

Speech-Language Pathology Treatment for Chronic Cough

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Introduction

- CHS, RCC, and UCC
- Concept of Voluntary control of cough

Chronic Cough, unsolved case

58세 여성

3년째 마른기침

유발 상황

향수, 찬 공기, 대화

동반 감각

기침 직전 목이 간질거림

생활 영향

수면 방해, 회의 회피, 요실금

현재까지

ICS | OCS → no effect

Anti-histamine | LTRA → no effect

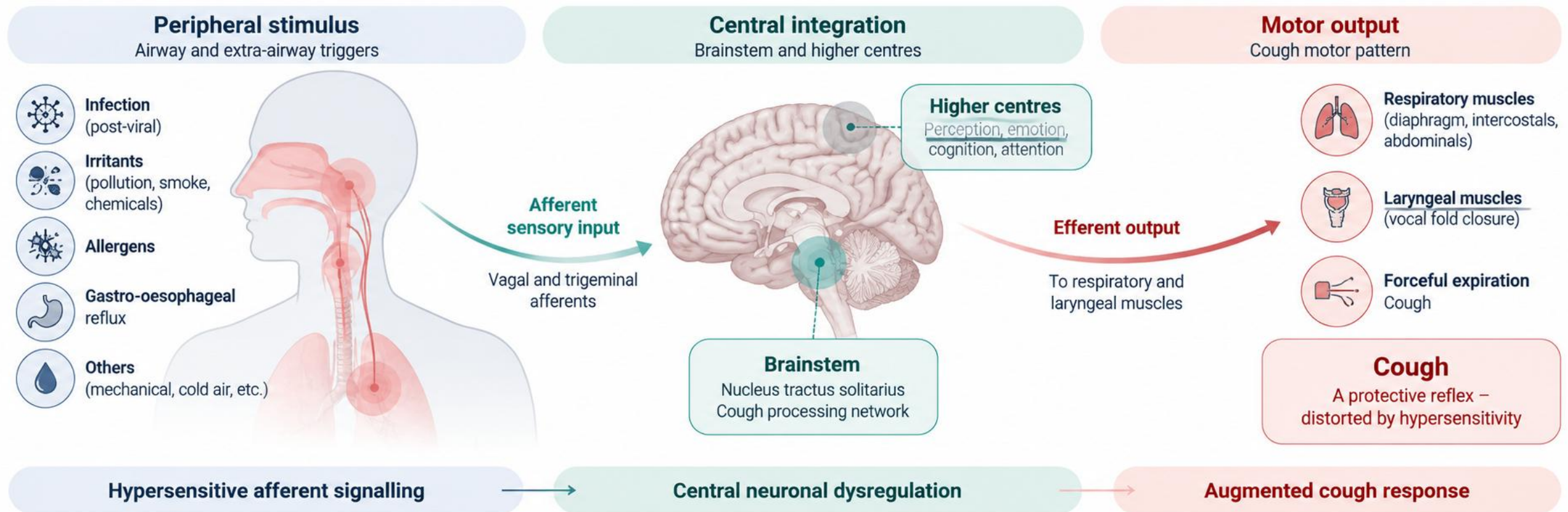
PPI or P-CAB → no effect

Codeine → effect (+) → 3 months / year

- S/E: Constipation, Headache etc

Impression? What is next?

Cough Reflex: from peripheral stimulus to central integration and output



Cough Reflex = Cough Hypersensitivity Pathway

Where Do Patients "feel" the urge to cough?

What patients describe



Throat / laryngeal sensation

- Tickle
- Irritation
- Globus ("lump in the throat")
- Itch / dryness
- Need to clear the throat

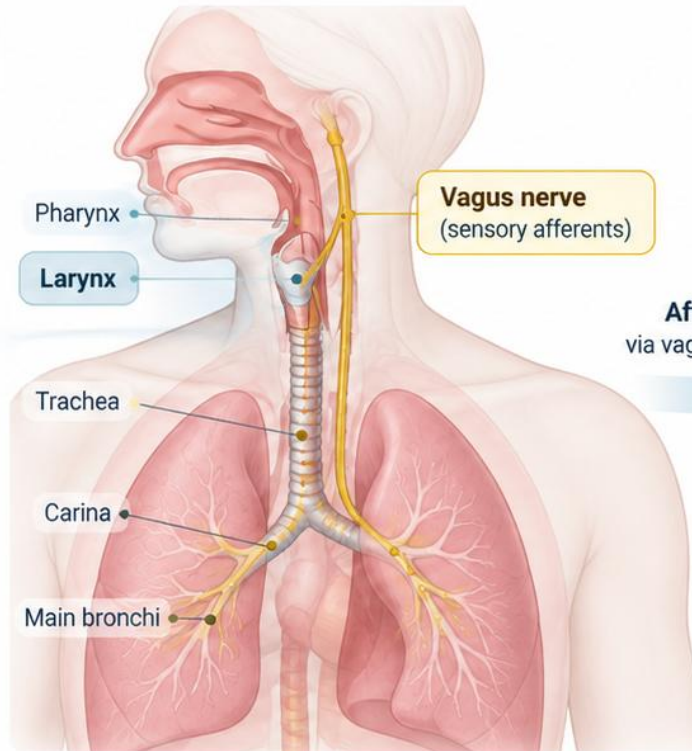
"It feels like something is stuck in my throat."



