts and Advances in Pulmonary Rehabilitation**

THIS OFFICIAL STATEMENT OF THE AMERICAN THORACIC SOCIETY (ATS) AND THE EUROPEAN RESPIRATORY SOCIETY (ERS) WAS APPROVED BY THE ATS BOARD OF DIRECTORS, JUNE 2013, AND BY THE ERS SCIENTIFIC AND EXECUTIVE COMMITTEES IN JANUARY 2013 AND FEBRUARY 2013, RESPECTIVELY

In summary, current evidence indicates that IMT used in isolation does confer benefits across several outcome areas. However, its added benefit as an adjunct to exercise training in COPD is questionable. It is conceivable that IMT might be useful when added to whole-body exercise training in individuals with marked inspiratory muscle weakness or those unable to participate in cycling or walking because of comorbid conditions, but this idea needs to be evaluated prospectively.

# Inspiratory muscle training during pulmonary rehabilitation in chronic obstructive pulmonary disease:

## A randomized trial

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- Etude randomisée contrôlée prospective incluant 34 patients BPCO, avec PI max > 60cm H<sub>2</sub>O
- Groupe EMI : rehab + EMI
- Groupe contrôle : rehab seule
- Objectif principal : Amélioration de la dyspnée pour patients avec EMI, objectivée par questionnaire MDP (Multidimensional Dyspnea Profile) (*Banzett AJRCCM 2008*)
- Pas de différence significative de la diminution de la dyspnée entre les 2 groupes
- Analyse en sous groupe (patients avec VEMS<50%) montre que les patients les plus sévèrement atteints tirent bénéfice de l'entraînement des muscles inspireurs en terme d'amélioration de la dyspnée

# Effects of inspiratory muscle training on dyspnoea in severe COPD patients during pulmonary rehabilitation: controlled randomised trial

Eur Respir J 2018; 51: 1701107

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- Etude randomisée contrôlée prospective incluant 150 patients BPCO sévère et très sévère
- Groupe EMI : rehab + EMI
- Groupe contrôle : rehab seule
- Objectif principal : Amélioration de la dyspnée pour patients avec EMI, objectivée par questionnaire MDP (Multidimensional Dyspnea Profile) (Banzett AJRCCM 2008)
- Objectifs secondaires: amélioration de la dyspnée avec Borg et mMRC, amélioration de la QDV, amélioration de la capacité à l'exercice, force des muscles inspi
- Évaluation en sous groupes en fonction de la P<sub>I</sub>max, de la CI

# Effects of inspiratory muscle training on dyspnoea in severe COPD patients during pulmonary rehabilitation: controlled randomised trial

Eur Respir J 2018; 51: 1701107

TABLE 3 Change (after minus before intervention) in dyspnoea sensation and functional parameters at the end of the 6-min walk test (6MWT) after intervention (Multidimensional Dyspnoea Profile (MDP) and Borg scales)

	IMT group	Control group	p-value
<b>Subjects n</b>	74	75	
<b>Dyspnoea scales</b>			
Borg scale	-1.4±2.0	-1.0±1.9	0.160
mMRC	-0.9±1.2	-0.8±1.3	0.508
<b>MDP questionnaire</b>			
Unpleasantness	-0.4±2.4	-0.8±2.4	0.382
Sensory intensity	-4.6±10.5	-3.6±11.0	0.549
Muscle work/effort	-0.7±2.9	-0.9±3.1	0.700
Not enough air/smother/air hunger	-1.2±3.3	-1.0±2.6	0.637
Tight/constricted	-0.6±2.8	-0.4±2.4	0.597
Mental effort/concentrate	-1.0±2.9	-0.6±2.9	0.360
Breathing a lot (rapid/deep/heavy)	-1.0±2.8	-0.7±3.4	0.473
Depression	-0.3±1.9	-0.2±1.1	0.625
Anxiety	-0.0±2.4	-0.2±1.6	0.659
Frustration	-0.6±2.3	-0.6±2.2	0.982
Anger	-0.2±2.7	-0.1±1.6	0.732
Fear	0.1±2.5	-0.2±1.4	0.292
<b>SGRQ</b>			
Total	-10.1±10.9	-9.0±12.5	0.580
Symptoms	-4.8±15.1	-3.4±14.8	0.581
Activity	-9.1±14.7	-10.3±17.6	0.653
Impact	-12.1±13.7	-10.1±14.7	0.406
<b>Functional parameters</b>			
$P_{\text{imax}}$ cmH <sub>2</sub> O	14.8±14.9	9.9±13.8	0.041 <sup>#</sup>
IC at rest L	0.1±0.5	0.2±0.4	0.404
IC at end of 6MWT L	0.0±0.5	0.0±0.7	0.796
IC at end of 6MWT - at rest L	-0.1±0.6	-0.2±0.7	0.525
6MWD m	23.4±51.2	36.2±44.9	0.111

