Place de la rééducation au cours du syndrome d'apnées du sommeil?

21ème Congrès de Pneumologue de Langue Française

J-C Borel[1,2,3],, M Lebret[1,2], M Mendelson[1] , J-L Pépin[1,3] F Sériès[4]

1 HP2 Inserm U1042, 38- La Tronche, France
2 AGIR*àdom*, Meylan, France
3 Laboratoire EFCR-Sommeil, CHU Grenoble
4 CRIUCPQ, Université Laval, Quebec Qc, Québec, Canada

J.borel@agiradom.com
JCBorel@chu-grenoble.fr

Liens d’intérêts

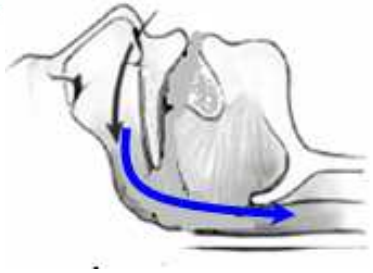
-AGIR à dom. (employé)

- Philips-Healthcare (financement études; conférencier)

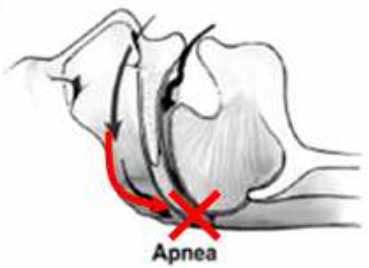
- RESMED (financement congrès; conférencier)

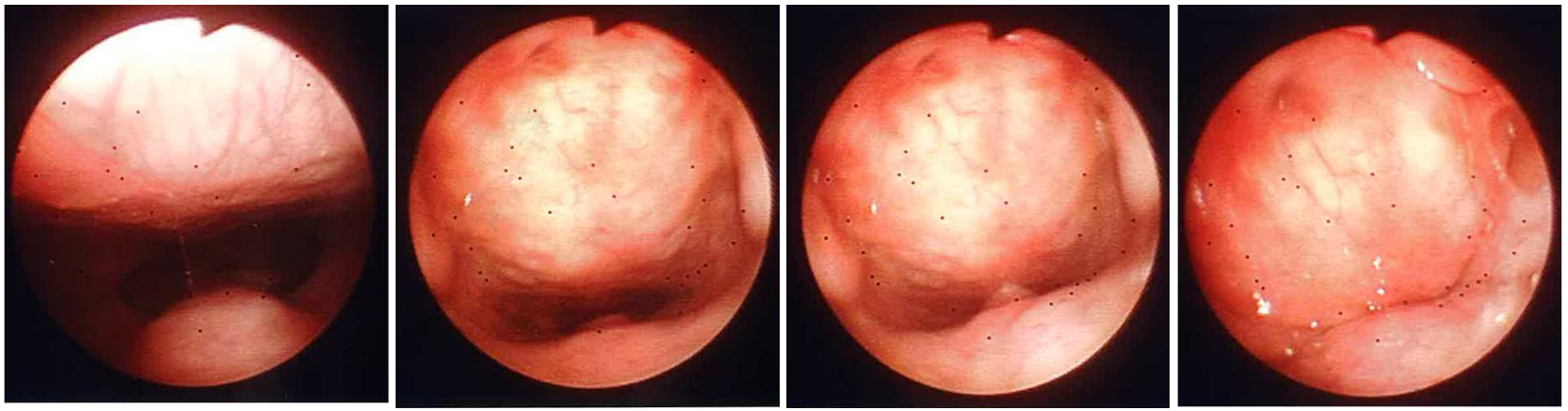
- NOMICS-SA (Brevet déposé)

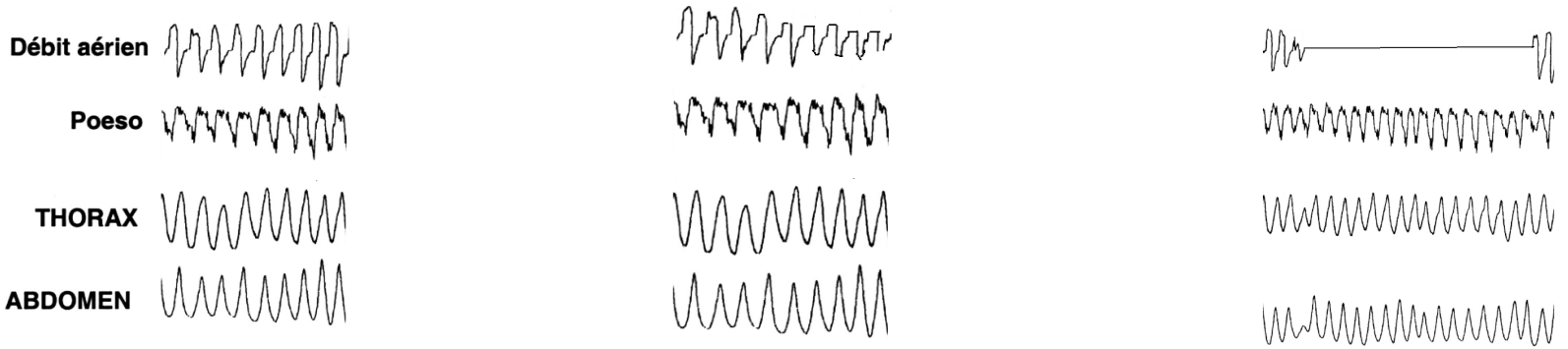
Syndrome d'apnées obstructives du sommeil (SAOS)