Upper / central chest sensation

- Tickle
- Irritation
- Strange / abnormal sensation
- "Something in my chest"
- Urge to cough

"I feel an itch or irritation in the centre of my chest."



Afferent input
via vagal sensory fibres

Higher brain centres
Perception, emotion,
attention

Brainstem
Nucleus tractus solitarius
Cough processing network

Conscious urge-to-cough

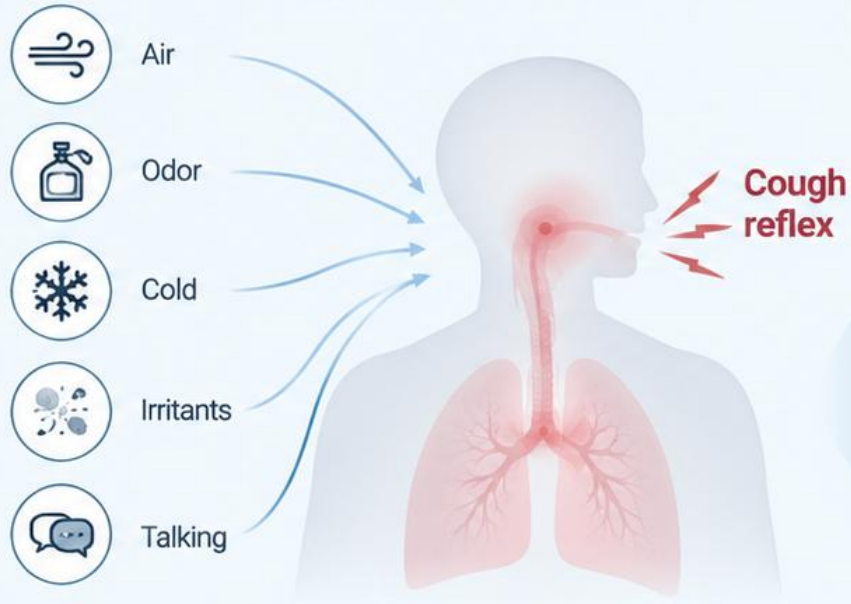
Abnormal sensory processing
in cough hypersensitivity

The urge-to-cough is a sensory experience, commonly perceived in the throat and upper central chest, and is mediated by vagal afferent pathways.

Cough Hypersensitivity to RCC/UCC

Cough hypersensitivity

Exaggerated cough response to normally innocuous stimuli



When hypersensitivity persists...

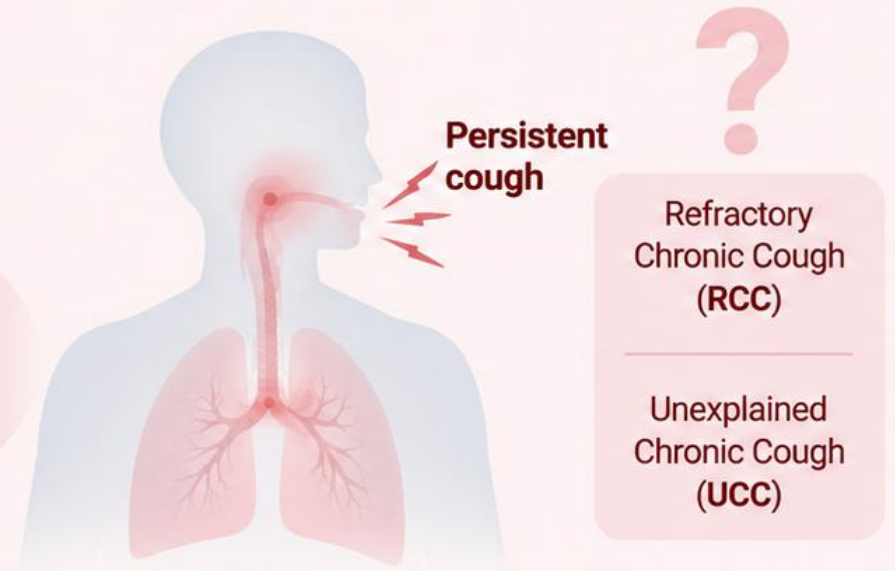


Overlapping mechanism

Heightened airway sensory pathways (e.g. vagal afferents)

