ENTRAINEMENT DES MUSCLES INSPIRATOIRES

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Entrainement des muscles inspirateurs 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
DOI: 10.1177/0269215509103507

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 d'entrainement à l'effort global

- Le candidat idéal : force muscles inspi réduite et dyspnée

Entrainement 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

- Il est démontré que l'EMI utilisé isolément apporte des bénéfices (capacité à l'exercice, dyspnée…)
- Ajouté à un pg de RE son bénéfice supplémentaire manque de preuve dans certains domaines (dyspnée...)
- Il est pertinent de l'ajouter à un pg de RE global si faiblesse des muscles inspi ou si le patient ne peut réaliser RE sur vélo ou tapis.
- Nécessité d'études prospectives pour améliorer niveau de preuve

Les effets de l'entrainement des muscles inspiratoires

Eur Respir J 2002; 20: 570–576
DOI: 10.1183/09031936.02.00237402
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European Respiratory Journal
ISSN 0903-1936

Effects of controlled inspiratory muscle training in patients with COPD: a meta-analysis

F. Lötters*, B. van Tol#, G. Kwakkel#, R. Gosselink¶

- 15 essais contrôlés
- EMI avec Intensité contrôlée ≥ 30% PImax
- Résultats positifs sur :

Les effets de l'entrainement des muscles inspiratoires

- La dyspnée

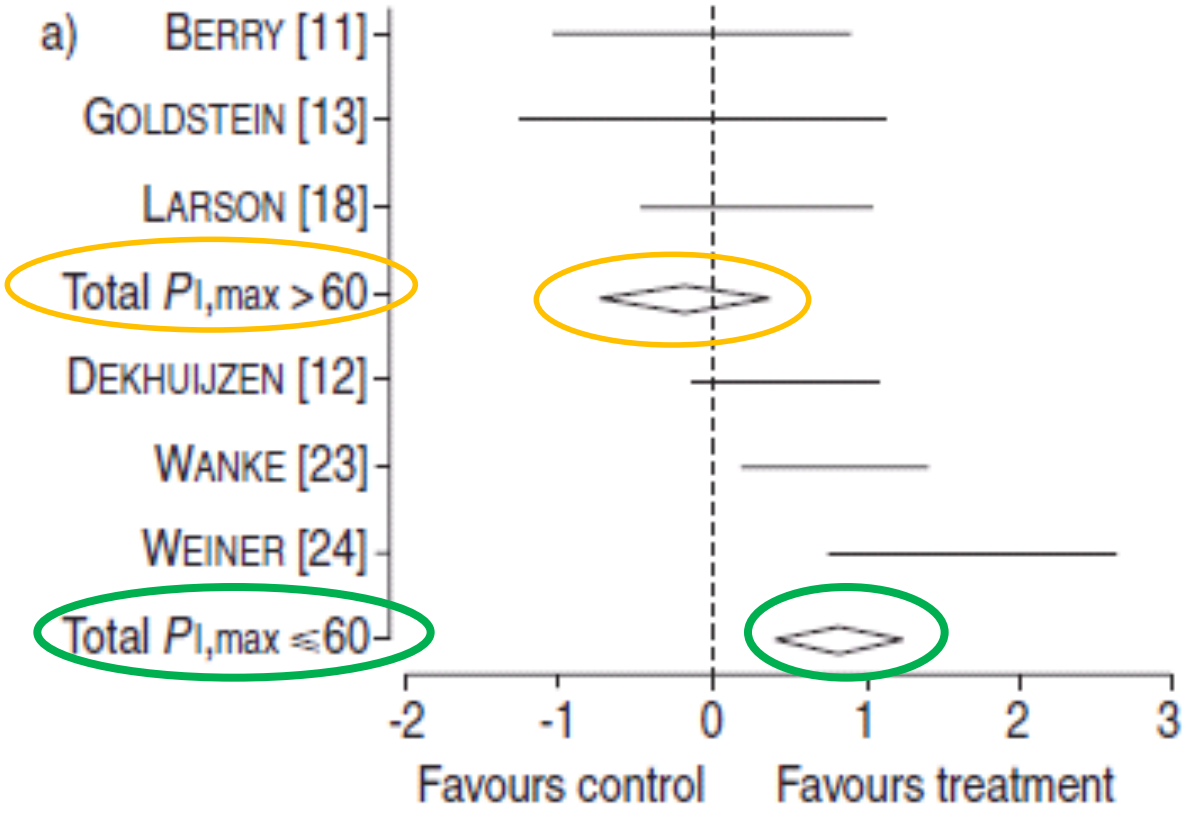
Table 2. – Overall results of the meta-analysis using the fixed effect model