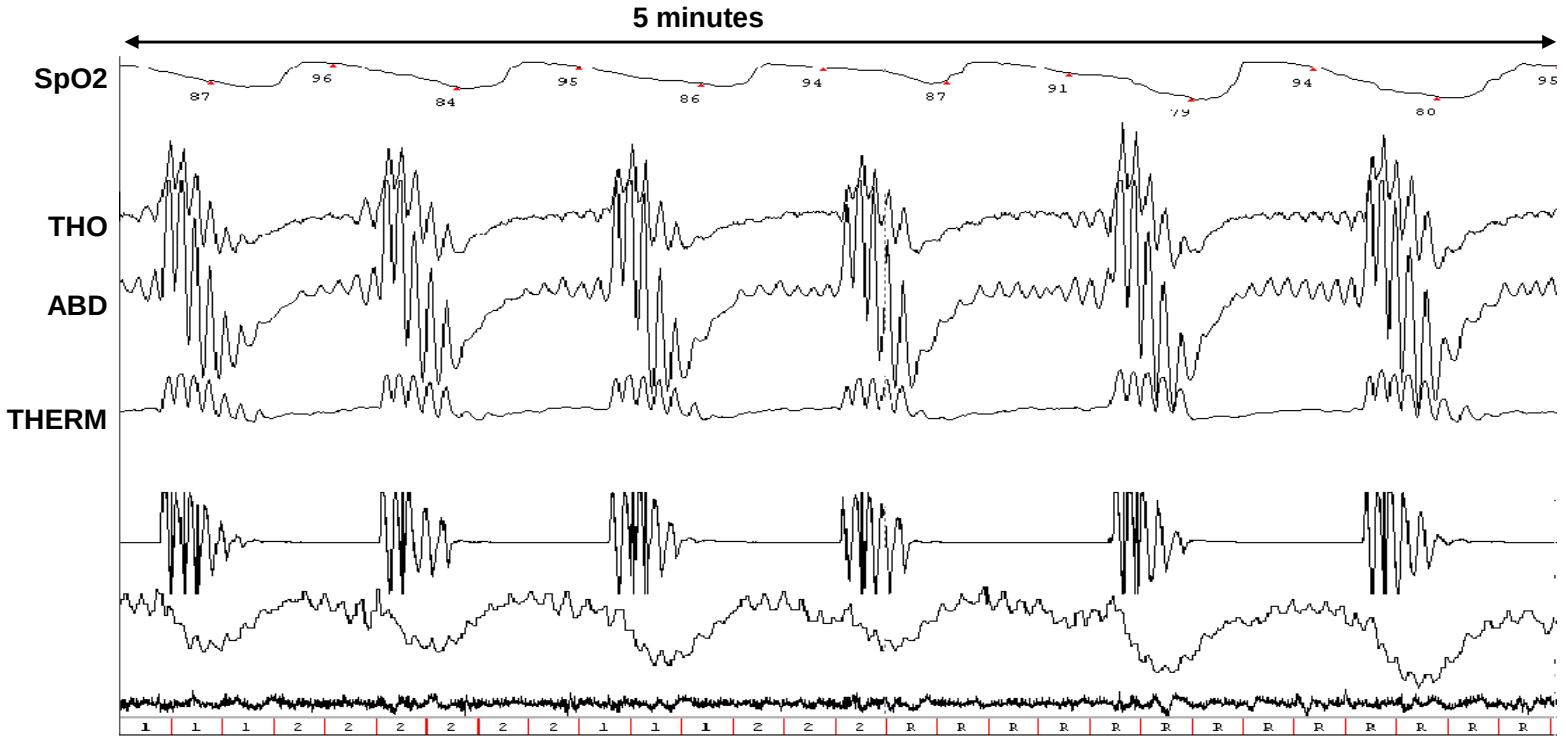


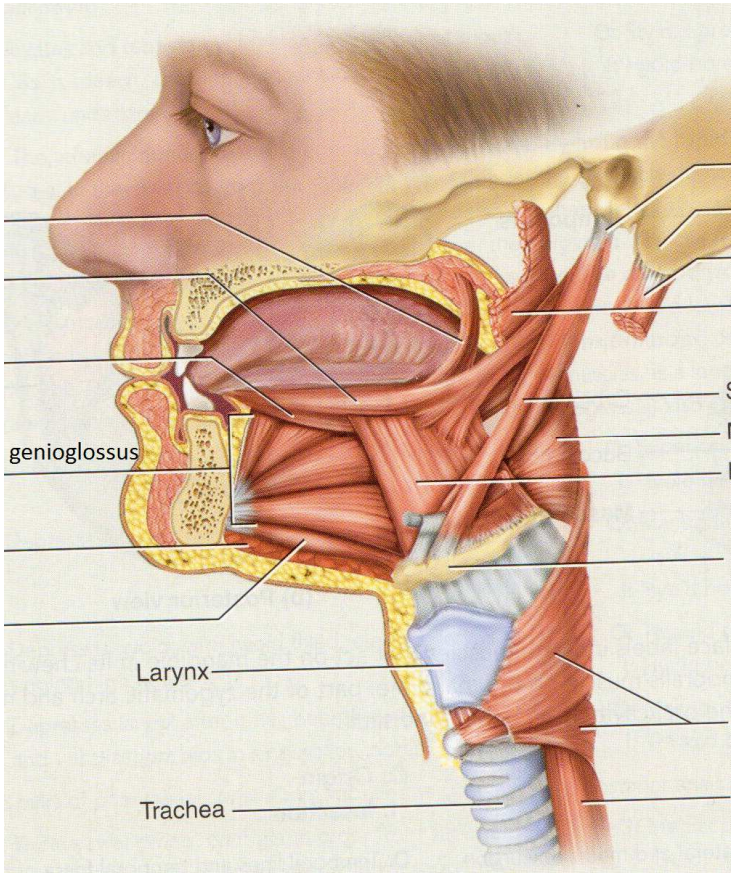
Anterieur

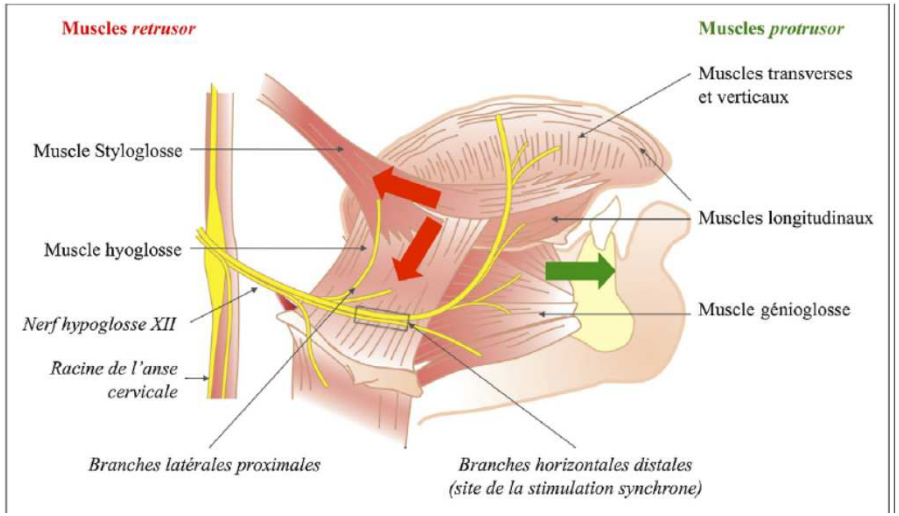




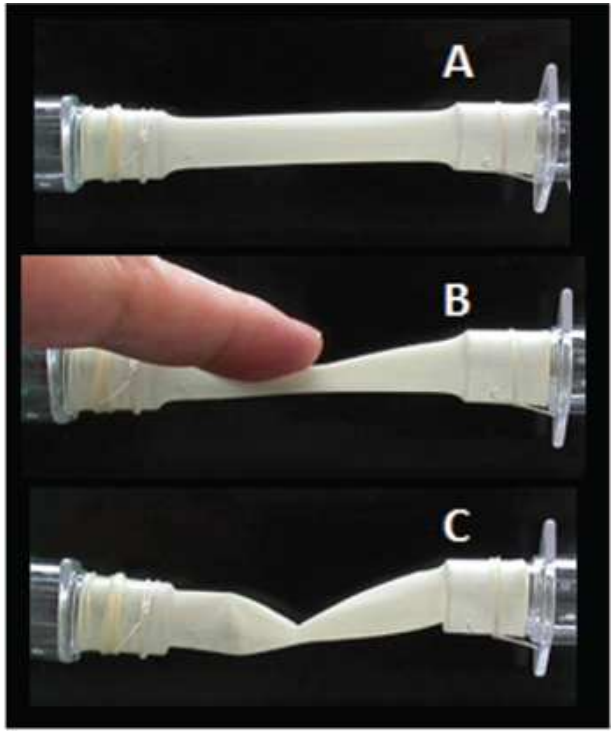


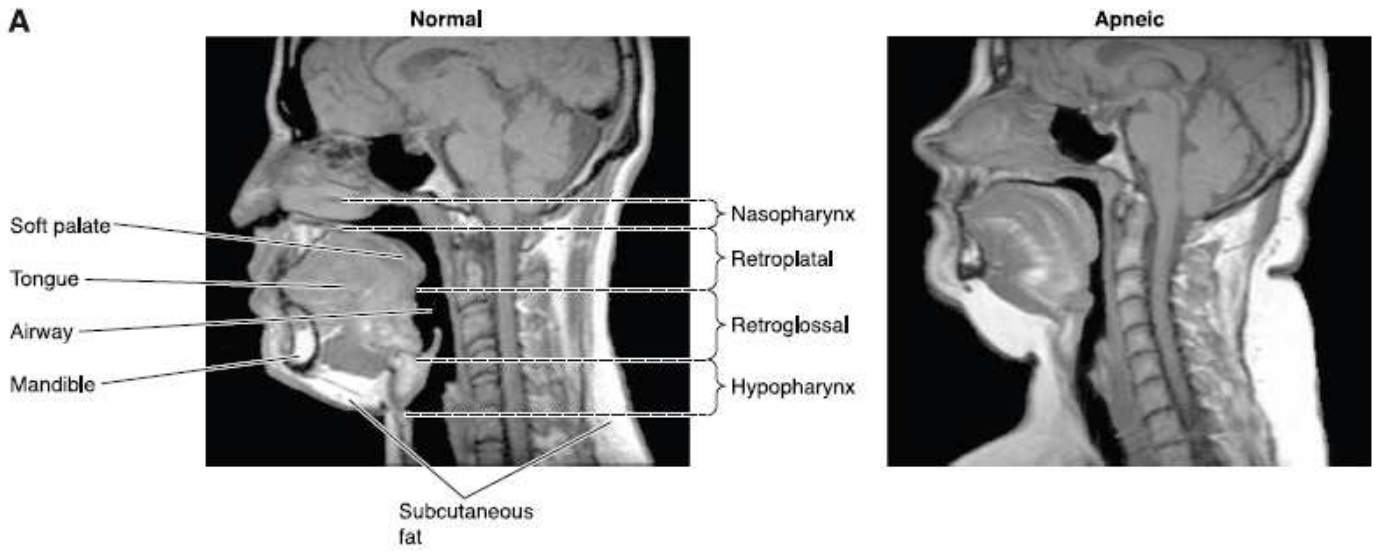

5 minutes
SpO2
87
96
84
95
86
94
87
91
79
94
80
95
THO
ABD
THERM

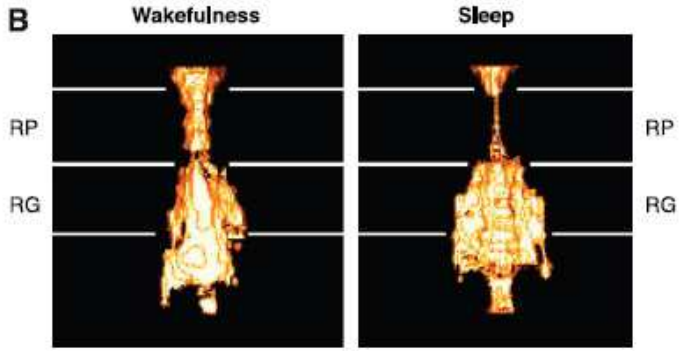

genioglossus
Larynx
Trachea

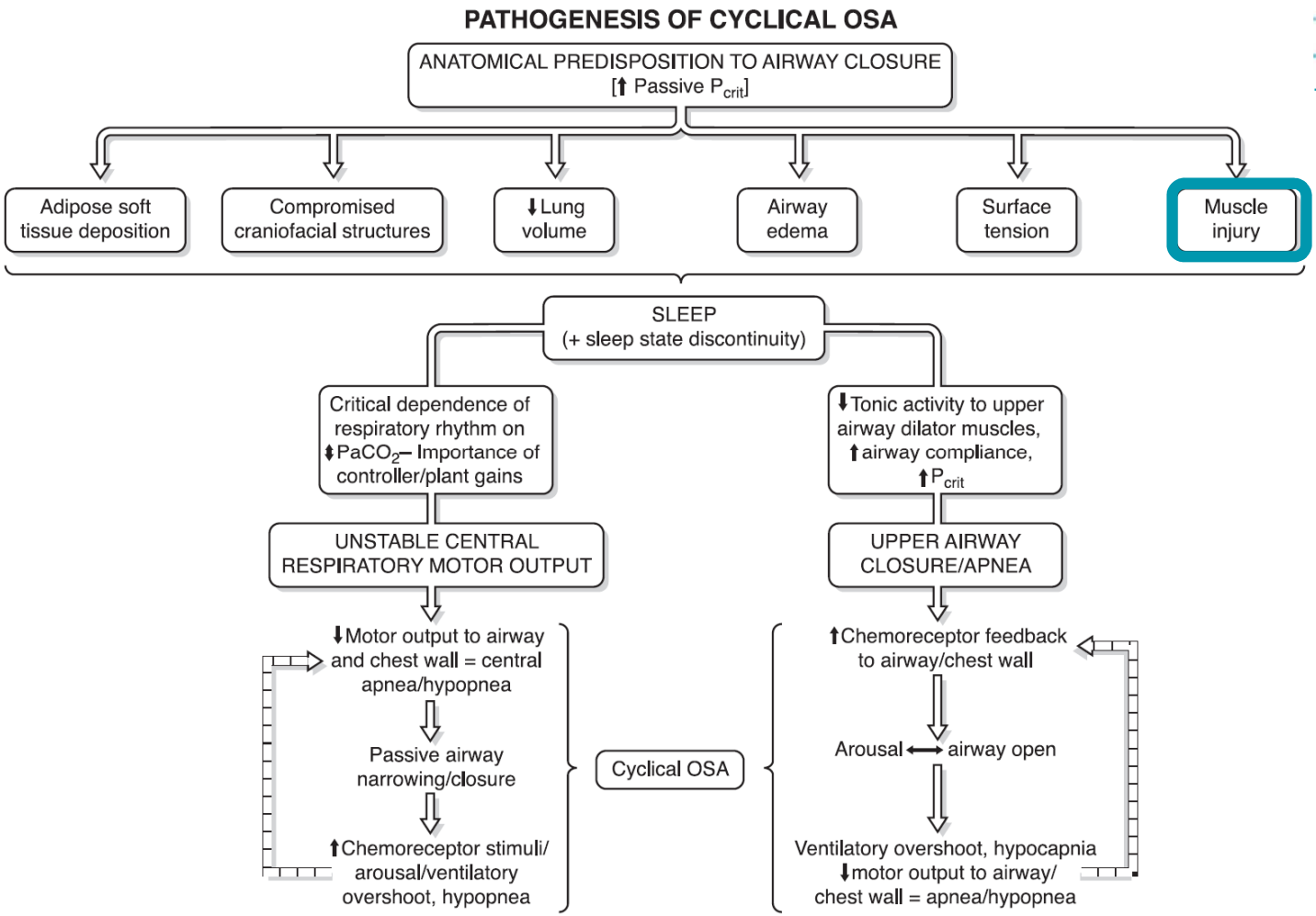

Muscles retrusor
Muscles protrusor
Muscles transverses et verticaux
Muscle Styloglosse
Muscles longitudinaux
Muscle hyoglosse
Muscle génioglosse
Nerf hypoglosse XII
Racine de l'anse cervicale
Branches latérales proximales
Branches horizontales distales
(site de la stimulation synchrone)

Mécanismes du collapsus pharyngé




A
Normal
Apneic
Soft palate
Tongue
Airway
Mandible
Nasopharynx
Retroplatal
Retroglossal
Hypopharynx
Subcutaneous fat