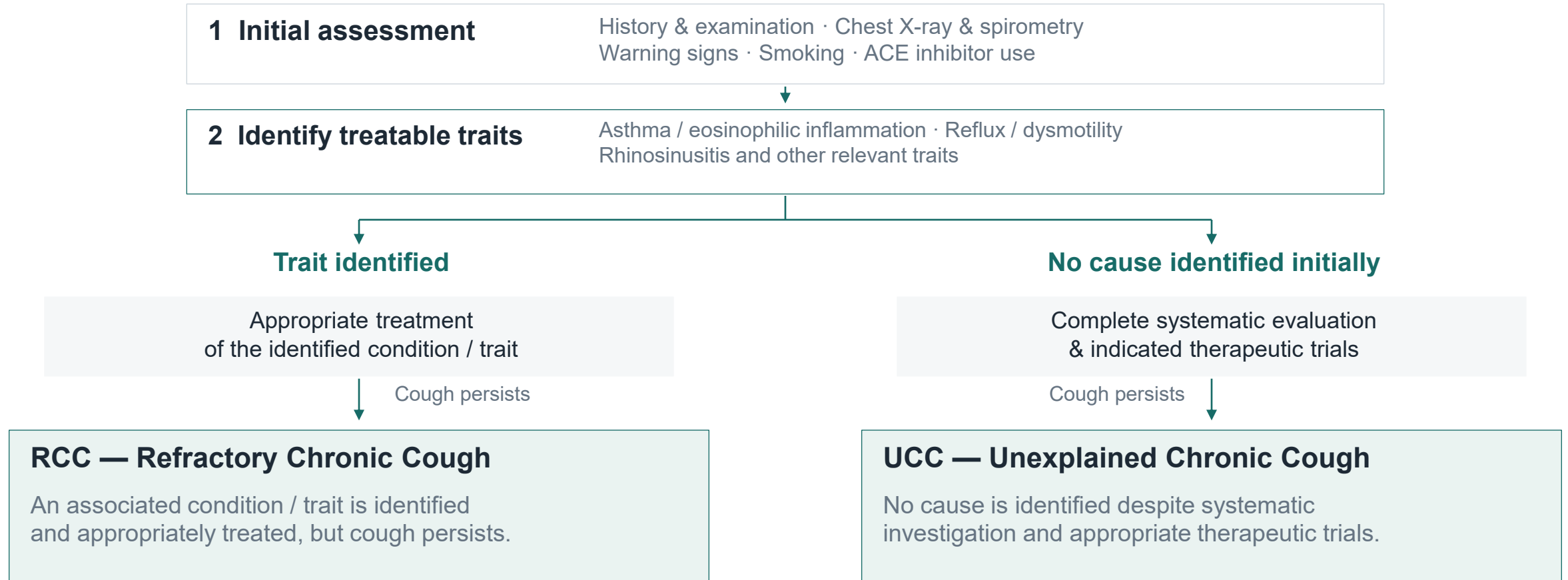
RCC and UCC

Chronic cough with no obvious cause (refractory or unexplained)



RCC or UCC?

Treatable Traits



RCC: identified and treated, but persistent | UCC: investigated, but unexplained

Adults with chronic cough (>8 weeks). Illustrative pathway; RCC/UCC terminology can overlap.

Patient Voices: Living with RCC and UCC

More than a cough—it affects everyday life

“Even the smell of perfume triggers my cough.”

RCC / UCC patient



Triggered by
low-level stimuli

“When I talk for a long time,
my throat feels sore.”

RCC / UCC patient



Talking can
provoke cough

“Once it starts,
it’s hard to stop.”

RCC / UCC patient



Cough fits are
difficult to control



Low-level triggers · urge-to-cough · heightened sensitivity

These quotes illustrate cough hypersensitivity.
However, they do not by themselves establish a specific diagnosis.

Pharmacotherapy in RCC and UCC

Author	Year	Area	Centre	Total	Male/Female	White/Other	Age ^a	BMI (kg/m ²) ^{ab}	Cough duration (years) ^a	Medication	Category of medication
McGarvey	2023	Mix	Multiple	400	105/295	288/112	57.1 ± 0.7	27.8 ± 0.4	10.4 ± 6.1	Sivopixant	P2X3 antagonist
Niimi A ^c	2022	Asia	Multiple	31	11/20	–	50 ± 14.6	24.1 ± 5.0	8.1 ± 8.6	Sivopixant	P2X3 antagonist
Niimi B ^c	2022	Asia	Multiple	169	63/106	0/169	58 ± 15	24.1 ± 4.2	9.2 ± 10.5	Gefapixant	P2X3 antagonist
McGarvey	2022	Mix	Multiple	2044	518/1526	1627/417	59.6 ± 11.7	–	11.35 ± 0.21	Gefapixant	P2X3 antagonist
Morice	2021	Europe	Multiple	40	9/31	39/1	61.5 ± 10.5	26.8 ± 3.4	–	Eliapixant	P2X3 antagonist
Smith A ^c	2020	Mix	Multiple	253	60/193	234/19	60.2 ± 9.9	27.7 ± 4.7	14.5 ± 11.7	Gefapixant	P2X3 antagonist
Smith B ^c	2020	Mix	Multiple	59	10/49	56/3	62.1 ± 1.45	26.6 ± 0.6	15.4 (14–55.3)	Gefapixant	P2X3 antagonist
Morice	2019	Europe	Single	24	3/21	–	61.1	–	14.6 ± 9.89	Gefapixant	P2X3 antagonist
Abdulqawi	2015	Europe	Single	24	6/18	24/0	54.5 ± 11.1	25.9 (20–35)	9.0 (3.0–25.0)	Gefapixant	P2X3 antagonist
Ludbrook	2021	Europe	Multiple	17	2/15	16/1	61.0 ± 9.85	27.61 ± 4.96	–	GSK2798745	TRP modulator
Belvisi	2017	Europe	Multiple	20	5/15	20/0	63.1 ± 9.4	28.0 ± 5.0	–	XEN-D0501	TRP modulator
Khalid	2014	Europe	Single	21	6/15	21/0	53 (34–70)	26.6 (22.3–31.7)	–	SB-705498	TRP modulator
Badri	2022	Europe	Single	22	6/16	–	63.7 ± 7.2	25.8 ± 4	10.5 (5.8–17.0)	Lesogaberan	GABA modulator
Ryan	2012	Oceanic	Single	62	22/40	–	61.8 ± 1.7	28.9	3.0 (1.5–12.5)	Gabapentin	GABA modulator
Abdulqawi	2020	Europe	Single	26	4/22	–	53.5 ± 12.1	–	10.0 (7.0–16.0)	Lidocaine	Opioid analgesic
Smith	2019	Europe	Single	13	2/11	13/0	60.1 ± 8.36	–	13.1 ± 6.7	Orvepitant	NK-1 antagonist
Birring	2017	Europe	Multiple	27	6/21	25/2	62 (23–73)	27.7 ± 5.7	9.9 ± 9.8	PA-101	Sodium cromoglycate
Hodgson	2016	Europe	Single	44	14/30	–	58.0 ± 1.5	28.1 ± 0.7	–	Azithromycin	Macrolide
Yousaf	2010	Europe	Single	30	6/24	–	62.0 ± 1.6	26.8 ± 0.9	11.6 ± 0.8	Erythroycin	Macrolide