Outcome measure	Studies n	Weighted averaged effect-size	Natural units	95% CI	Z-statistic	Homogeneity Q-statistic	Studies needed# n
Inspiratory muscle strength $P_{I,max}$	15	0.56	10.5 cmH_2O	0.35–0.77	5.27*	16.83	⩾77
Inspiratory muscle endurance MVV	4	0.21	2.8 $L \cdot min^{-1}$	-0.29–0.70	0.82	1.38	
Inspiratory muscle endurance s	7	0.41	154.2 s	0.14–0.68	2.94**	6.67	⩾14
Inspiratory muscle endurance cmH_2O	4	1.16	10.3 cmH_2O	0.67–0.15	4.67*	5.39	⩾10
Functional exercise capacity 6- or 12MWD	8	0.22	48.1 m	-0.05–0.48	1.58	2.58	
Laboratory exercise capacity $V'_{O_2,max}$	5	0.04	-0.04 $L \cdot min^{-1}$	-0.36–0.29	-0.24	2.50	
Laboratory Exercise capacity $V'_{E,max}$	5	0.03	-1.5 $L \cdot min^{-1}$	-0.03–0.35	0.16	5.49	
Dyspnea-Borg exercise-related	5	-0.55	-1.5	-0.90–0.19	-3.10**	3.69	⩾10
Dyspnoea-TDI rest	2	2.3	2.7	1.44–3.15	5.28**	4.14	⩾14

CI: confidence interval; $P_{I,max}$: maximum static inspiratory alveolar pressure; MVV: maximal voluntary ventilation; 6- or 12MWD: 6- or 12-min walking distance; $V'_{O_2,max}$: maximal oxygen consumption; $V'_{E,max}$: maximal minute ventilation; TDI: transitional dyspnoea index. #: studies needed for $p>0.05$; **: $p<0.01$; ***: $p<0.001$.

Les effets de l'entrainement des muscles inspiratoires

- La force des muscles inspiratoires



Les effets de l'entrainement des muscles inspiratoires

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

REVIEW

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

R. Gosselink*,#, J. De Vos*,#, S.P. van den Heuvel¶, J. Segers*,#, M. Decramer*,# and G. Kwakkel+

- Evaluer EMI : force et endurance muscles inspi, dyspnée, TM6 ou 12, et /ou qualité de vie
- EMI en force (≥ 30% Pimax) et/ou endurance
- 32 essais contrôlés randomisés, toutes langues

Les effets de l'entrainement des muscles inspiratoires

TABLE 1 Overall results of the meta-analysis

Outcome measures	Subjects n	Q-statistic	I^2	SES	95% CI	p-value (z-statistic)	Natural units
$P_{I,max}$	32	57.8	46	0.73	0.53–0.93	0.001	+13 cmH_2O
RMET	14	47.3	73	1.05	0.62–1.49	0.001	+261 s
ITL	11	16.8	3	0.98	0.72–1.25	0.001	+13 cmH_2O
MVV	4	1.2	0	0.23	-0.27–0.72	0.373	+3 $L \cdot min^{-1}$
Functional exercise capacity	22	14.3	0	0.28	0.12–0.44	0.001	6MWD: +32 m
							12MWD: +85 m
Endurance exercise capacity	3	4.6	57	0.72	-0.12–1.55	0.087	+198 s
$V'_{O_2,max}$ $L \cdot min^{-1}$	9	6.0	0	-0.13	-0.38–0.11	0.293	-0.04 $L \cdot min^{-1}$
$V'_{O_2,max}$ $mL \cdot min^{-1} \cdot kg^{-1}$	5	5.0	20	0.3	-0.02–0.63	0.067	+1.3 $mL \cdot min^{-1} \cdot kg^{-1}$
$V'_{E,max}$	9	5.5	0	-0.04	-0.3–0.2	0.696	-0.7 $L \cdot min^{-1}$
Wmax	10	5.1	0	0.07	-0.16–0.3	0.562	+1.7 W
Dyspnoea Borg score	14	15.6	17	-0.45	-0.66– -0.24	0.001	-0.9
Dyspnoea TDI	4	6.3	52	1.58	0.86–2.3	0.001	+2.8
Dyspnoea CRQ-Dyspnoea	9	16.6	52	0.34	-0.03–0.71	0.068	+1.1
Quality of life CRQ	9	10.4	20	0.34	0.09–0.60	0.007	+3.8
CRQ fatigue	10	8.2	0	0.27	0.03–0.50	0.024	+0.9
CRQ emotion	10	7.6	0	0.19	-0.04–0.42	0.107	+0.5
CRQ mastery	10	8.5	0	0.09	-0.14–0.33	0.432	-0.005

n=32. SES: summary effect size; $P_{I,max}$: maximal inspiratory pressure; RMET: respiratory muscle endurance test: ITL: incremental threshold loading; MVV: maximal voluntary ventilation; $V'_{O_2,max}$: maximal oxygen uptake; $V'_{E,max}$: maximal minute ventilation; Wmax: maximal power output; TDI: transition dyspnoea index; CRQ: chronic respiratory questionnaire.

Les effets de l'entrainement des muscles inspiratoires associé à l'entrainement à l'exercice

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).

Les effets de l'entrainement des muscles inspiratoires associé à l'entrainement à l'exercice

Does IMT add to a general exercise training programme?