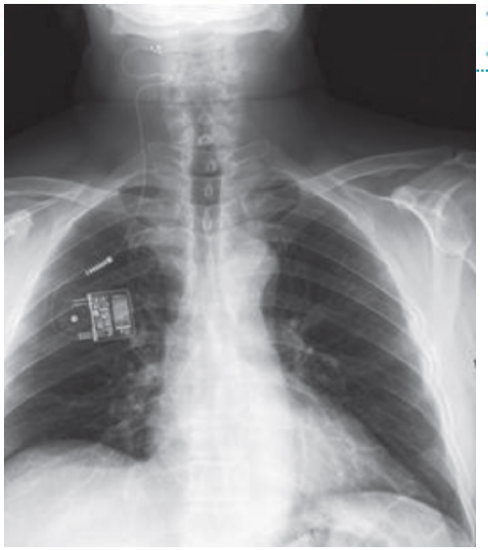

B
Wakefulness
Sleep
RP
RG
RP
RG



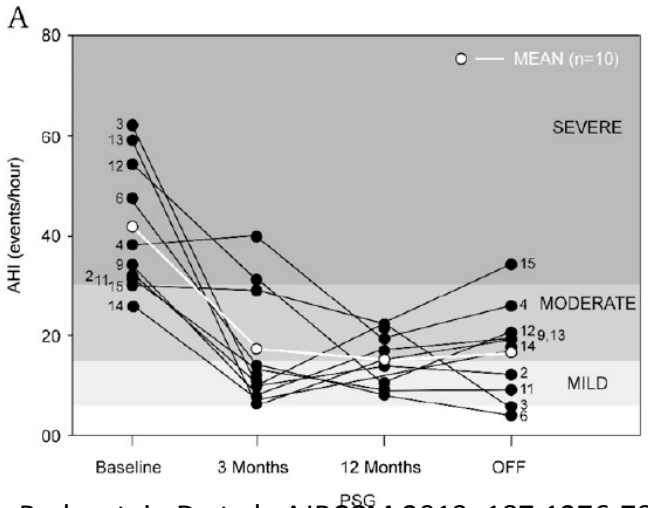
Dempsey J Physiol Rev 2010

Augmentation de l'activation musculaire réduit SAOS

- Tonus des muscles des VAS rôle primordial dans le maintien de l'ouverture des voies aériennes supérieures
- Développement de stratégies pour manipuler l'activité musculaire VAS (Electro-stim)
- Effet rémanent d'une activation tonique au long cours : hypothèse d'une modification pathogénique
  - Amélioration efficacité musculaire
  - Coordination

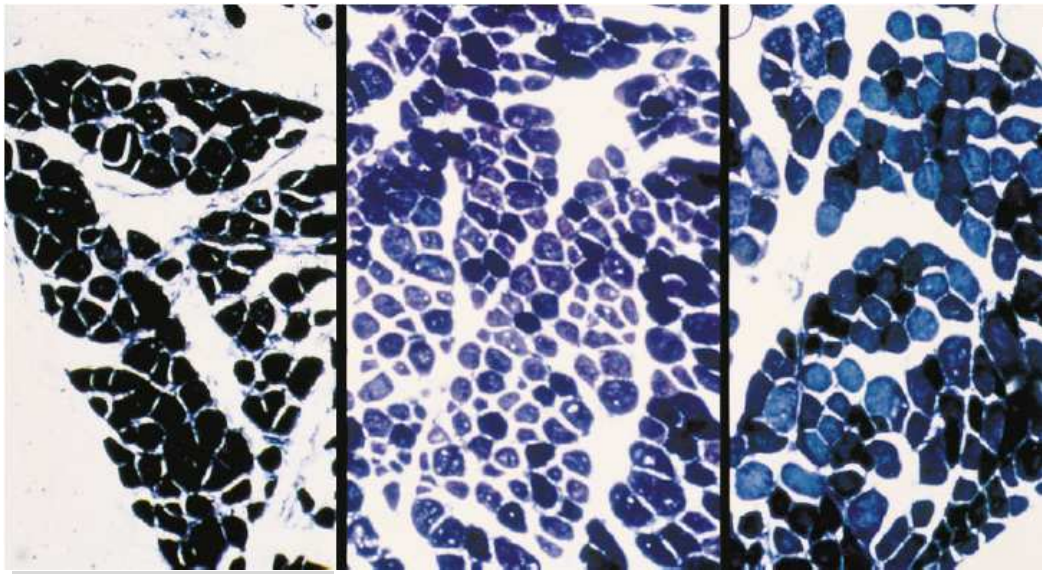


Mwenge G et al. Eur Resp J 2013; 41:360-7

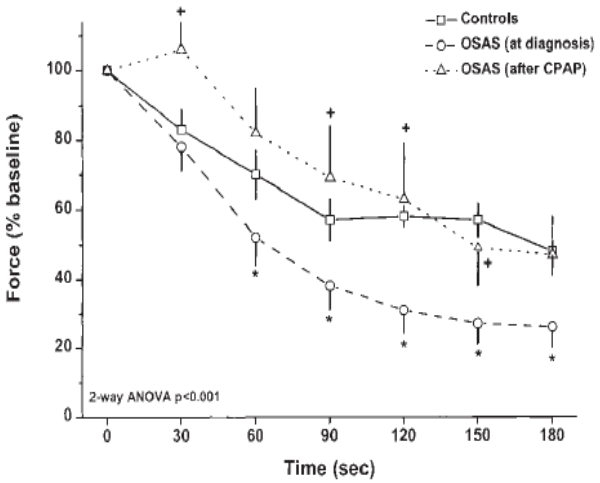


Rodenstein D et al. AJRCCM 2013; 187:1276-78

Activation musculaire ≠ Efficacité musculaire

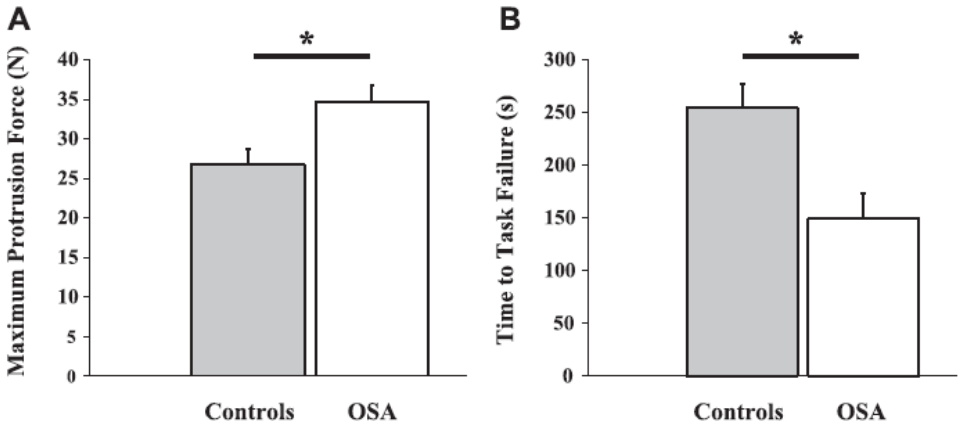


Contrôles	OSAS	OSAS +CPAP (1 an)
%Type 2 39 ±4%	% Type 2 =59 ± 4	%Type 2 40 ±3%



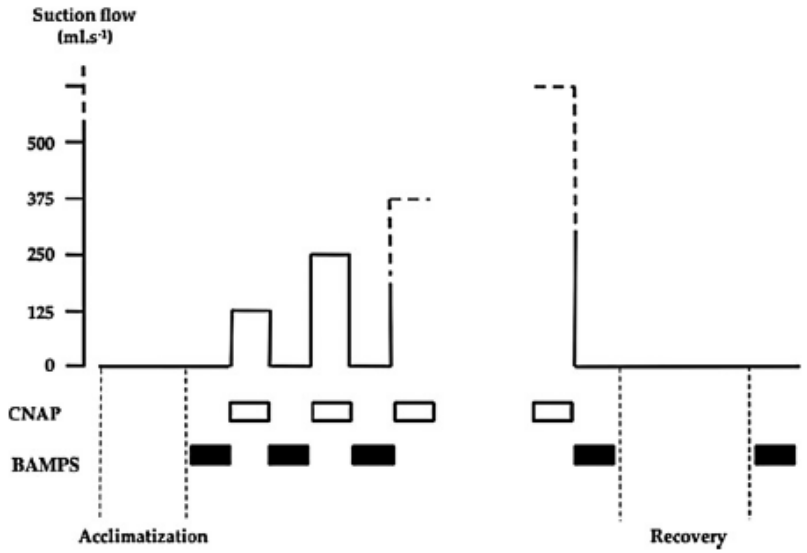
Carrera M et al. AJRCCM 1999; 159:1960-1966

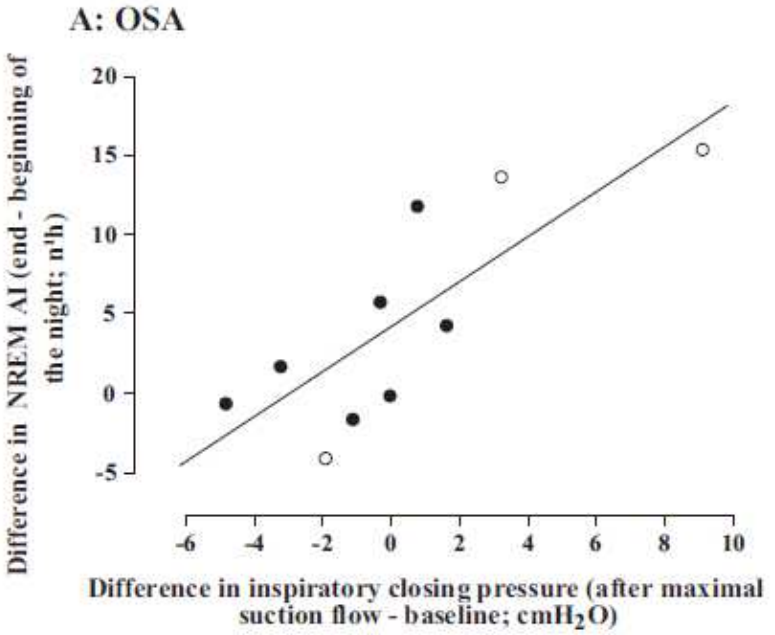
Fatigabilité musculaire, une caractéristique importante des muscles des VAS chez le sujet SAOS



Eckert D et al. JAP 2011; 111:1643-54

Fatigabilité musculaire et aggravation AIH au cours de la nuit





Gakwaya S et al. Resp Physiol neurobiol ;181:88–94.

Une activité importante des muscles des voies aériennes supérieures peut-elle réduire le risque de SAOS?

Table 2
Results of the multivariable model predicting a high risk of OSA based on the Berlin questionnaire

	Odds ratio (95% Confidence interval)
Age	1.39 (1.09, 1.78)
BMI	3.24 (2.60, 4.03)
Female[a]	0.56 (0.40, 0.77)
Wind player[b]	1.12 (0.82, 1.54)

[a] Referent group: male.
[b] Referent group: all non-wind players (strings, percussion, keyboard).

	Beta (SE)	Standardised beta
(Constant)	101.27 (5.00)	
Gender	−8.52* (1.41)	−0.38
Age	−0.16* (0.07)	−0.15
BMI	−0.73* (0.19)	−0.24
Type of instrument	1.48 (1.41)	0.06

25.8 h per week (SD = 8.8)

Brawn D et al. Sleep Med 2009;10:657-660

Wardrop P et al. Clin Otolaryngol. 2011;36:134-8

Une activité importante des muscles des voies aériennes supérieures peut-elle réduire le risque de SAOS?

Instrument à anche double (hautbois, basson cor anglais..~~orgue~~)

Table 2—Binary logistic regression predicting high risk of OSA according to the Berlin Questionnaire

Predictor	B	Wald's χ^2	df	p	Odds Ratio	95% CI
Years Playing	0.001	0.010	1	0.921	1.001	0.981 – 1.022
Hours Playing / Week	-0.014	3.256	1	0.071	0.986	0.970 – 1.001
Gender	-0.313	3.355	1	0.067	0.732	0.524 – 1.022
Age	0.016	2.162	1	0.141	1.016	0.995 – 1.038
Double Reed[a]	-0.676	3.949	1	0.047*	0.508	0.261 – 0.991
Single Reed[a]	-0.195	0.912	1	0.340	0.823	0.774 – 1.904
High Brass[a]	0.194	0.711	1	0.399	1.214	0.552 – 1.227
Low Brass[a]	0.101	0.182	1	0.670	1.106	0.696 – 1.757
Test		χ^2	df	p		
Overall Model Evaluation		30.456	8	> 0.001*		
Goodness-of-Fit Test						
Hosmer & Lemeshow		7.745	8	0.459		

[a]Comparison group is non-wind instrumentalist. *p < 0.05.