^aData expressed as mean (SD). ^bCalculated as weight in kilograms divided by height in metres squared. ^cTwo trials with the same first author and year of publication, then we use A and B to distinguish between different studies.

Table 1: Characteristics of the randomised controlled trials included in the meta-analysis.

Treatment	LCQ	24 h cough frequency	Cough severity VAS
Placebo	0.327	0.472	0.425
Gefapixant	0.711	0.983	0.786
Eliapixant	0.555	0.392	0.667
XEN-D0501	0.39	0.192	ND ^a
GSK2798745	0.304	ND ^a	0.284
SB-705498	ND ^a	0.328	0.331
Lesogaberan	0.529	0.632	0.601
Azithromycin	0.671	ND ^a	ND ^a
PA-101	0.514	ND ^a	0.397

Abbreviations: SUCRA, surface under the cumulative ranking curve; LCQ, leicester cough questionnaire. ^aND, this medication was not included in the network meta-analysis.

Table 4: The results of network meta-analysis for SUCRA.

SR/NMA

Non-Pharmacotherapy in RCC and UCC

TABLE I. Summary of nonpharmacological interventions in chronic cough

Intervention	Hypothesized mechanisms	Study design	Population studied	Outcome
Speech pathology cough control therapy	Likely multifactorial including improved cough suppression, reduced hyper-sensitivity	2 single- blind placebo-controlled RCTs	Patients with refractory chronic	Improved symptoms, quality of life, reduced
CPAP	Reduced			
Pulmonary rehabilitation	Reduced			
Deep diaphragmatic breathing training	Altered			
Chest band	Altered			
Radiofrequency neurolysis	Reduced			
Transcranial magnetic stimulation	Central sensitization	Pre-post design	Healthy controls	Increased cough reflex threshold

Table 1. Components of speech pathology intervention for chronic cough

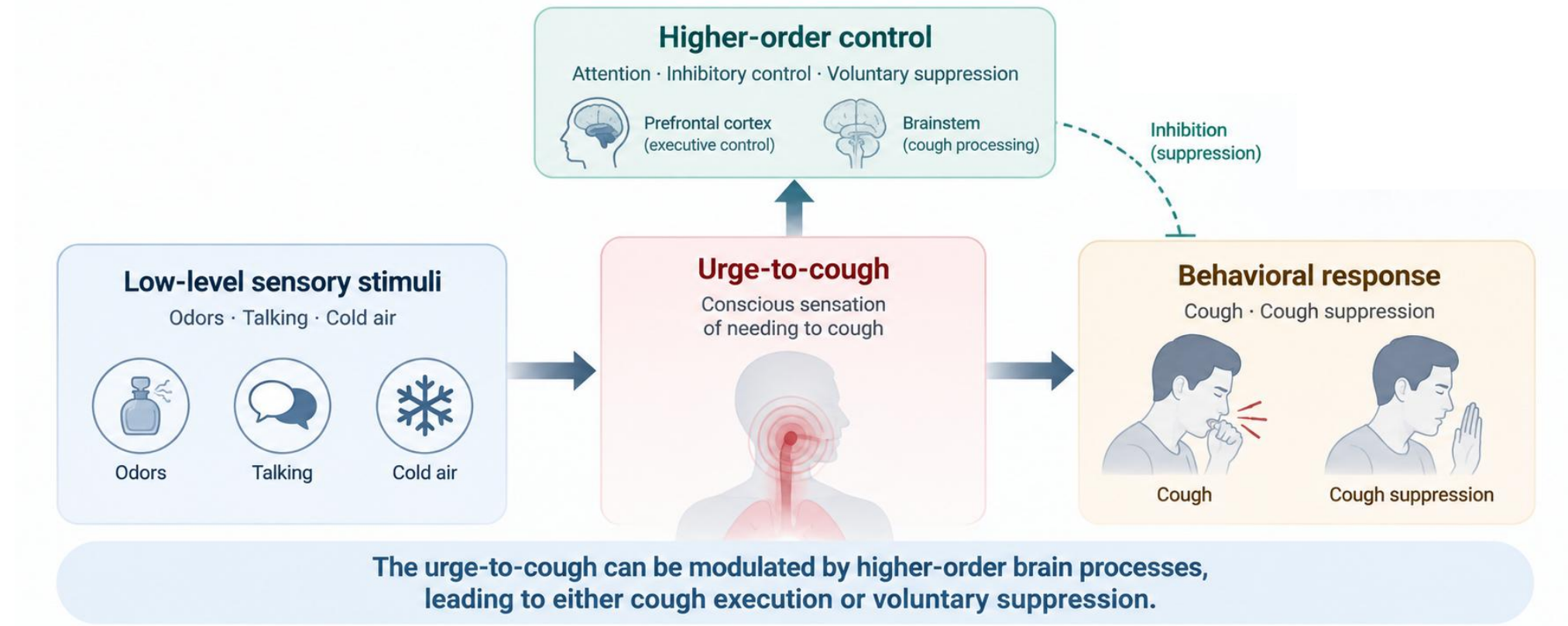
Component	Description	Examples
Education	Explains the rationale for a behavioural approach Emphasises the capacity for voluntary control	Although the urge to cough is distressing there is no physiological need to cough
Cough suppression techniques	Increase awareness of urge to cough Replace with competing technique	PVFM release breathing, cough control breathing, accent method breathing
Reducing laryngeal irritation	Reduce exposure or behaviours that trigger an urge to cough	Hydration, minimise exposure to irritating substance, reduce phonotraumatic behaviours
Psychoeducational counselling	Facilitate motivation to undertake behavioural intervention	Set realistic treatment goals, optimise treatment adherence