IMT, when added to a GER programme, had an additional effect on inspiratory muscle strength and endurance, but not on dyspnoea (Borg score and CRQ scale). Similar to the effects observed during IMT alone, no additional effect was found on measures of maximal exercise capacity (W_{max}, $V'_{E,max}$ and $V'_{O_2,max}$). These conclusions are at variance with the analysis of O'Brien *et al.* [20], who observed a significant increase in maximal exercise tidal volume, but not on inspiratory muscle endurance. In the present meta-analysis, the additional effect of IMT to GER on functional exercise capacity just failed to reach statistical significance in patients with inspiratory muscle weakness. However, the observed strong trend in the present analysis, including two more studies, was stronger than in our previous meta-analysis [21]. It has face validity to consider that patients limited in their exercise performance by ventilatory constraints and dyspnoea due to inspiratory muscle weakness might indeed benefit from additional IMT. However, this hypothesis has to be investigated in a randomised controlled trial. Furthermore, inspiratory muscle fatigue reflexively

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

Eur Respir J 2018; 51: 1701107

Marc Beaumont[1], Philippe Mialon[2], Catherine Le Ber[1], Patricia Le Mevel[1], Loïc Péran[1], Olivier Meurisse[1], Capucine Morelot-Panzini[3], Angelina Dion[4] and Francis Couturaud[5]

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
Subjects n	74	75	
Dyspnoea scales			
Borg scale	−1.4±2.0	−1.0±1.9	0.160
mMRC	−0.9±1.2	−0.8±1.3	0.508
MDP questionnaire			
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
SGRQ			
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
Functional parameters			
P_{Imax} cmH_2O	14.8±14.9	9.9±13.8	0.041*
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_{Imax}: maximal inspiratory pressure; IC: inspiratory capacity; 6MWD: 6-min walking distance. *: $p<0.05$.

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

Résultats identiques selon la PImax

Amélioration significative de la PImax pour le groupe EMI

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

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

TABLE 4 Primary and secondary outcomes for the control group and intervention group

	T0	Change T1–T0	SRM	AMD (95% CI) T1	Cohen's d
P_{max} kPa					
Control	6.69±2.19	0.88±1.46	0.60	*0.96 (0.72–1.16)*	0.59
Intervention	6.73±2.39	1.83±1.58	1.15		
P_{max} cmH_2O					
Control	68.22±22.33	8.97±14.69	0.60	*0.96 (0.72–1.16)*	0.59
Intervention	68.63±24.37	18.66±16.11	1.15		
P_{max} % pred					
Control	63.68±21.05	8.35±13.97	0.60	*8.95 (6.87–11.03)*	0.59
Intervention	63.94±23.04	17.29±14.99	1.15		
FIV1 L					
Control	2.93±0.87	0.25±0.52	0.48	*0.16 (0.02–0.29)*	0.20
Intervention	2.90±0.86	0.36±0.53	0.68		
FEV1 L					
Control	1.50±0.57	0.19±0.31	0.60	0.02 [−0.03–0.07]	0.06
Intervention	1.55±0.57	0.21±0.33	0.63		
VC L					
Control	3.18±0.91	0.25±0.46	0.55	0.00 [−0.07–0.07]	0.00
Intervention	3.22±0.91	0.24±0.46	0.53		
6MWD m					
Control	420.1±115.1	83.99±65.76	1.28	1.59 [−7.94–11.12]	0.02
Intervention	425.2±113.7	85.30±62.80	1.36		
SGRQ-Total					
Control	50.79±17.8	−10.50±13.22	−0.80	1.57 [−0.44–3.59]	0.12
Intervention	51.32±17.5	−9.42±13.44	−0.70		
CAT					
Control	20.27±7.23	−3.42±5.85	−0.59	−0.09 [−0.96–0.76]	−0.02
Intervention	20.83±7.45	−3.76±5.76	−0.65		
CCQ-Total					
Control	2.85±1.15	−0.58±0.90	−0.65	0.01 [−0.12–0.15]	0.01
Intervention	2.94±1.16	−0.63±0.98	−0.64		
TDI T1					
Control[#]		4.60±3.01		−0.09 [−0.61–0.42]	−0.03
Intervention[¶]		4.57±3.17			

Data are presented as means±, unless otherwise stated. T1: after rehabilitation; T0: baseline; SRM: standardised response mean; AMD: adjusted mean difference between intervention group and control group (adjusted for baseline, maximal inspiratory pressure (P_{max}) baseline, sex, smoking status and Global Initiative for Chronic Obstructive Lung Disease stage); FIV1: forced inspiratory volume in 1 s; FEV1: forced expiratory volume in 1 s; VC: vital capacity; 6MWD: 6-min walk distance; SGRQ: St George's Respiratory Questionnaire; CAT: COPD Assessment Test; CCQ: Clinical COPD Questionnaire; TDI: transition dyspnoea index. #: n=268; ¶: n=225. Italic indicates p<0.05.

Amélioration significative de la PImax et FIV1 pour le groupe EMI

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

Résultats identiques selon la PImax

Randomised controlled trial of adjunctive inspiratory muscle training for patients with COPD

Noppawan Charususin,[1,2,3] Rik Gosselink,[1,2] Marc Decramer,[1] Heleen Demeyer,[1,2] Alison McConnell,[4] Didier Saey,[5] François Maltais,[5] Eric Derom,[6] Stefanie Vermeersch,[6] Yvonne F Heijdra,[7] Hanneke van Helvoort,[7] Linda Garms,[7] Tessa Schneeberger,[8] Klaus Ken

Thorax 2018;**73**:942–950.