Ward C et al. Clin Sleep Med 2012;8:251-255

Une rééducation des VAS peut-elle améliorer l'efficacité mécanique et/ou réduire la fatigue au cours du SAOS?

8 semaines (5*20'/semaines)

Table 2 Effects of intervention on sleep related outcomes

Outcome	Didgeridoo group	Control group	Raw difference* (95% CI)	Adjusted difference† (95% CI)
Epworth scale				
At 4 months	7.4 (2.3)	9.6 (6.0)		
Change from baseline	−4.4 (3.7)	−1.4 (2.6)	−3.0 (−5.7 to −0.3), P=0.03	−2.8 (−5.4 to −0.2), P=0.04
Pittsburgh quality of sleep index				
At 4 months	4.3 (2.1)	5.6 (2.7)		
Change from baseline	−0.9 (1.6)	−0.2 (1.7)	−0.7 (−2.1 to 0.6), P=0.27	−0.8 (−2.3 to 0.8), P=0.30
Partner rating of sleep disturbance				
At 4 months	2.3 (1.4)	4.8 (2.2)		
Change from baseline	−3.4 (2.4)	−0.6 (1.9)	−2.8 (−4.7 to −0.9), P<0.01	−2.7 (−4.2 to −1.2), P<0.01
Apnoea-hypopnoea index				
At 4 months	11.6 (8.1)	15.4 (9.8)		
Change from baseline	−10.7 (7.7)	−4.5 (6.9)	−6.2 (−12.3 to −0.1), P=0.05	−6.6 (−13.3 to −0.1), P=0.05

SAOS modéré, non obèse

« One of the challenges in the ttt of OSAS is poor compliance. New ttts need to motivate enough to be used… »

Puhan M et al. BMJ 2006. DOI 10.1136/bmj38705.470590.55

Une rééducation des VAS peut-elle améliorer l'efficacité mécanique et/ou réduire la fatigue au cours du SAOS?

- **Design (RCT)**
- **SAOS modérés 15<IAH<30 (n=39)**
- **3 mois 30min quotidiennes**
- **Series exercices oropharyngés (langue, palais mou, piliers pharynx)**
- **Groupe contrôle: Lavage nez; 1 séance/semaine inspi profonde + recommandation 30'/j**
- **8 patients exclus (3 actifs vs 5 contrôles)… (20%)**

Guimaraes K, AJRCCM 2009. 179: 962-966

Un rééducation des VAS peut-elle améliorer l'efficacité mécanique et/ou réduire la fatigue au cours du SAOS?

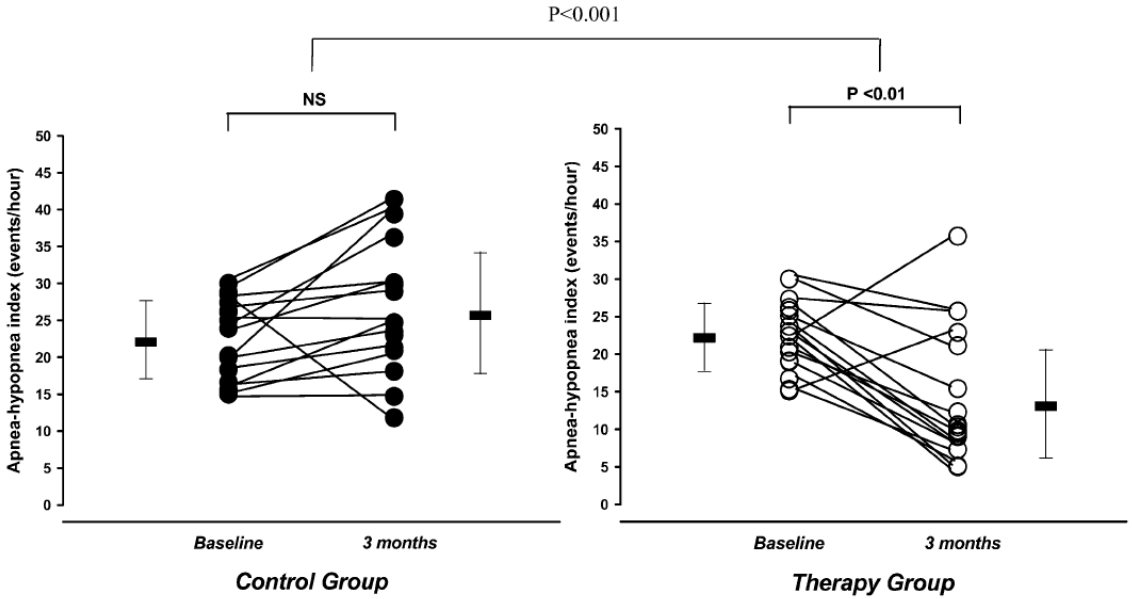


Figure 1. Individual values for apnea-hypopnea index (AHI). In the control group, the AHI from baseline to 3 months (from 22.4 ± 5.4 to 25.9 ± 8.5 events/h) was similar. In contrast, the AHI significantly decreased in the group randomized to oropharyngeal exercises (from 22.4 ± 4.8 to 13.7 ± 8.5 events/h; $P < 0.01$). The differences between groups remained significant ($P < 0.001$). Short horizontal lines and bars are mean ± SD. NS = not significant.

Guimaraes K, AJRCCM 2009. 179: 962-966

Une rééducation des VAS peut-elle améliorer l'efficacité mécanique et/ou réduire la fatigue au cours du SAOS?

*Simplification de la procédure de rééd (3*8')*

TABLE 2] Demographic Characteristics, Questionnaires, and Polysomnographic and Snore Characteristics of the Patients Assigned to Control or Oropharyngeal Therapy on Basal and After 3 Mo

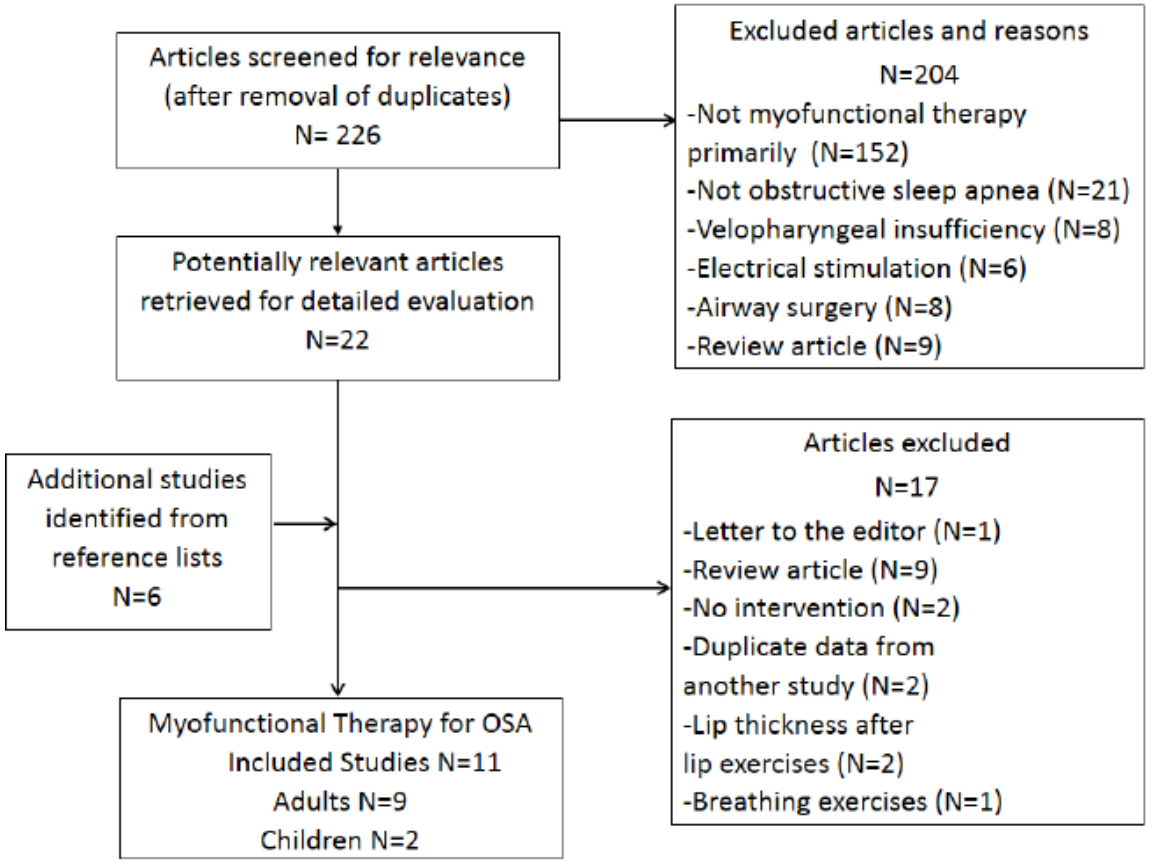
	Control Group (n = 20)			Therapy Group (n = 19)		
Measure	Baseline	3 mo	*P* Value	Baseline	3 mo	*P* Value
Demographic characteristics						
BMI, kg/m²	28.3 ± 2.5	28.2 ± 3.5	.453	28.1 ± 2.7	28.2 ± 2.8	.469
Neck circumference, cm	38.0 ± 3.5	37.9 ± 3.4	.628	37.9 ± 2.5	37.5 ± 2.4	.000[a]
Abdominal circumference, cm	94.3 ± 10.2	94.6 ± 10.4	.673	93.9 ± 5.7	93.7 ± 4.5	.687
Polysomnography						
TST, h	6.2 ± 0.6	6.2 ± 1.1	.894	6.1 ± 0.8	6.5 ± 0.9	.079
Sleep efficiency, %	84.4 ± 7.5	85.0 ± 11.1	.776	86.0 ± 9.7	86.3 ± 8.6	.825
Arousal index	15.3 ± 5.4	16.9 ± 5.2	.239	20.0 ± 10.2	6.2 ± 1.4	.077
Spo_2 min	85.1 ± 5.8	84.0 ± 7.6	.325	85.5 ± 7.5	83.8 ± 8.9	.120
Desaturation index	12.3 ± 8.7	12.1 ± 6.9	.881	10.8 ± 8.8	9.7 ± 6.0	.437
Questionnaires						
Patient						
Pittsburgh Sleep Quality Index	6.9 ± 3.4	6.4 ± 3.9	.459	6.0 ± 3.2	4.0 ± 2.6	.004
Epworth Sleepiness Scale	9.0 (7.0-13.5)	8.0 (3.5-12.5)	.190	7.0 (3.0-11.0)	7.0 (4.0-10.0)	.084
Subjective snore intensity	3.0 (2.0-4.0)	3.0 (2.0-3.0)	.083	2.0 (2.0-3.0)	2.0 (1.0-2.0)	.155
Subjective snore frequency	4.0 (3.0-4.0)	3.5 (2.0-4.0)	.010[a]	3.0 (2.0-4.0)	2.0 (1.0-4.0)	.030
Bed partner (control group [n = 12], therapy group [n = 13])						
Subjective snore intensity	3.5 (2.3-4.0)	3.0 (2.0-4.0)	.194	4.0 (2.5-4.0)	1.0 (1.0-2.0)	.003[a]
Subjective snore frequency	4.0 (3.0-4.0)	3.5 (3.0-4.0)	.180	4.0 (3.0-4.0)	2.0 (1.5-3.0)	.004[a]

Data are presented as mean ± SD or median (25%-75%). See Table 1 legend for expansion of abbreviations.
[a]*P* < .05 for the comparisons using repeated measures analysis of variance: compare the interaction between the two groups (control and therapy) and the two moments (baseline and after 3 mo).