Data are presented as mean±sd, unless otherwise stated. IMT: inspiratory muscle training; mMRC: modified Medical Research Council; SGRQ: St George's Respiratory Questionnaire;  $P_{\text{imax}}$ : maximal inspiratory pressure; IC: inspiratory capacity; 6MWD: 6-min walking distance. <sup>#</sup>: p<0.05.

➔ Pas d'effet supplémentaire de l'EMI sur la dyspnée, la QDV dans le cadre d'un PRR

➔ Résultats identiques selon la  $P_{\text{imax}}$  et la CI

➔ Amélioration significative de la  $P_{\text{imax}}$  pour le groupe EMI

# Cycle ergometer and inspiratory muscle training offer modest benefit compared with cycle ergometer alone: a comprehensive assessment in stable COPD patients

International Journal of COPD 2017:12 2655–2668

Kai Wang,<sup>1\*</sup> Guang-qiao Zeng,<sup>2,†</sup> Rui Li,<sup>1,†</sup> Yu-wen Luo,<sup>1</sup> Mei Wang,<sup>1</sup> Yu-he Hu,<sup>1</sup> Wen-hui Xu,<sup>1</sup> Lu-qian Zhou,<sup>2</sup> Rong-chang Chen,<sup>2</sup> Xin Chen<sup>1</sup>

- Essai contrôlé randomisé comparant 3 groupes : contrôle, vélo, vélo+EMI
- Programme de 8 semaines, 3 fois/semaine
- EMI : Threshold IMT<sup>®</sup> à 30% P<sub>I</sub>max, 7 fois 2' EMI, 1' repos, augmentation intensité fonction de Borg
- Comparaison entre les 3 groupes de la capacité à l'exercice (TM6 et VO<sub>2</sub>max), capacité respiratoire (VEMS, CVF, Cl...), dyspnée (Borg, mMRC), QDV (CAT, SGRQ), moral (HAD), P<sub>I</sub>max, état nutritionnel (IMC, MM)

# Cycle ergometer and inspiratory muscle training offer modest benefit compared with cycle ergometer alone: a comprehensive assessment in stable COPD patients

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**Table 2** Effects of pulmonary rehabilitation in the combined training, CET, and control groups