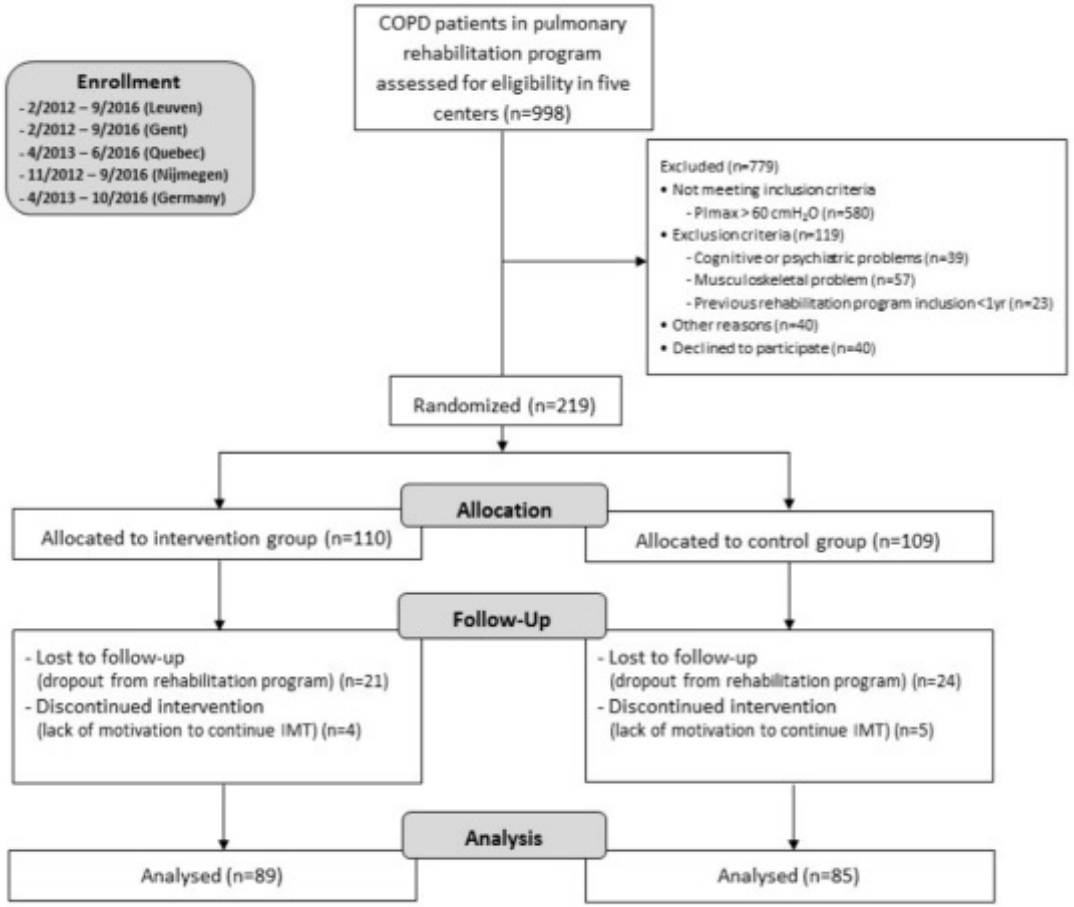


Figure 1 A diagram summarising the flow of participants through the study.

Table 2 Changes in exercise-related outcomes

Variables	Intervention group		Control group		Adjusted difference (95% CI) at post training	P values*
	Pre training	Post training	Pre training	Post training		
Functional exercise capacity						
6MWD (m)	353 (116)	388 (113)†	374 (102)	407 (105)†	0.3 (–13 to 14)	0.967
Dyspnoea post 6MWD	5.4 (2.2)	5.7 (2.3)	5.5 (2.2)	5.4 (2.1)	0.2 (–0.3 to 0.8)	0.400
Leg effort post 6MWD	4.2 (2.3)	4.3 (2.0)	4.3 (2.4)	4.4 (2.0)	–0.1 (–0.7 to 0.4)	0.630
Maximal exercise capacity						
Peak work rate (W)	54 (21)	64 (26)†	54 (20)	59 (22)†	5.2 (–0.4 to 10.8)	0.069
Peak VO_2 (mL/min)	1009 (310)	1048 (313)	909 (275)	966 (323)	0.01 (–0.09 to 0.11)	0.881
Peak V_E (L/min)	36 (11)	37 (11)	38 (12)	39 (15)	–0.5 (–3.4 to 2.3)	0.703
Dyspnoea post CPET	6.7 (2.6)	6.3 (2.7)	5.9 (2.3)	6.4 (2.1)	–0.5 (–1.4 to 0.5)	0.324
Leg effort post CPET	5.8 (2.9)	6.0 (2.4)	5.9 (2.2)	6.1 (2.1)	–0.1 (–1.0 to 0.8)	0.836
Endurance exercise capacity						
Work rate (W)	42 (16)		44 (18)			
Endurance cycle time (s)	271 (126)	496 (309)†	303 (163)	466 (292)†	75 (1 to 149)	0.048
Dyspnoea post cycle test	6.1 (2.2)	6.0 (2.1)	6.1 (2.2)	5.9 (2.3)	–0.3 (–1.0 to 0.4)	0.405
Leg effort post cycle test	6.0 (1.9)	5.2 (2.1)†	5.5 (2.3)	5.5 (2.3)	–0.4 (–1.2 to 0.3)	0.216
Dyspnoea score at isotime	6.1 (2.2)	3.7 (1.3)†	5.9 (2.0)	4.4 (1.9)†	–0.7 (–1.5 to –0.01)	0.049
Leg effort score at isotime	6.1 (1.9)	4.2 (1.7)†	4.9 (2.3)	4.5 (2.2)	–0.9 (–1.7 to 0.01)	0.052