Nécessité d'évaluer l'effet avec des critères de jugements adaptés (IFL, µ-arousals, ronflements)

Ieto V et al. Chest 2015. 148: 683-91

En synthèse, que peut-on attendre d'une prise en charge spécifique de rééducation des VAS?



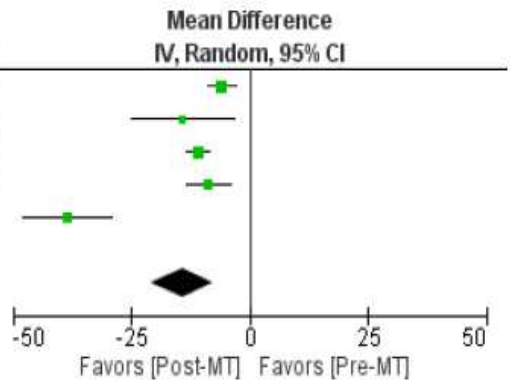
2 RCTs (43 patients…)
Total N=120 patients adultes…

Camacho M et al. SLEEP 2015;38:669–675

En synthèse, que peut-on attendre d'une prise en charge spécifique de rééducation des VAS?

Study or Subgroup	Post-Myofunctional Tx Mean	SD	Total	Pre-Myofunctional Tx Mean	SD	Total	Weight	Mean Difference IV, Random, 95% CI	Year
Suzuki 2013	9.2	1.5	6	15.1	3.4	6	23.3%	-5.90 [-8.87, -2.93]	2013
Diaferia 2013	13.9	18.5	27	28	22.7	27	14.7%	-14.10 [-25.15, -3.05]	2013
Baz 2012	11.5	5.4	30	22.3	4.5	30	23.7%	-10.80 [-13.32, -8.28]	2012
Guimaraes 2009	13.7	8.5	16	22.4	4.8	16	21.8%	-8.70 [-13.48, -3.92]	2009
Berreto 2007	6	3.7	2	44.5	5.7	2	16.5%	-38.50 [-47.92, -29.08]	2007
Total (95% CI)			**81**			**81**	**100.0%**	**-14.26 [-20.98, -7.54]**	

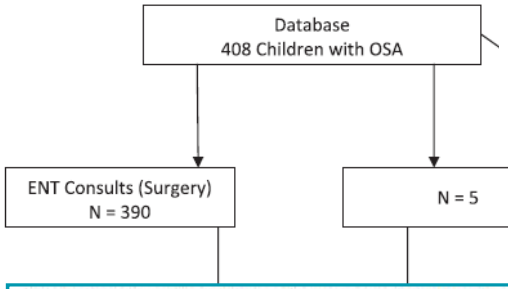
Heterogeneity: Tau² = 48.01; Chi² = 43.66, df = 4 (P < 0.00001); I² = 91%
Test for overall effect: Z = 4.16 (P < 0.0001)



50% réduction IAH, chez les sujets modérés

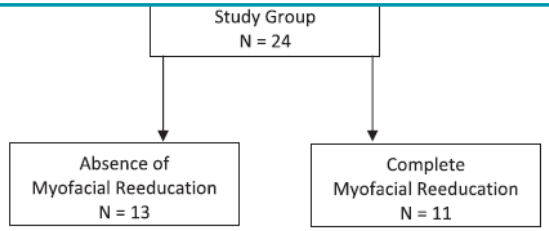
Camacho M et al. SLEEP 2015;38:669–675

Impact de la rééducation au long cours?



Sleep-disordered breathing documented with polysomnography.

	Entry	Post-AT	Postorthodontics	Follow-up study	
				No reeducation	Reeducation
No. of children (n)	24	23	24	13	11
Age (y)	5.5 ± 1.2	5.10 ± 1.3	7.3 ± 1.5	11.8 ± 1.4	11.5 ± 1.2
AHI (event/h)	10.5 ± 2.6	4.3 ± 1.6	0.4 ± 0.3	5.3 ± 1.5	0.5 ± 0.4*
Lowest SaO_2 (%)	90 ± 1.5	92 ± 1	95 ± 1	91 ± 1.8	96 ± 1**
Flow limitation (% TST)	-	-	10 ± 10	72 ± 14	5 ± 8***



Suivi au long cours 22-50 mois

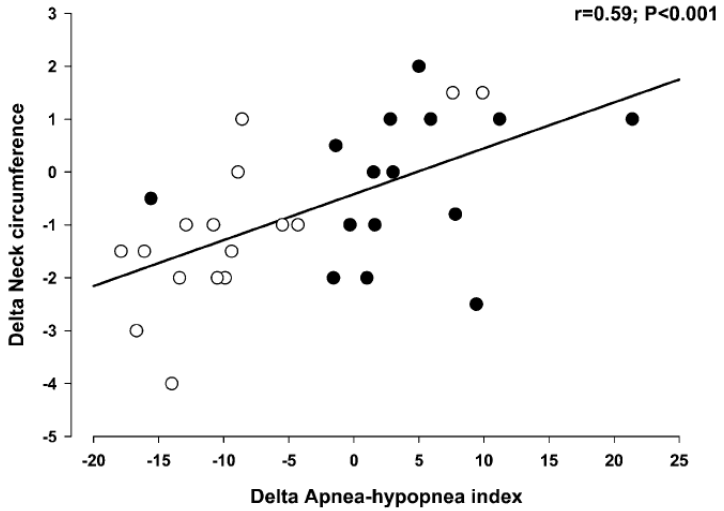
Guilleminaud C, Huang Y, Monteyrol P et al. Sleep Med 2013; 14:518-25

Quels sont les mécanismes impliqués dans l'amélioration de l'efficacité musculaire au cours du sommeil après un REE spécifique des µ VAS?

Remaniements anatomiques, histologiques?

TABLE 2. ANTHROPOMETRIC, SYMPTOM, AND SLEEP CHARACTERISTICS AT BASELINE AND AFTER 3 MONTHS OF RANDOMIZATION

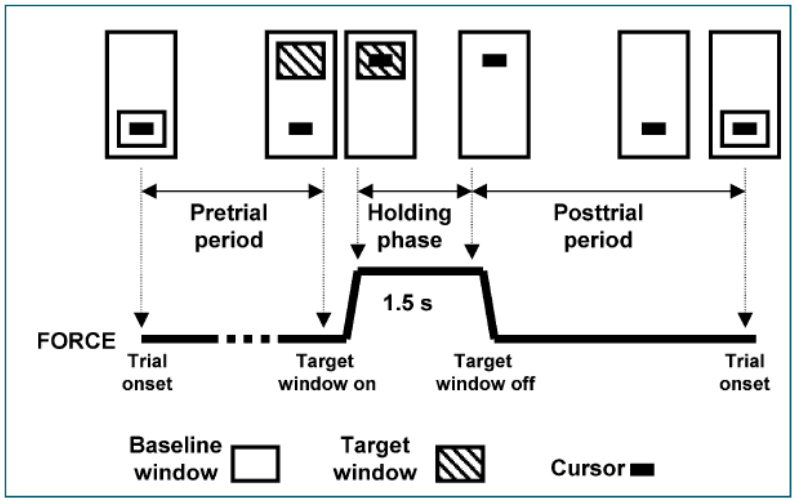
	Control (*N* = *15*)			Therapy (*N* = *16*)		
Variables	Baseline	3 mo	*P* Value	Baseline	3 mo	*P* Value
BMI, kg/m^2	31.0 ± 2.8	30.8 ± 3.0	0.34	29.6 ± 3.8	29.5 ± 4.3	0.65
Neck circumference, cm	40.9 ± 3.5	40.7 ± 3.7	0.53	39.6 ± 3.6	38.5 ± 4.0	0.01*
Abdominal circumference, cm	102.9 ± 7.3	102.3 ± 7.4	0.26	100.0 ± 10.4	98.9 ± 12.1	0.33

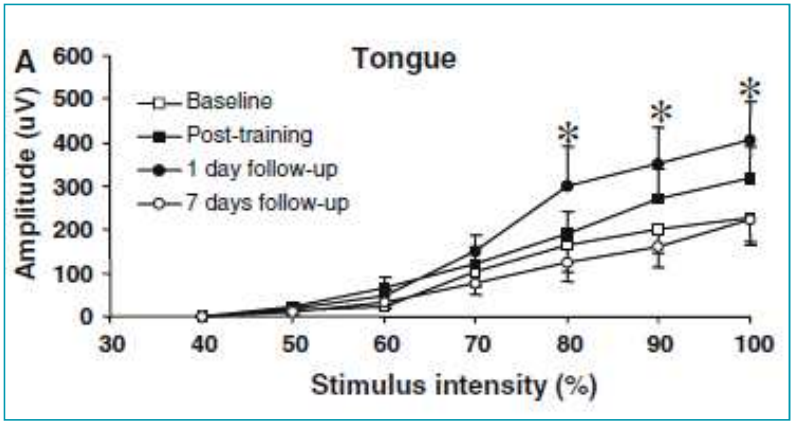


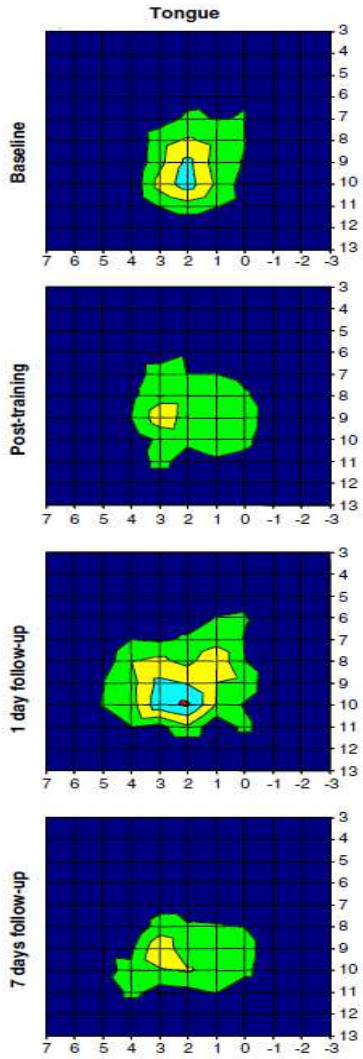
Guimaraes K, AJRCCM 2009. 179: 962-966

Quels sont les mécanismes impliqués dans l'amélioration de l'efficacité musculaire au cours du sommeil après un REE spécifique des μ VAS?

Modification du control cortico-moteur ?