Parameter	Control group (n=26)	CET group (n=27)	Combined training group (n=28)	F	P-value
$\Delta P_{I_{max}}$ (cmH <sub>2</sub> O)	-2.38±0.94	1.32±0.91 <sup>a</sup>	5.20±0.89 <sup>a,b</sup>	17.151	<0.001
$\Delta P_{E_{max}}$ (cmH <sub>2</sub> O)	-5.29±1.97	5.42±1.92 <sup>a</sup>	2.37±1.88 <sup>a</sup>	7.943	0.001
$\Delta FVC$ (L)	0.00±0.05	-0.02±0.05	0.11±0.05	2.211	0.117
$\Delta FVC\%pred$ (%)	-2.10±2.20	-0.69±2.15	4.83±2.13	2.832	0.065
$\Delta FEV_1$ (L)	-0.02±0.03	0.01±0.03	0.06±0.03	0.593	0.555
$\Delta FEV_1\%pred$ (%)	1.75±1.61	0.16±1.56	1.23±1.54	0.264	0.769
$\Delta FEV_1/FVC$	-3.23±2.00	0.55±1.96	-0.13±1.90	1.007	0.370
$\Delta MVV$ (L)	1.11±1.20	0.90±1.18	4.14±1.17	2.360	0.101
$\Delta IC$ (L)	-0.04±0.02	0.06±0.02 <sup>a</sup>	0.10±0.02 <sup>a</sup>	13.209	<0.001
$\Delta mMRC$	0.11±0.13	-0.33±0.13 <sup>a</sup>	-0.47±0.13 <sup>a</sup>	5.534	0.006
$\Delta CAT$	0.30±0.35	-3.00±0.34 <sup>a</sup>	-2.39±0.34 <sup>a</sup>	25.715	<0.001
$\Delta SGRQ$	0.95±0.56	-3.51±0.54 <sup>a</sup>	-3.32±0.54 <sup>a</sup>	20.598	<0.001
$\Delta HADS$	-0.12±0.39	-3.47±0.39 <sup>a</sup>	-3.16±0.38 <sup>a</sup>	22.410	<0.001
$\Delta HADS$ depression	-0.15±0.28	-2.20±0.27 <sup>a</sup>	-2.10±0.27 <sup>a</sup>	17.605	<0.001
$\Delta HADS$ anxiety	-0.10±0.20	-1.32±0.20 <sup>a</sup>	-1.07±0.20 <sup>a</sup>	14.470	<0.001
$\Delta BMI$ (kg/m <sup>2</sup> )	-0.02±0.21	0.54±0.21	0.23±0.21	1.712	0.187
$\Delta FFM$ (kg/m <sup>2</sup> )	-0.11±0.24	0.68±0.24 <sup>a</sup>	0.87±0.23 <sup>a</sup>	4.825	0.011
$\Delta BODE$	-0.07±0.13	-0.02±0.12	-0.24±0.12	1.194	0.309

**Notes:** Data are presented as mean ± SE unless otherwise stated;  $\Delta$ , difference (after minus before intervention); P-value results of analysis of covariance comparison of the differences between groups; <sup>a</sup>P<0.05 vs control group; <sup>b</sup>P<0.05 vs CET group.



# Cycle ergometer and inspiratory muscle training offer modest benefit compared with cycle ergometer alone: a comprehensive assessment in stable COPD patients

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Kai Wang,<sup>1\*</sup> Guang-qiao Zeng,<sup>2†</sup> Rui Li,<sup>1</sup> Yu-wen Luo,<sup>1</sup> Mei Wang,<sup>1</sup> Yu-bei Hu,<sup>1</sup> Wen-hui Xu,<sup>1</sup> Lu-gan Zhou,<sup>2</sup> Rong-chang Chen,<sup>2</sup> Xin Chen<sup>1</sup>

**Table 3** Change in exercise capacity and CPET parameters after pulmonary rehabilitation in the combined training, CET, and control groups