PVFM: paradoxical vocal fold movement.

GERD, Gastroesophageal reflux disease; OSA, obstructive sleep apnea; RCT, randomized controlled trial.

*Hypothesized mechanisms by current authors.

From Urge-to-Cough to Voluntary Cough Control



Cough Hypersensitivity involves both sensory amplification and impaired inhibition control

Capsaicin challenge

Airway sensory stimulation



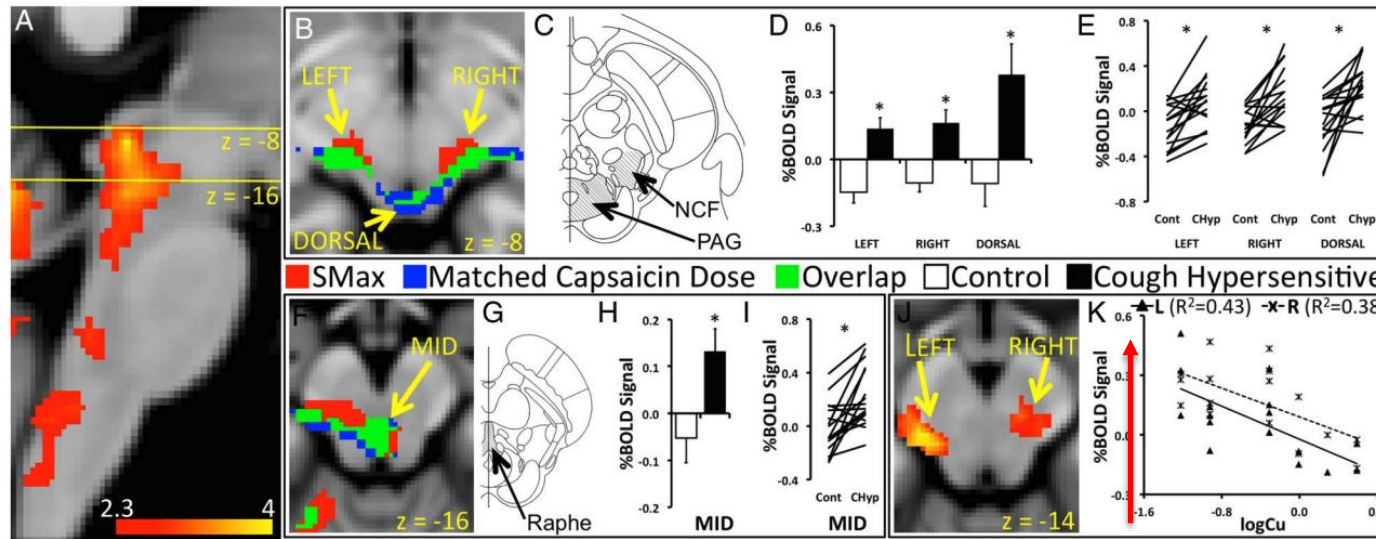
fMRI + Cough suppression task

Central responses
& voluntary suppression

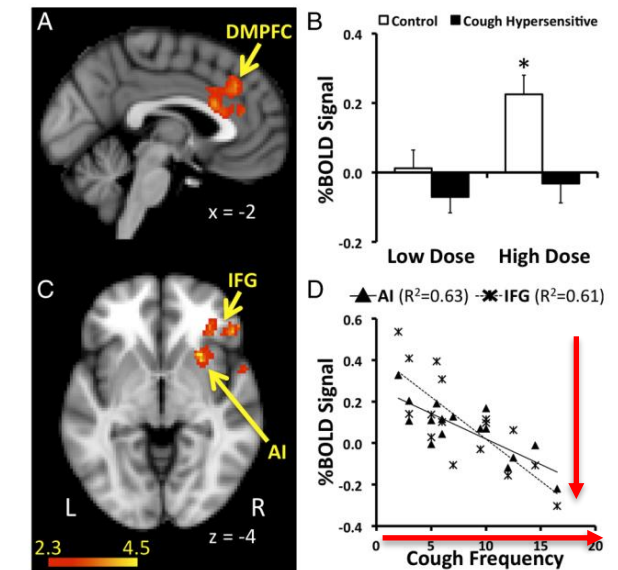


Patient vs Healthy controls

Difference in neural and behavioral responses



NCF: nucleus cuneiformis, PAG: periaqueductal gray



DMPFC: 배내측전두엽피질, IFG: 하전두회, AI: 전측섬엽