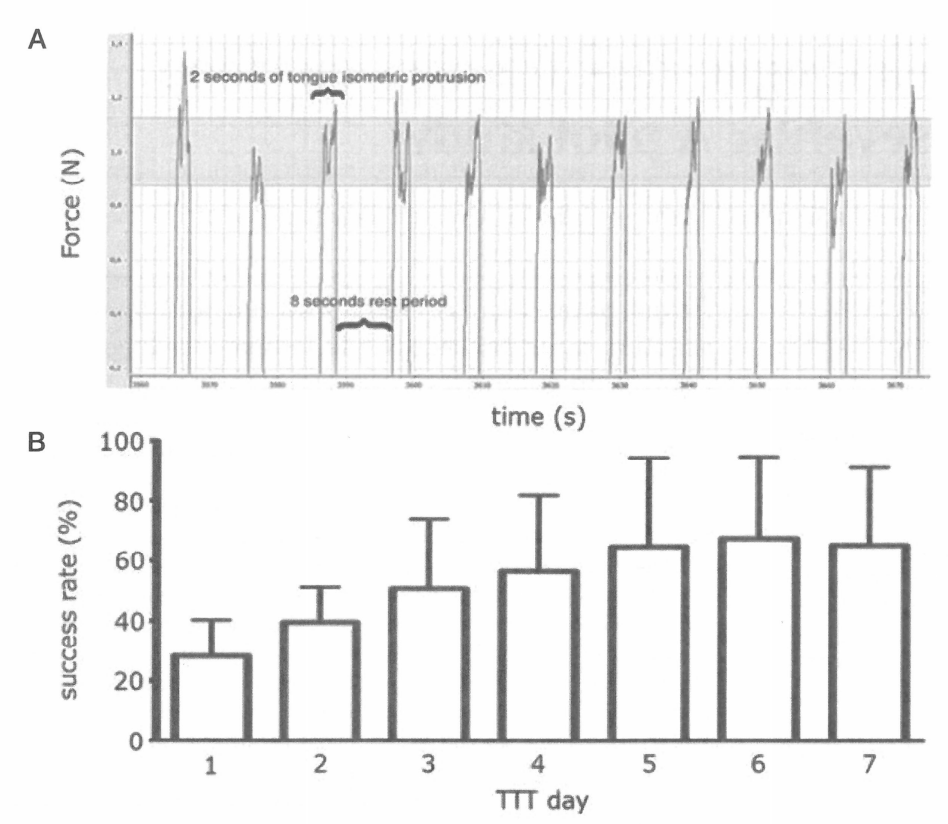


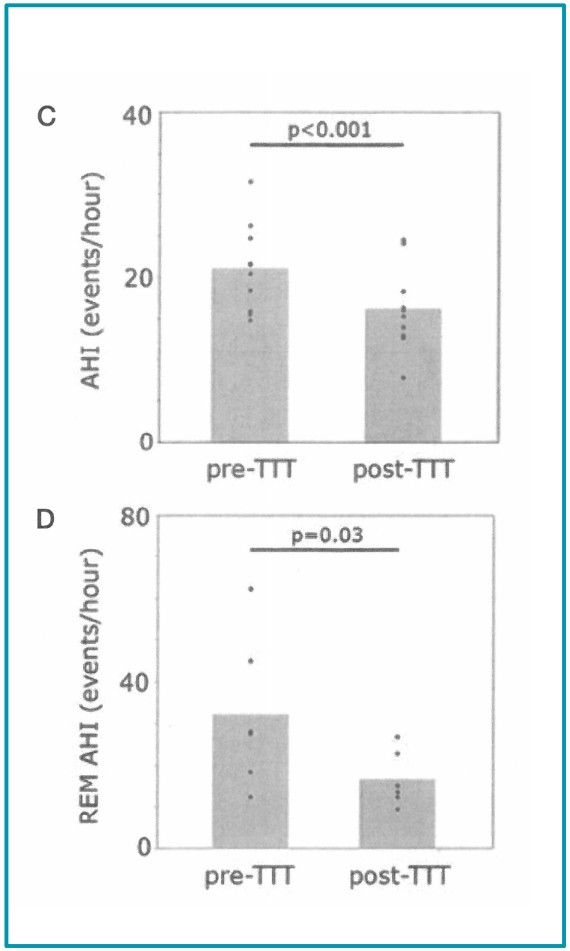


Svenson P, Exp Brain Res 2006; 173:165-173

Quels sont les mécanismes impliqués dans l'amélioration de l'efficacité musculaire au cours du sommeil après un REE spécifique des µ VAS?

Modification du control cortico-moteur ?





10 patients SAOS, 52±8 ans; BMI= 26.5±1.8; AIH= 20.9±5.3/h

1h/ jour pendant 7 jours.

Rousseau E , Can respir J. 2015;22: 176-78

Les dispositifs supports ?

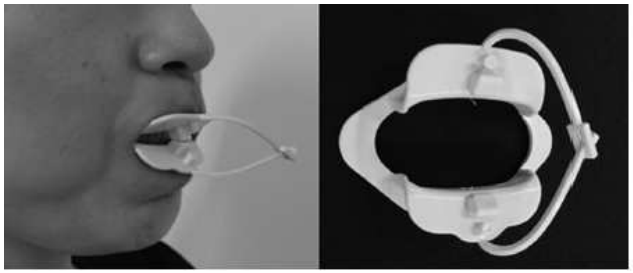
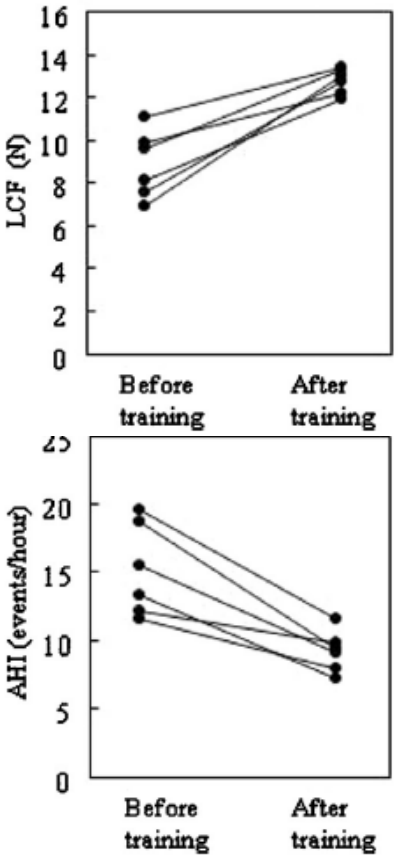


Fig. 1. Labial closure force training with Lip Trainer Patakara®. Insert the device between teeth and lips, close the lips without teeth contact, and then perform the lip-stretching movement.

Fig. 2. Measurement of labial closure force using the Lip De Cum®. Labial closure force was measured using the Lip De Cum®. With the Frankfurt plane parallel to the floor, the subjects, while seated upright, were asked to close their lips while separating the upper molars from the lower molars for 5 s.



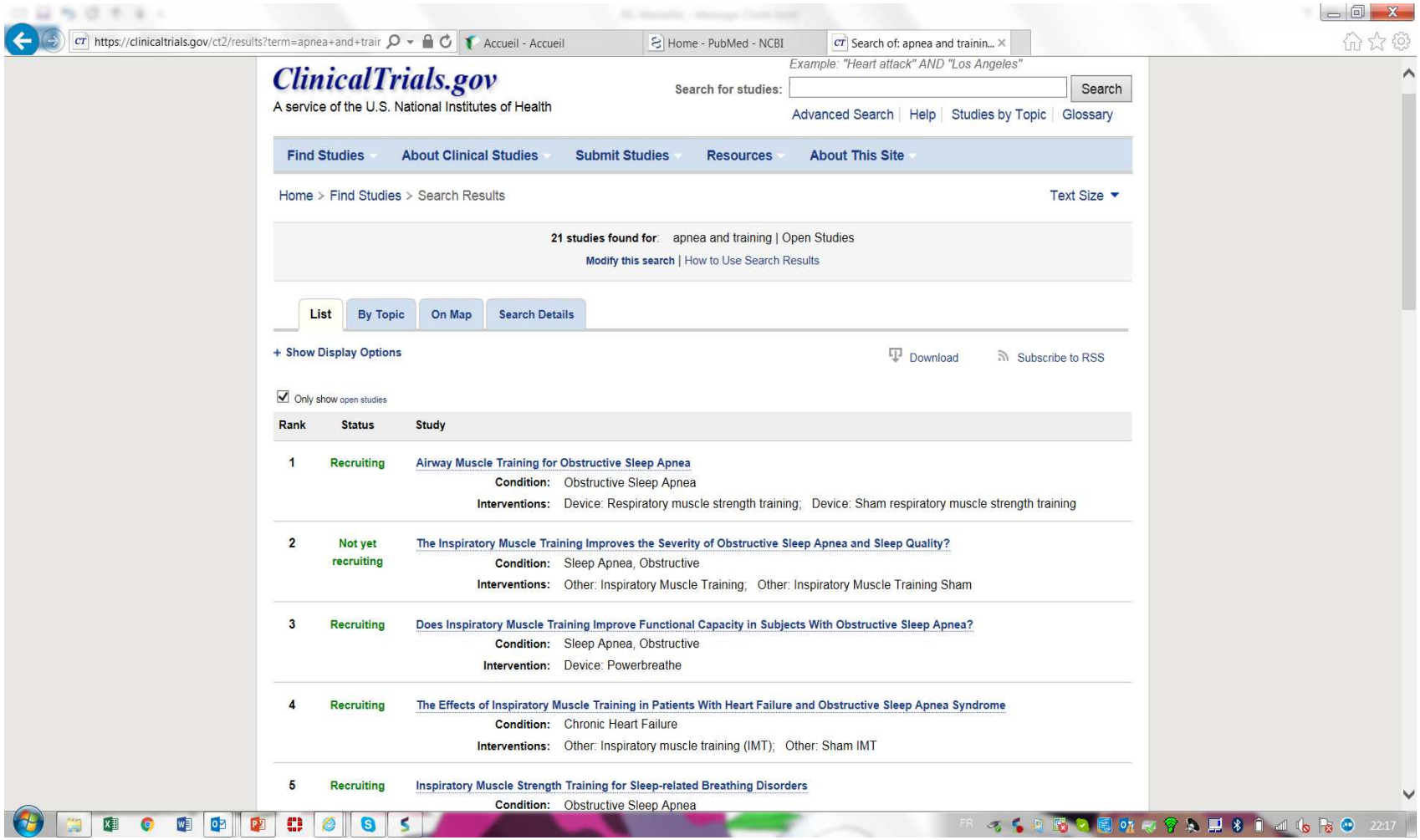
http://www.liptrainer.com/main/specifications.htm

Suzuki H et alJ Prosthodontic Research 2013. 57: 195-199

http://www.iopimedical.com/

Adams V et al. Dysphagia. 2013;28:350-69

Les éssais en cours…. (n=21)



https://clinicaltrials.gov/ct2/results?term=apnea+and+trair

Accueil - Accueil | Home - PubMed - NCBI | Search of: apnea and trainin...