Interpretation Improvements in respiratory muscle function after adjunctive IMT did not translate into additional improvements in 6MWD (primary outcome). Additional gains in endurance time and reductions in symptoms of dyspnoea were observed during an endurance cycling test (secondary outcome)

Les effets de l'entrainement des muscles inspiratoires

Received: 29 September 2017 | Revised: 13 February 2018 | Accepted: 4 April 2018

DOI: 10.1111/crj.12905

REVIEW ARTICLE

WILEY

Effects of inspiratory muscle training in COPD patients: A systematic review and meta-analysis

Marc Beaumont[1] | Patrice Forget[2] | Francis Couturaud[3] | Gregory Reychler[4,5,6]

Conclusion: IMT using threshold devices improves inspiratory muscle strength, exercise capacity and quality of life, decreases dyspnea. However, there is no added effect of IMT on dyspnea during PR (compared with PR alone).

L’entrainement des muscles inspiratoires avant chirurgie thoraco abdominale

- L’EMI en pré-opératoire diminue les complications pulmonaires post opératoires (Hulzebos et al. *JAMA. 2006;296:1851-1857 – Gomes Neto et al Clin Rehabil 2017;31(4):454-64)*
- L’EMI *en pré-opératoire améliore la force des muscles inspiratoires et la préserve en post opératoire (Kulkarni et al. Ann R Coll Surg Engl* 2010; **92**: 700–705)

L’entrainement des muscles inspiratoires avant chirurgie thoraco abdominale

Preoperative inspiratory muscle training for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery (Review)

Cochrane Library

Katsura M, Kuriyama A, Takeshima T, Fukuhara S, Furukawa TA

- 12 RCT , 695 patients
- Objectifs : effet EMI sur complications post opératoires (atélectasie, pneumopathie) et le temps d’hospitalisation

Preoperative inspiratory muscle training for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery (Review)

Katsura M, Kuriyama A, Takeshima T, Fukuhara S, Furukawa TA

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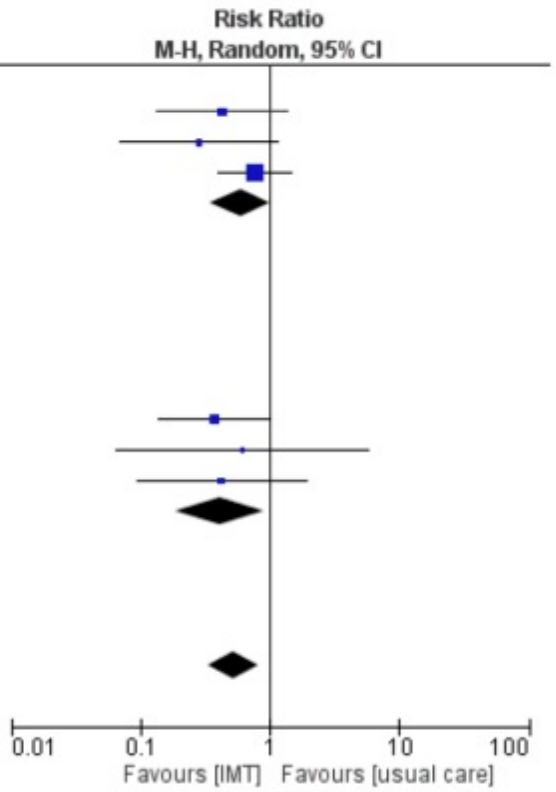
Figure 4. Forest plot of comparison: 1 Preoperative inspiratory muscle training (IMT) versus usual care, non-exercise intervention, outcome: 1.1 PPC; Atelectasis.

Study or Subgroup	IMT Events	IMT Total	usual care Events	usual care Total	Weight	Risk Ratio M-H, Random, 95% CI
1.1.1 cardiac surgery						
Carvalho 2011	3	16	7	16	14.2%	0.43 [0.13, 1.37]
Hulzebos 2006a	2	14	6	12	9.8%	0.29 [0.07, 1.16]
Hulzebos 2006b	14	139	18	137	44.4%	0.77 [0.40, 1.48]
Subtotal (95% CI)		**169**		**165**	**68.4%**	**0.59 [0.35, 1.00]**
Total events	19		31			
Heterogeneity: Tau² = 0.00; Chi² = 1.93, df = 2 (P = 0.38); I² = 0%						
Test for overall effect: Z = 1.95 (P = 0.05)						
1.1.2 major abdominal surgery						
Barbalho-Moulim 2011	0	15	0	17		Not estimable
Dronkers 2008	3	10	8	10	19.3%	0.38 [0.14, 1.02]
Heynen 2012	1	9	2	11	3.8%	0.61 [0.07, 5.70]
Soares 2013	2	18	5	19	8.4%	0.42 [0.09, 1.91]
Subtotal (95% CI)		**52**		**57**	**31.6%**	**0.41 [0.19, 0.90]**
Total events	6		15			
Heterogeneity: Tau² = 0.00; Chi² = 0.16, df = 2 (P = 0.92); I² = 0%						
Test for overall effect: Z = 2.24 (P = 0.03)						
Total (95% CI)		**221**		**222**	**100.0%**	**0.53 [0.34, 0.82]**
Total events	25		46			
Heterogeneity: Tau² = 0.00; Chi² = 2.66, df = 5 (P = 0.75); I² = 0%						
Test for overall effect: Z = 2.87 (P = 0.004)						
Test for subgroup differences: Chi² = 0.57, df = 1 (P = 0.45), I² = 0%						