Cough hypersensitivity was characterized by both **enhanced** central sensory processing and **impaired** voluntary cough suppression.

Moe et al 2024: The Midbrain may Amplify Cough Sensory Input

Figure 6. Increased midbrain response to capsaicin and ATP at matched urge-to-cough
Participants with chronic cough showed greater midbrain activation than controls, despite equivalent urge-to-cough levels.

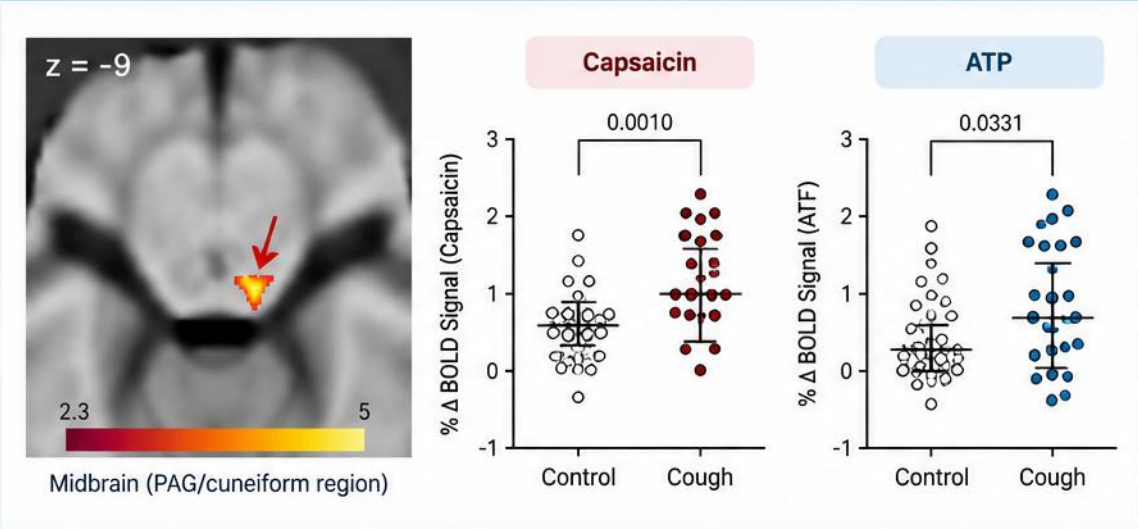
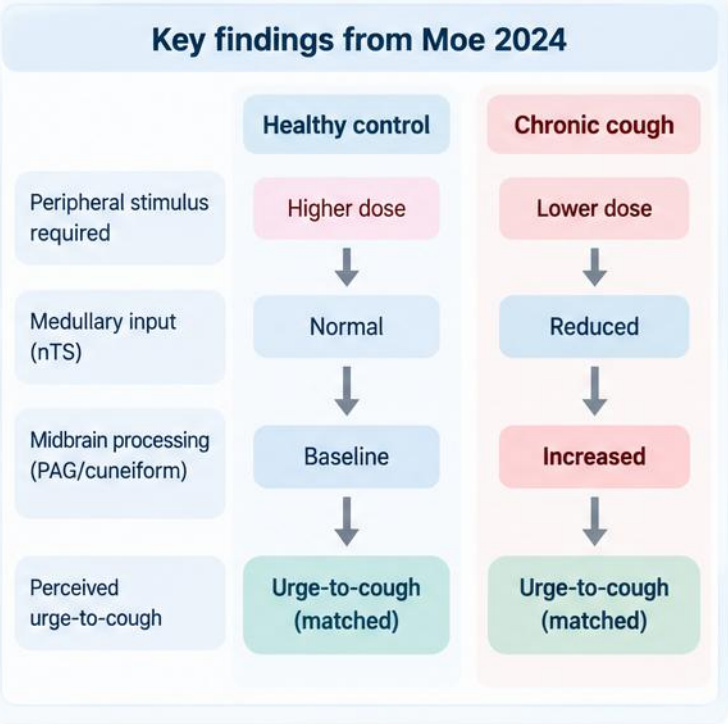


Fig. 6. Brainstem responses to capsaicin and ATP inhalation during fMRI scanning. Participants with chronic cough showed significantly greater activation in the midbrain (PAG/cuneiform region) compared with controls, despite matched urge-to-cough levels.