ClinicalTrials.gov
A service of the U.S. National Institutes of Health

Example: "Heart attack" AND "Los Angeles"
Search for studies: Search
Advanced Search | Help | Studies by Topic | Glossary

Find Studies | About Clinical Studies | Submit Studies | Resources | About This Site

Home > Find Studies > Search Results — Text Size

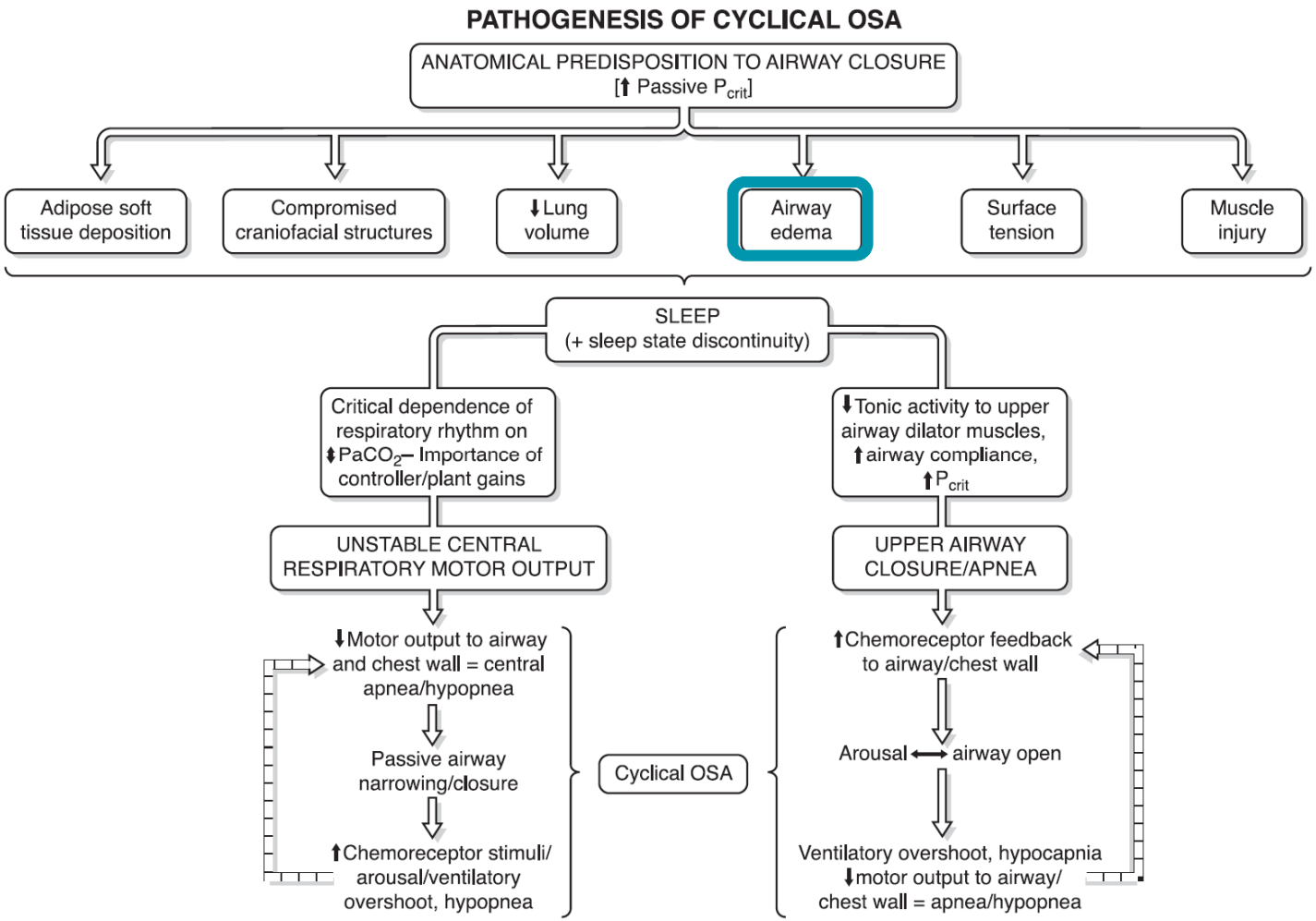
21 studies found for: apnea and training | Open Studies
Modify this search | How to Use Search Results

List | By Topic | On Map | Search Details

+ Show Display Options — Download — Subscribe to RSS

Only show open studies

Rank	Status	Study
1	Recruiting	Airway Muscle Training for Obstructive Sleep Apnea **Condition:** Obstructive Sleep Apnea **Interventions:** Device: Respiratory muscle strength training; Device: Sham respiratory muscle strength training
2	Not yet recruiting	The Inspiratory Muscle Training Improves the Severity of Obstructive Sleep Apnea and Sleep Quality? **Condition:** Sleep Apnea, Obstructive **Interventions:** Other: Inspiratory Muscle Training; Other: Inspiratory Muscle Training Sham
3	Recruiting	Does Inspiratory Muscle Training Improve Functional Capacity in Subjects With Obstructive Sleep Apnea? **Condition:** Sleep Apnea, Obstructive **Intervention:** Device: Powerbreathe
4	Recruiting	The Effects of Inspiratory Muscle Training in Patients With Heart Failure and Obstructive Sleep Apnea Syndrome **Condition:** Chronic Heart Failure **Interventions:** Other: Inspiratory muscle training (IMT); Other: Sham IMT
5	Recruiting	Inspiratory Muscle Strength Training for Sleep-related Breathing Disorders **Condition:** Obstructive Sleep Apnea



Dempsey J Physiol Rev 2010

Mécanismes: pression tissulaire péri-pharyngée: œdème…théorie du « fluid-shift »

Rétention hydrique

pourrait contribuer à

la physiopathologie

SAOS

Table 1. Prevalence of sleep apnoea in different populations

Population	Study	N	AHI	OSA prevalence (%)	CSA prevalence (%)
Community	Young (1993)	602	≥15	9 (M) 4 (F)	
	Duran (2001)	2148	≥15	14 (M) 7 (F)	
	Bixler (1998)*	741	≥20	6	0.5
Hypertension	Fletcher (1985)*	46	≥10	30	
	Worsnop (1998)†	34	≥10	23	
Drug-resistant hypertension	Logan (2001)	41	≥10	83	
	Pratt-Ubunama (2007)	71	≥10	65	
End-stage renal disease	de Oliveira Rodrigues (2005)	45	≥5	31	
	Jurado-Gamez (2007)	32	≥10	44	
Heart failure	Javaheri (2006)	100	≥15	12	37
	Yumino (2009)	218	≥15	26	21

White LH et Bradley D. J Physiol 2012

Mécanismes: pression tissulaire péri-pharyngée: œdème…théorie du « fluid-shift »

Accumulation fluides
dans territoires interstitiels et vasculaires dans les membres inférieurs en position verticale

Favorisée:
-Haute pression hydrostatique
-Etat inflammatoire
-Perméabilité augmentée

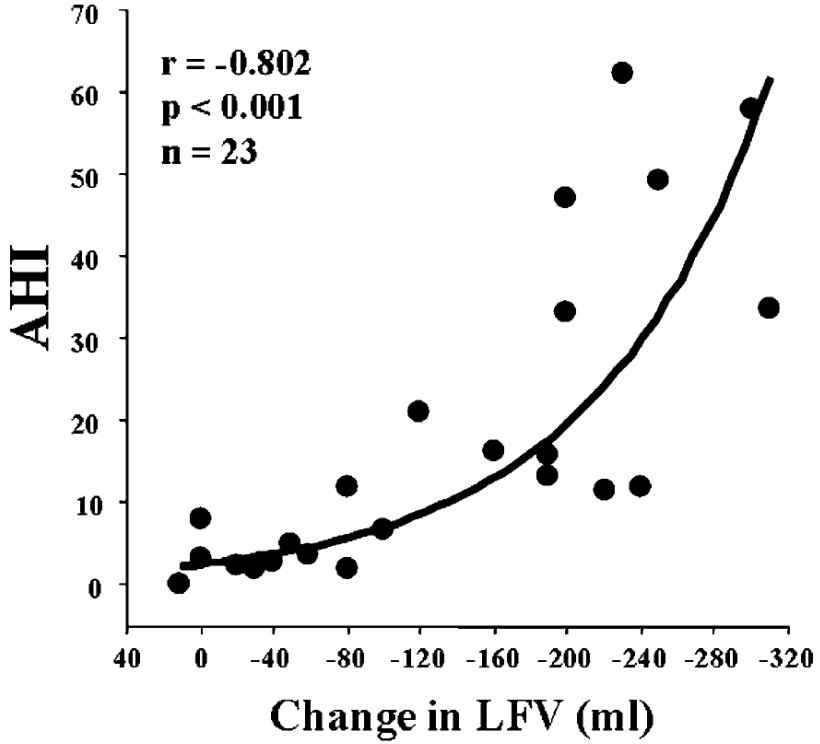
Redistribution rostrale
en position allongée
- Répartition pelvis- thorax-cou

Jour

Nuit

White LH et Bradley D. J Physiol 2012

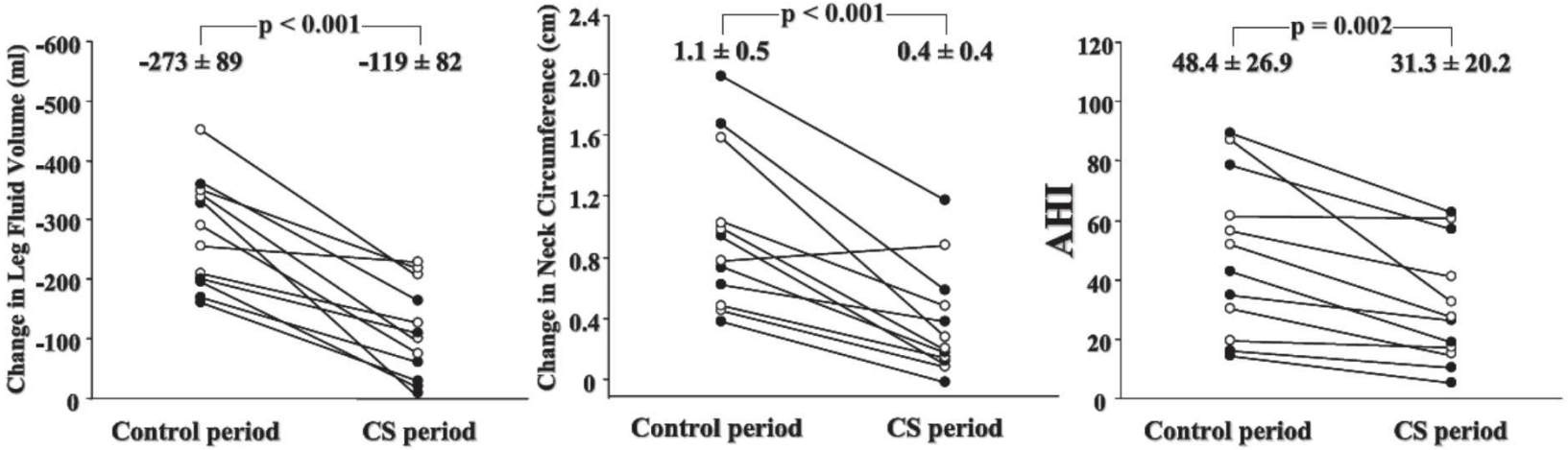
Mécanismes: pression tissulaire péri-pharyngée: œdème…théorie du « fluid-shift »



Redolfi S, et al. *AJRCCM* 2009;179:241–246

Attenuation of Obstructive Sleep Apnea by Compression Stockings in Subjects with Venous Insufficiency

Stefania Redolfi[1,2], Isabelle Arnulf[1], Michel Pottier[1], Jacques Lajou[3], Isabelle Koskas[3], T. Douglas Bradley[4*] and Thomas Similowski[5*]