Preoperative inspiratory muscle training for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery (Review)

Katsura M, Kuriyama A, Takeshima T, Fukuhara S, Furukawa TA

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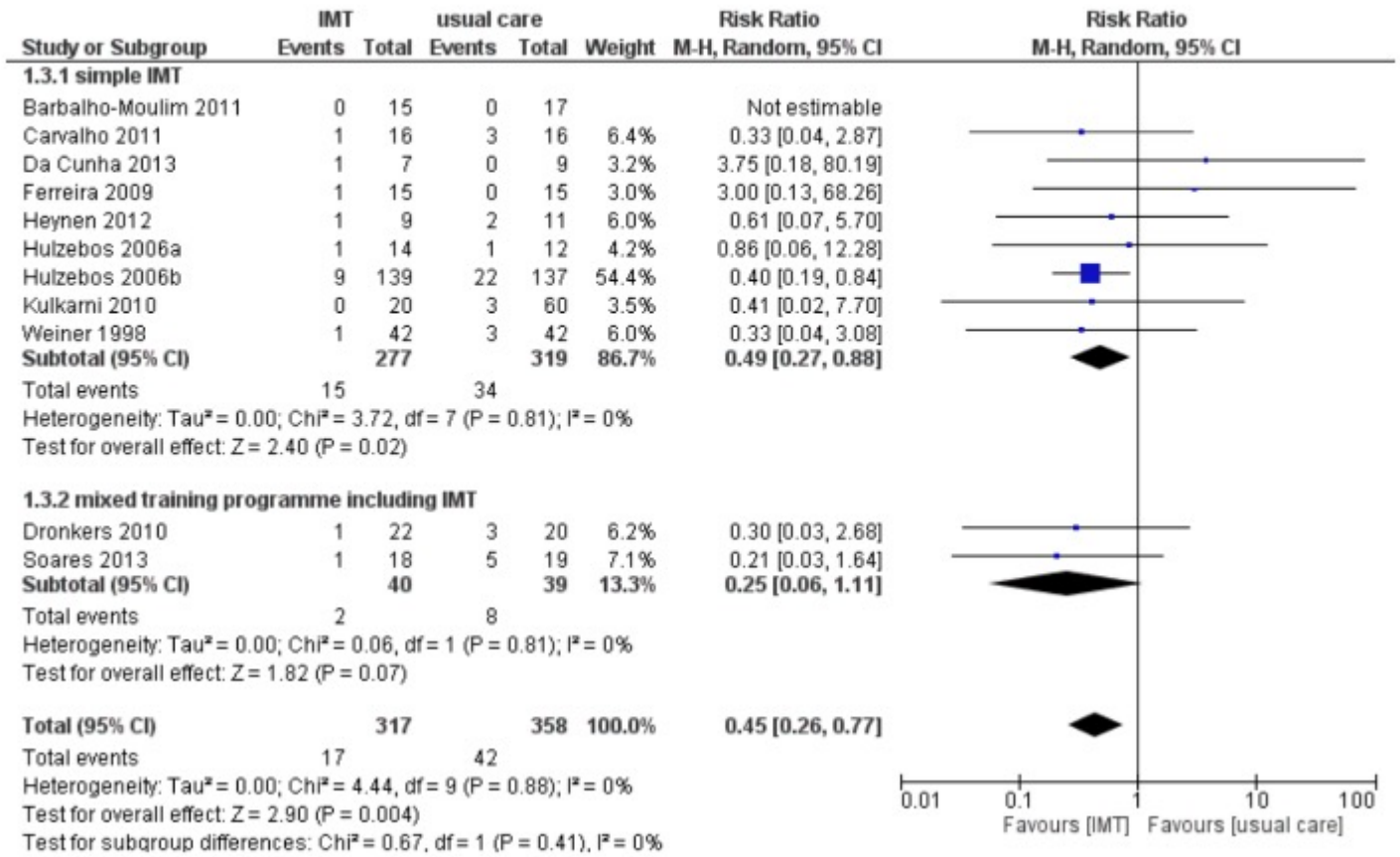
Figure 6. Forest plot of comparison: 1 Preoperative inspiratory muscle training (IMT) versus usual care, non-exercise intervention, outcome: 1.3 PPC; Pneumonia (Type of intervention).