Take-home message

Cough hypersensitivity may reflect central amplification of relatively weak peripheral sensory inputs.

In chronic cough, a lower peripheral stimulus is required to evoke the same urge-to-cough, with reduced medullary but increased midbrain activation.



Details of Speech-Language Pathology Treatment

What did the Original Speech Pathology Program include?

Education

Nature of chronic cough, adverse effects of repeated coughing, benefits of suppression, voluntary control

Vocal Hygiene

Hydration and strategies to reduce laryngeal irritation and optimise voice use

Cough Suppression

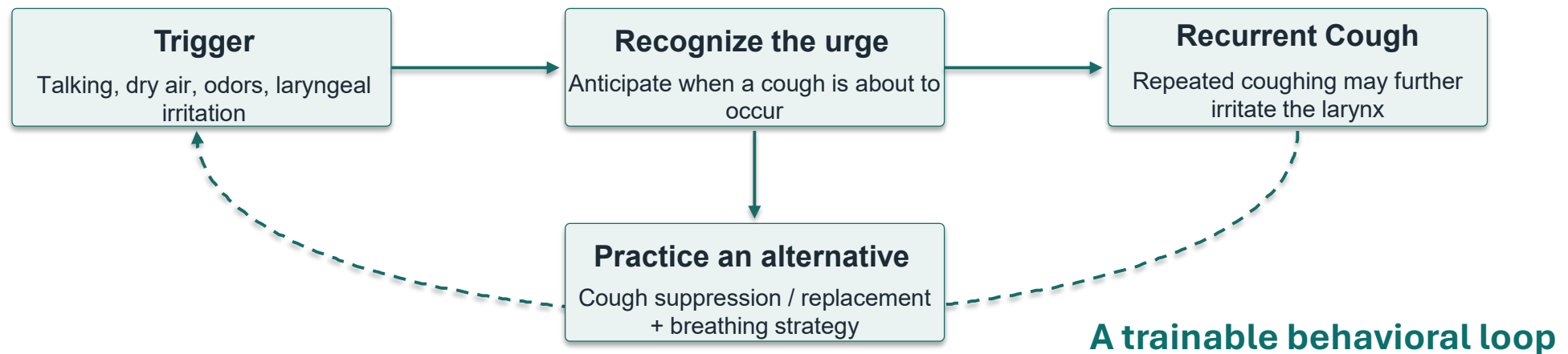
Anticipate the urge to cough, then suppress or replace the cough with an alternative strategy

Counselling

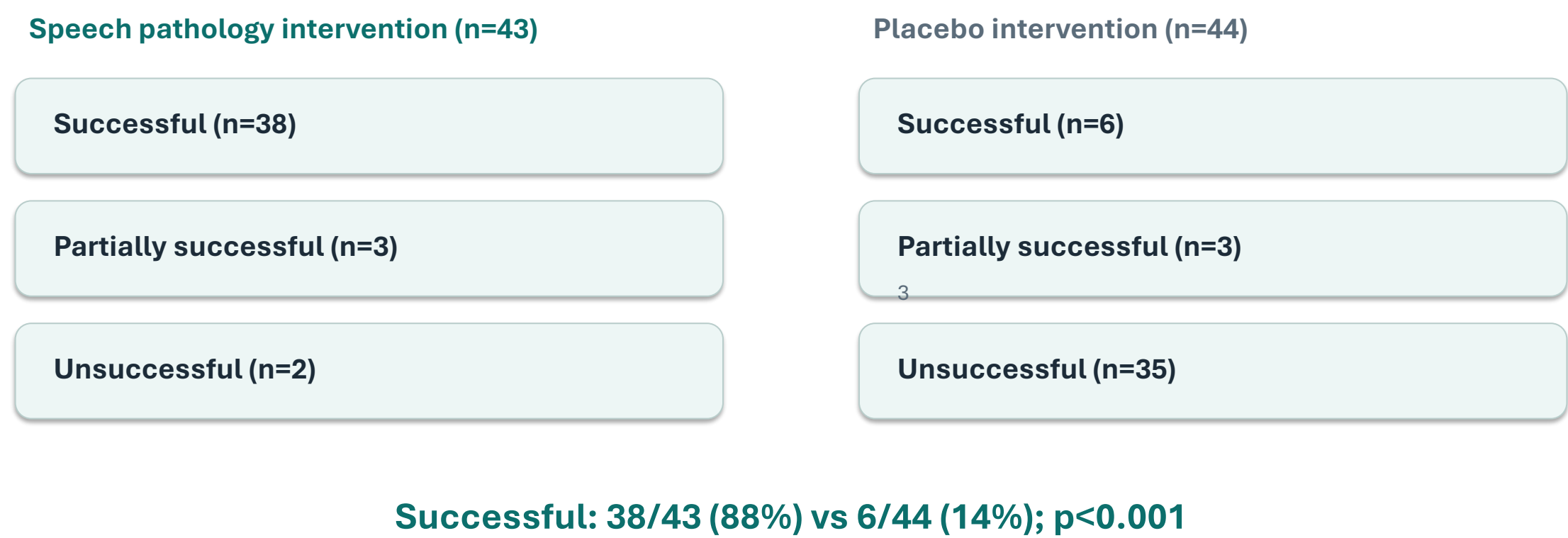
Individualised reinforcement, goal setting and strategies to facilitate adherence

SPEICH-C was a multicomponent behavioural intervention; the independent contribution of each component was not tested.