Am J Respir Crit Care Med Vol 184. pp 1062–1066, 2011

Activité physique

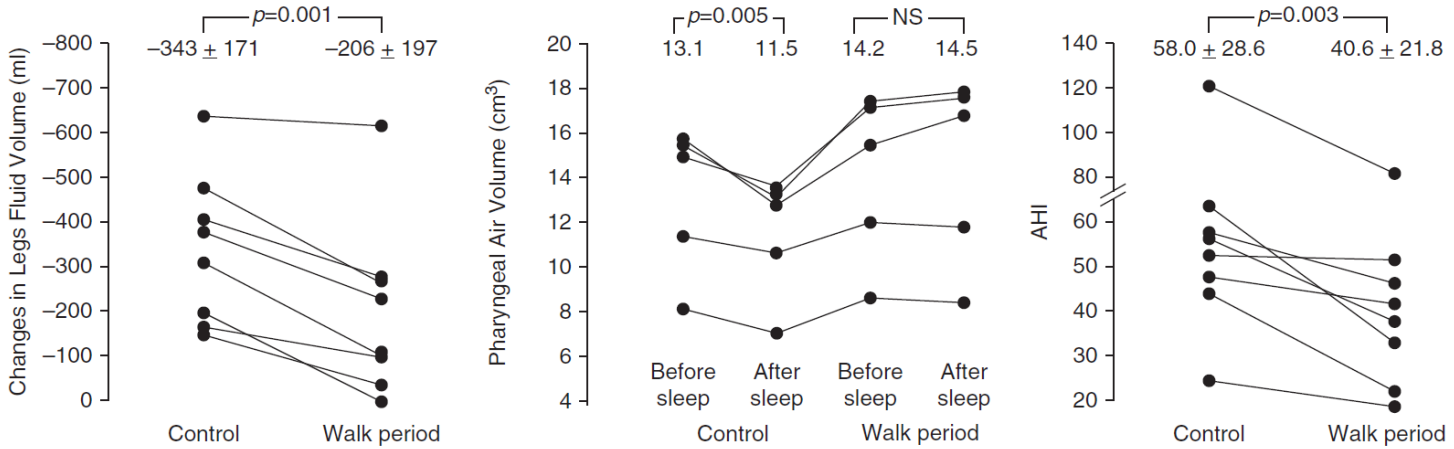
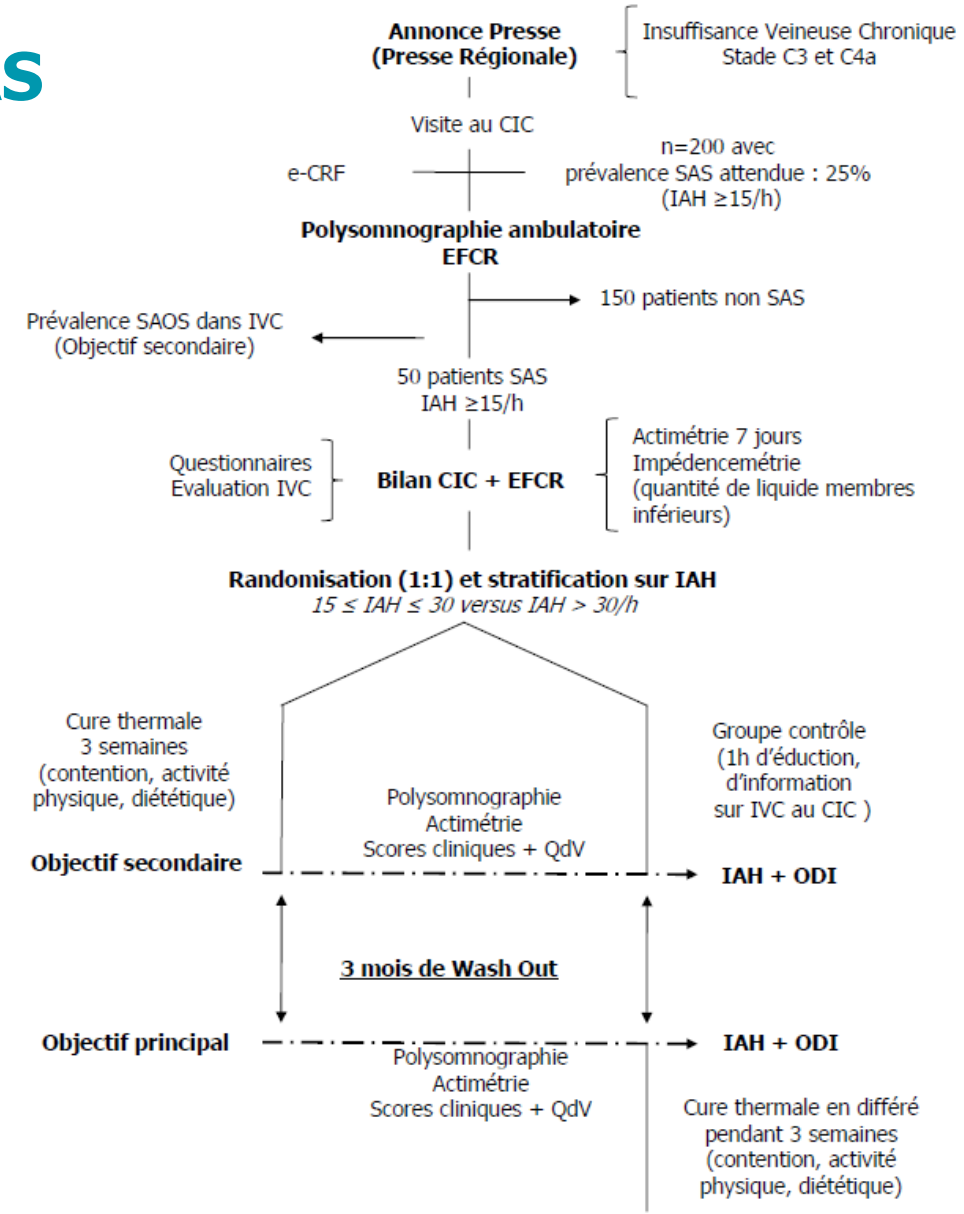


Figure 1. Influence of 1 week of 45 minutes of walking twice a day (walk period) on overnight changes in leg fluid volume, pharyngeal air volume, and apnea–hypopnea index in the seven men and one woman. Leg fluid volume is the mean of the volumes of the two legs. AHI = apnea/hypopnea index; NS = not significant.

S Redolfi, AJRCCM 2015

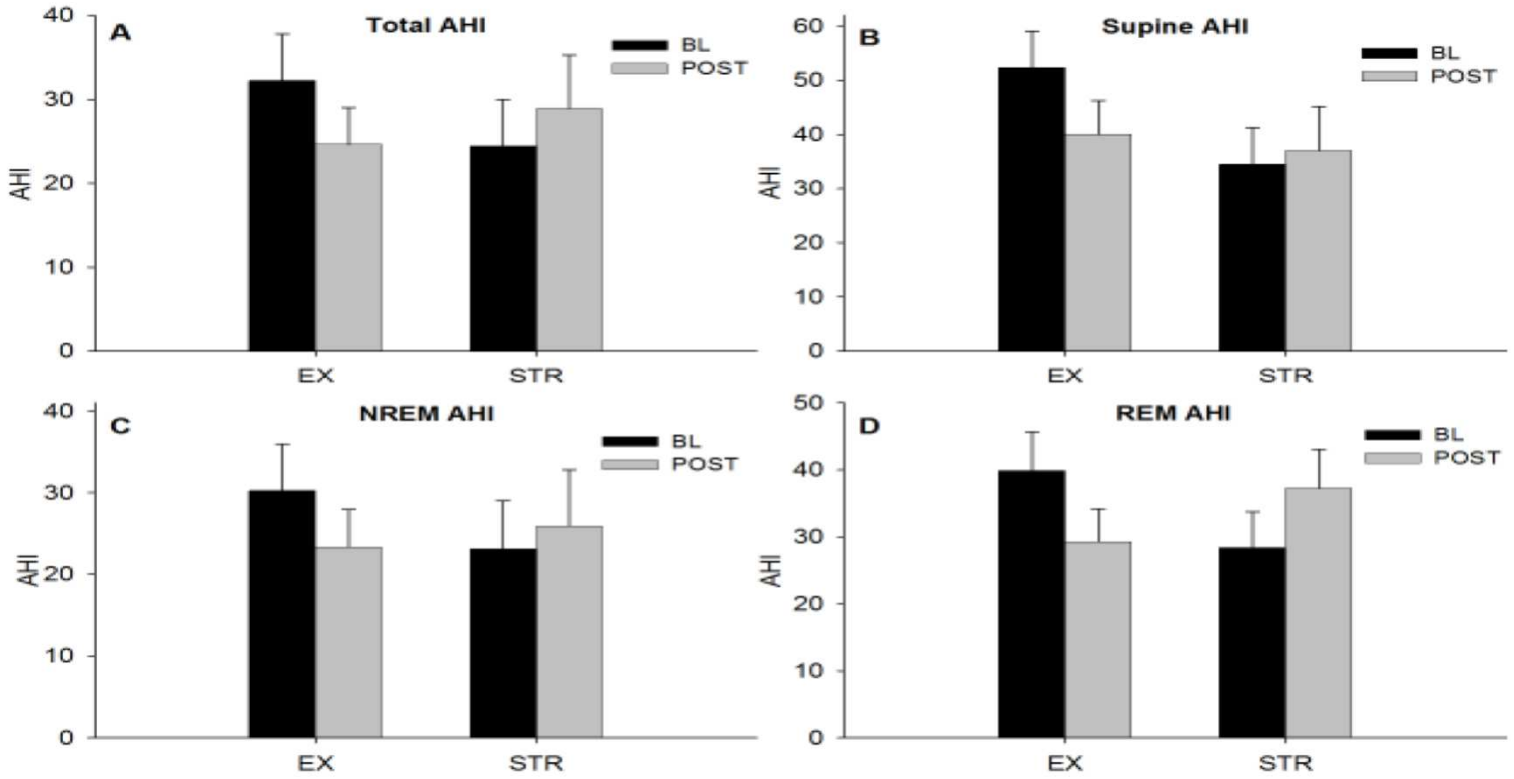
Therma-SAS


Annonce Presse
(Presse Régionale)
Insuffisance Veineuse Chronique
Stade C3 et C4a
Visite au CIC
e-CRF
n=200 avec
prévalence SAS attendue : 25%
(IAH ≥15/h)
Polysomnographie ambulatoire
EFCR
150 patients non SAS
Prévalence SAOS dans IVC
(Objectif secondaire)
50 patients SAS
IAH ≥15/h
Questionnaires
Evaluation IVC
Bilan CIC + EFCR
Actimétrie 7 jours
Impédencemétrie
(quantité de liquide membres
inférieurs)
Randomisation (1:1) et stratification sur IAH
15 ≤ IAH ≤ 30 versus IAH > 30/h
Cure thermale
3 semaines
(contention, activité
physique, diététique)
Groupe contrôle
(1h d'éduction,
d'information
sur IVC au CIC)
Polysomnographie
Actimétrie
Scores cliniques + QdV
Objectif secondaire
IAH + ODI
3 mois de Wash Out
Objectif principal
IAH + ODI
Polysomnographie
Actimétrie
Scores cliniques + QdV
Cure thermale en différé
pendant 3 semaines
(contention, activité
physique, diététique)

Activité physique et syndrome d'apnées du sommeil

Réduction significative de l'IAH

(Ré-entrainement : 32.2±5.6 to 24.6±4.4, stretching : 24.4±5.6 to 28.9±6.4; *P<0.01)*



Kline CE et al. Sleep 2011;34:1631-40

Conclusion - Perspectives

- **Prise en charge rééducative est clairement en faveur d'une amélioration du SAOS (IAH, symptômes)**
  - Pour les formes légère et modérée de SAOS
  - Évaluation à court terme
- **Mécanismes d'amélioration sont à étudier pour optimiser les bénéfices**
  - Sélection des patients
  - Type de rééducation, durée et répétition (maintien des acquis)
- **Résultats au long cours?**
  - Implication des patients
  - Outcomes cliniques?
- **REE-VAS, une stratégie combinée pour mieux tolérer CPAP, MAD?**
- **REE-VAS combinée à ré-entraînement global (fluid-shift)?**