Preoperative inspiratory muscle training for postoperative pulmonary complications in adults undergoing cardiac and major abdominal surgery (Review)

Katsura M, Kuriyama A, Takeshima T, Fukuhara S, Furukawa TA

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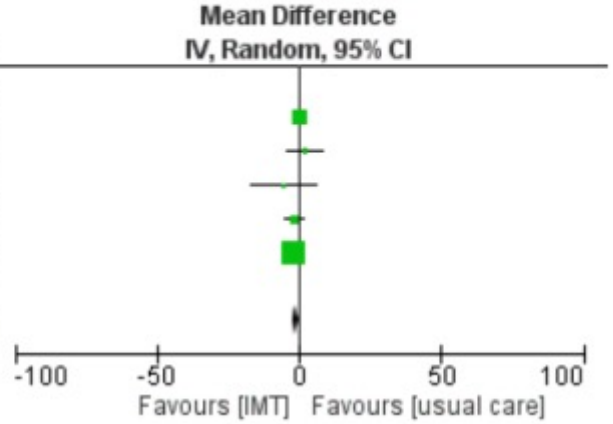
Figure 7. Forest plot of comparison: 1 Preoperative inspiratory muscle training (IMT) versus usual care, non-exercise intervention, outcome: 1.8 Duration of hospital stay.

	IMT			usual care				Mean Difference
Study or Subgroup	Mean	SD	Total	Mean	SD	Total	Weight	IV, Random, 95% CI
Barbalho-Moulim 2011	2	0	15	2.11	0.33	17		Not estimable
Carvalho 2011	8	3.1	16	8	2.9	16	29.2%	0.00 [-2.08, 2.08]
Da Cunha 2013	9	4.9	7	7	7.6	9	3.7%	2.00 [-4.15, 8.15]
Dronkers 2010	16.2	11.5	22	21.6	23.7	20	1.1%	-5.40 [-16.84, 6.04]
Hulzebos 2006a	7.93	1.94	14	9.92	5.78	12	11.7%	-1.99 [-5.41, 1.43]
Hulzebos 2006b	7.89	2.17	139	9.94	8.27	137	54.3%	-2.05 [-3.48, -0.62]
Total (95% CI)			**213**			**211**	**100.0%**	**-1.33 [-2.53, -0.13]**

Heterogeneity: Tau² = 0.16; Chi² = 4.29, df = 4 (P = 0.37); I² = 7%
Test for overall effect: Z = 2.17 (P = 0.03)



L’entrainement des muscles inspiratoires chez des patients obèses

- L’EMI améliore la PI max et la capacité à l’exercice, tech intéressante pour démarrer un réentrainement à l’exercice (Edwards et al. Journal of Obesity 2012)

- L’EMI améliore la capacité à l’exercice et la dyspnée dans le cadre d’un programme d’activité physique et d’amaigrissement (Villiot Danger et al. Int J Obes (Lond). 2011;35(5):692-9)

L’entrainement des muscles inspiratoires dans les fibroses

- IMT dans fibroses très peu étudié
- Peu d’ECR (4 dont 2 avec RR)
- Etudes observationnelles plutôt encourageantes
- Les auteurs rapportent qu’il est difficile de conclure quant à l’intérêt ou non de l’EMI dans les fibroses

L’entrainement des muscles inspiratoires dans les bronchectasies

- ECR incluant 45 patients, programme pdt 8 semaines, 3fois / semaine
- G IMT: 70% Pimax, séance en IT :2’ IMT, 1’ repos, pendant 21’
- G contrôle : 10% Pimax
- Résultats:
  - Amélioration significative PI et PE max, ISWT, Leicester Cough Q(social) comparativement au GC

L’entrainement des muscles inspiratoires dans la mucoviscidose

2 revues Cochrane (Hilton et Solis-Moya 2018) (Stanford et al 2020)

- 9 RCT (dont 4 publiés sous forme d’abstracts) / 10 RCT
- Hétérogénéité +++ des études (intensité, durée, fréquence)
- Impossibilité de suggérer bénéfices ou non

L’entrainement des muscles inspiratoires dans l’asthme

Inspiratory muscle training for asthma (Review)

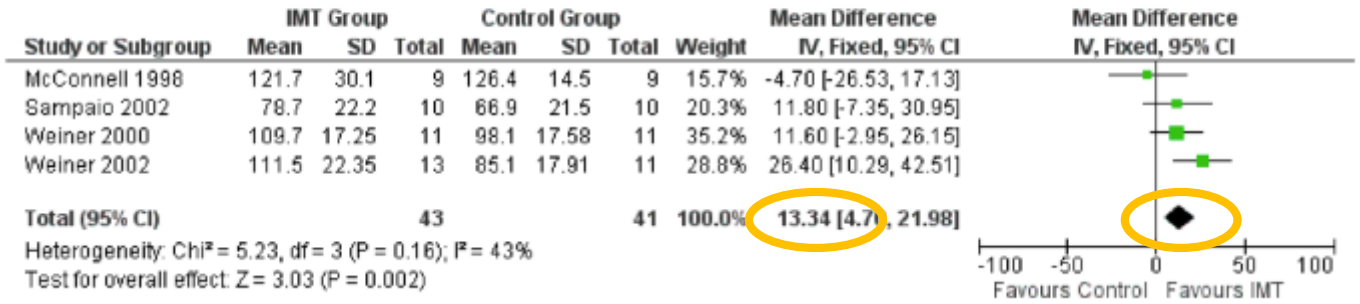
Silva IS, Fregonezi GAF, Dias FAL, Ribeiro CTD, Guerra RO, Ferreira GMH

Cochrane Database Syst Rev. 2013 Sep 8;2013(9):CD003792

L'entrainement des muscles inspiratoires dans l'asthme

- augmentation de la force

Figure 3. Forest plot of comparison: 1 Inspiratory muscle training versus Control, outcome: 1.1 PImax - cmH2O.