Parameter	Control group (n=26)	CET group (n=27)	Combined training group (n=28)	F	P-value
<b>6MWD</b>					
ΔDistance (m)	-1.64±4.64	32.55±4.59*	21.68±4.51*	14.320	<0.001
ΔBorg	0.35±0.24	-0.10±0.24	-0.23±0.23	1.620	0.205
<b>Rest CPET variables</b>					
ΔVE (L/min)	0.14±0.23	0.16±0.23	-0.43±0.22	2.301	0.107
ΔRf (b/min)	0.05±0.31	-0.21±0.30	-0.69±0.30	1.666	0.196
ΔVT (L)	-0.01±0.01	0.01±0.02	-0.01±0.02	0.630	0.535
ΔRER	0.01±0.01	0.03±0.01	0.02±0.01	0.746	0.478
ΔSPO <sub>2</sub> (%)	0.12±0.13	0.30±0.12	0.31±0.12	0.714	0.493
ΔHR (b/min)	-1.37±1.56	-2.64±1.53	-4.22±1.49	0.878	0.420
<b>Peak CPET variables</b>					
ΔVE (L/min)	0.91±0.92	1.96±0.90	0.20±0.89	0.989	0.377
ΔRf (b/min)	0.51±0.61	0.50±0.60	-0.60±0.59	1.140	0.325
ΔVT (L)	0.01±0.02	0.00±0.02	0.01±0.02	0.057	0.945
ΔRER	-0.01±0.01	0.00±0.01	-0.02±0.01	1.089	0.342
ΔSPO <sub>2</sub> (%)	0.28±0.44	-0.39±0.43	0.22±0.42	0.743	0.479
ΔHR (b/min)	-1.96±1.83	0.81±1.79	-1.21±1.76	0.631	0.535
ΔVO <sub>2max</sub> (mL/min)	3.45±20.96	149.01±20.04*	122.96±19.47*	14.180	<0.001
ΔVO <sub>2max</sub> %pred (%)	0.34±1.43	9.56±1.35*	6.28±1.32*	11.143	<0.001
ΔVO <sub>2max</sub> /kg (mL/min/kg)	-0.58±0.39	2.56±0.36*	2.26±0.36*	21.037	<0.001
ΔAT (mL/min)	-0.29±34.72	157.53±33.19*	104.75±32.30*	5.482	0.006
ΔAT%pred (%)	-0.27±1.96	7.68±1.84*	4.90±1.81*	4.453	0.015
ΔPower (Watt)	-0.62±2.29	11.86±2.25*	6.10±2.21*	7.547	0.001
ΔBorg	0.08±0.20	-0.18±0.20	-0.36±0.20	1.258	0.290

**Notes:** Data are presented as mean ± SE unless otherwise stated; Δ, difference (after minus before intervention); P-value results of analysis of covariance comparison of the differences between groups; \*P<0.05 vs control group.

# Inspiratory muscle training does not improve clinical outcomes in 3-week COPD rehabilitation: results from a randomised controlled trial

Eur Respir J 2018; 51: 1702000

Konrad Schultz<sup>1</sup>, Danijel Jelusic<sup>1</sup>, Michael Wittmann<sup>1</sup>, Benjamin Krämer<sup>1</sup>, Veronika Huber<sup>1</sup>, Sebastian Fuchs<sup>1</sup>, Nicola Lehbert<sup>1</sup>, Silke Wingart<sup>1</sup>, Dragan Stojanovic<sup>1</sup>, Oliver Göhl<sup>1</sup>, Harma J. Alma<sup>2</sup>, Corina de Jong<sup>2</sup>, Thys van der Molen<sup>2</sup>, Hermann Faller<sup>3</sup> and Michael Schuler<sup>3</sup>

- 611 patients BPCO, RR+EMI vs RR+Sham EMI, 3 semaines
- EMI: Powerbreathe Medic<sup>®</sup> à 30% P<sub>I</sub>max, 7 fois 2' EMI, 1' repos, augmentation de l'intensité jusque 60% P<sub>I</sub>max au moins

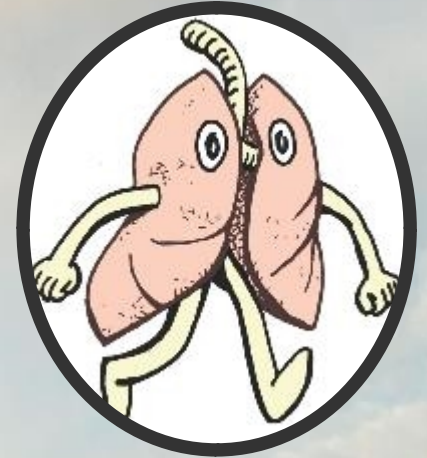


IMT as an add-on to a 3-week pulmonary rehabilitation improves inspiratory muscle strength, but does not provide additional benefits in terms of exercise capacity, quality of life or dyspnoea. A general recommendation for COPD patients to add IMT to a 3-week pulmonary rehabilitation cannot be made.

# Conclusion : quelle différence??



Merci pour votre attention



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