- impact sur les exacerbations non évalué

Primary outcome: exacerbations requiring a course of oral or inhaled corticosteroids or emergency department visits

These outcomes were not reported.

L’entrainement des muscles inspiratoires dans l’asthme

Original Article

CLINICAL REHABILITATION

Clinical Rehabilitation
1–17
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Efficacy of inspiratory muscle training on inspiratory muscle function, functional capacity, and quality of life in patients with asthma: A randomized controlled trial

Susan Martins Lage[1,2], Danielle Aparecida Gomes Pereira[3], Anna Luísa Corradi Magalhães Nepomuceno[4], Anna Cláudia de Castro[5], Augusto Gonçalves Araújo[6], Mariana Hoffman[1,7], Bruna Mara Franco Silveira[1] and Verônica Franco Parreira[1]

- ECR, 39 patients
- EMI 5/s, 8 s, 2 sessions/j : 3 cycles de 30 inspi / session, 50% Pimax
- Résultats:
  - Différence significative pour force et endurance des muscles inspi
  - Pas de différence significative entre les 2 groupes pour capacité à l’exercice (ISWT) et QDV

L’entrainement des muscles inspiratoires dans le sport

International Journal of *Environmental Research and Public Health*

MDPI

Review

Inspiratory Muscle Training in Intermittent Sports Modalities: A Systematic Review

Juan Lorca-Santiago [1], Sergio L. Jiménez [1,*], Helios Pareja-Galeano [1] and Alberto Lorenzo [2]

Effects of inspiratory muscle training intensity on cardiovascular control in amateur cyclists

Raphael Martins de Abreu[1], Alberto Porta[2,3], Patricia Rehder-Santos[1], Beatrice Cairo[3], Claudio Donisete da Silva[1], Étore De Favari Signini[1], Camila Akemi Sakaguchi[1], Aparecida Maria Catai[1]

Article

Effects of 4-Week Inspiratory Muscle Training on Sport Performance in College 800-Meter Track Runners

Yun-Chi Chang [1,2], Hsiao-Yun Chang [3], Chien-Chang Ho [2,4], Po-Fu Lee [2,5], Yi-Chen Chou [6], Mei-Wun Tsai [1] and Li-Wei Chou [1,*]

Eur J Appl Physiol (2010) 108:505–511
DOI 10.1007/s00421-009-1228-x

ORIGINAL ARTICLE

Inspiratory muscle training improves 100 and 200 m swimming performance

Andrew E. Kilding · Sarah Brown · Alison K. McConnell

Effect of Inspiratory Muscle Training on Performance of Handball Athletes

by
Charlini S. Hartz[1], Márcio A. G. Sindorf[1], Charles R. Lopes[1,2], José Batista[1], Marlene A. Moreno[1]

Research in Sports Medicine, 21:264–279, 2013

ISSN: 1543-8627 print/1543-8635 online
DOI: 10.1080/15438627.2013.792090

Routledge
Taylor & Francis Group

Inspiratory and Expiratory Respiratory Muscle Training as an Adjunct to Concurrent Strength and Endurance Training Provides No Additional 2000 m Performance Benefits to Rowers

Journal of Bodywork & Movement Therapies 23 (2019) 452–455

Contents lists available at ScienceDirect

Journal of Bodywork & Movement Therapies

journal homepage: www.elsevier.com/jbmt

ELSEVIER

Observational Study

Inspiratory muscle training improves performance of a repeated sprints ability test in professional soccer players

Rodrigo Luis Cavalcante Silva [a], Elliott Hall [b], Alex Souto Maior [a, *]

[a] UNISUAM (Augusto Motta University Center), Brazil
[b] School of Sport and Exercise Sciences, Liverpool John Moores University, UK

L’entrainement des muscles inspiratoires dans le sport

- Globalement effets positifs sur performance, sensation de pénibilité
- Effets dans sports avec effort en intermittence (Foot, Basket, sprint)
- Effets dans sports d’endurance
- Utilisé à priori dans sport de haut niveau
- EMI à haute intensité

Conclusion

- EMI à utiliser de manière systématique en pré-opératoire de chir thoraco abdominale ++++

- Intéressant
  - Chez les patients obèses
  - Dans la BPCO :
    - EMI intéressant si force objectivement altérée (patients plus répondeurs si PI max < 60cm H_2O)
    - Bénéfices clairs pour amélioration de la force et endurance des muscles inspirateurs, capacité à l'exercice, dyspnée… si isolé…
    - Bénéfices plus nuancés si associé à un programme de réhabilitation

- A étudier davantage mais prometteur dans les fibroses et les bronchectasies

Merci de votre attention