From Urge-to-Cough to a Trained Alternative Response

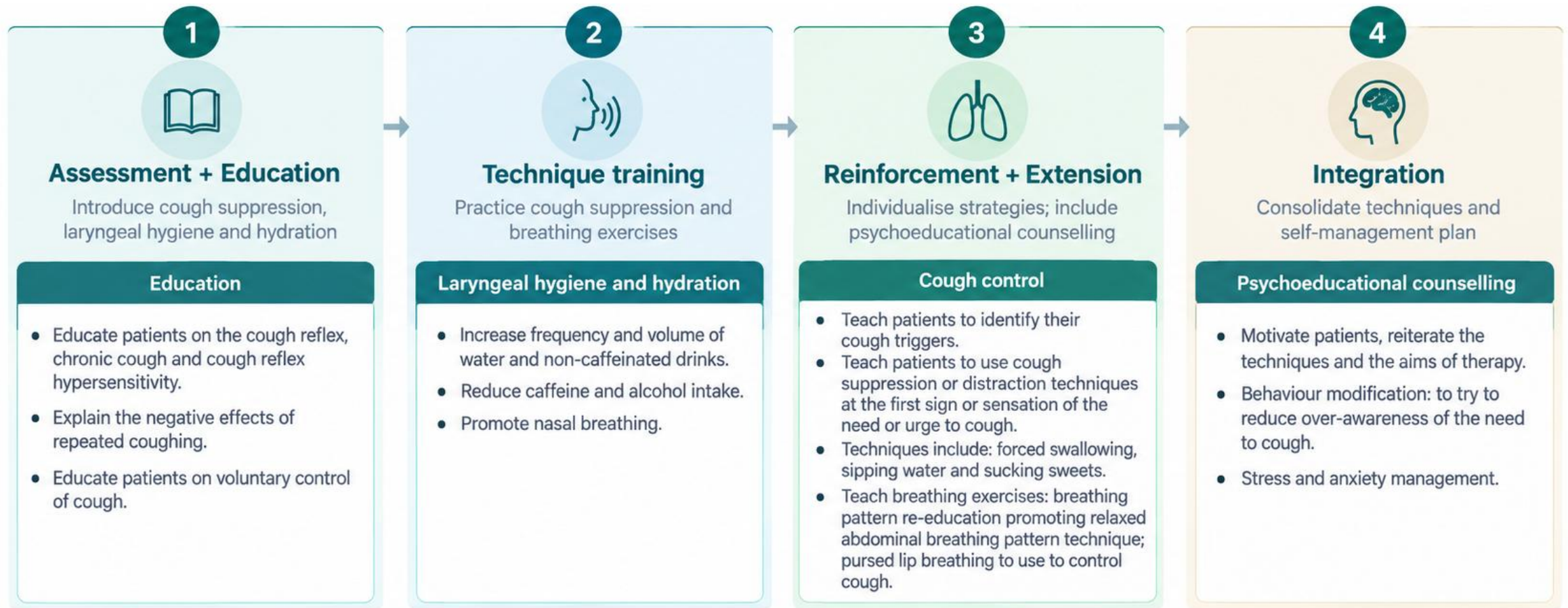


Speech Pathology Intervention RCT (Vertigan et al 2006)



Important: this was a non-blinded clinician judgement outcome, not objective cough counting.

PSALTI Protocol (+Exercise)



PSALTI Trial: 4 weeks 1:1 sessions | 1st session (60 min) | 2nd–4th sessions (45 min)

Education + Laryngeal hygiene/hydration + Cough control + Breathing exercises + Psychoeducational counselling

Physiotherapy Components in PSALTI

Breathing and cough-control techniques to reduce cough frequency and laryngeal hypersensitivity

Delivered by trained physiotherapists or speech and language therapists

The PSALTI protocol integrates physiotherapy and speech and language therapy components.



Physiotherapy: Breathing & Cough-Control Techniques

Aim: reduce laryngeal irritation and help voluntary control of cough

1 Breathing pattern re-education

Develop a relaxed, efficient breathing pattern (diaphragmatic)



- ✓ Diaphragmatic (abdominal) breathing
- ✓ Relaxed, low-effort breathing

2 Pursed-lip breathing

Slow expiration to promote a calm breathing pattern and suppress cough



- ✓ Pursed-lip breathing
- ✓ Use during urge to cough

3 Nasal breathing

Encourage nasal breathing rather than mouth breathing



- ✓ Keep the mouth gently closed
- ✓ Nasal breathing as default

4 Active cycle of breathing technique (when appropriate)

Used selectively for patients with excess sputum to aid airway clearance



- ✓ Breathing control → deep breaths → huff
- ✓ Aimed at airway clearance (if indicated)

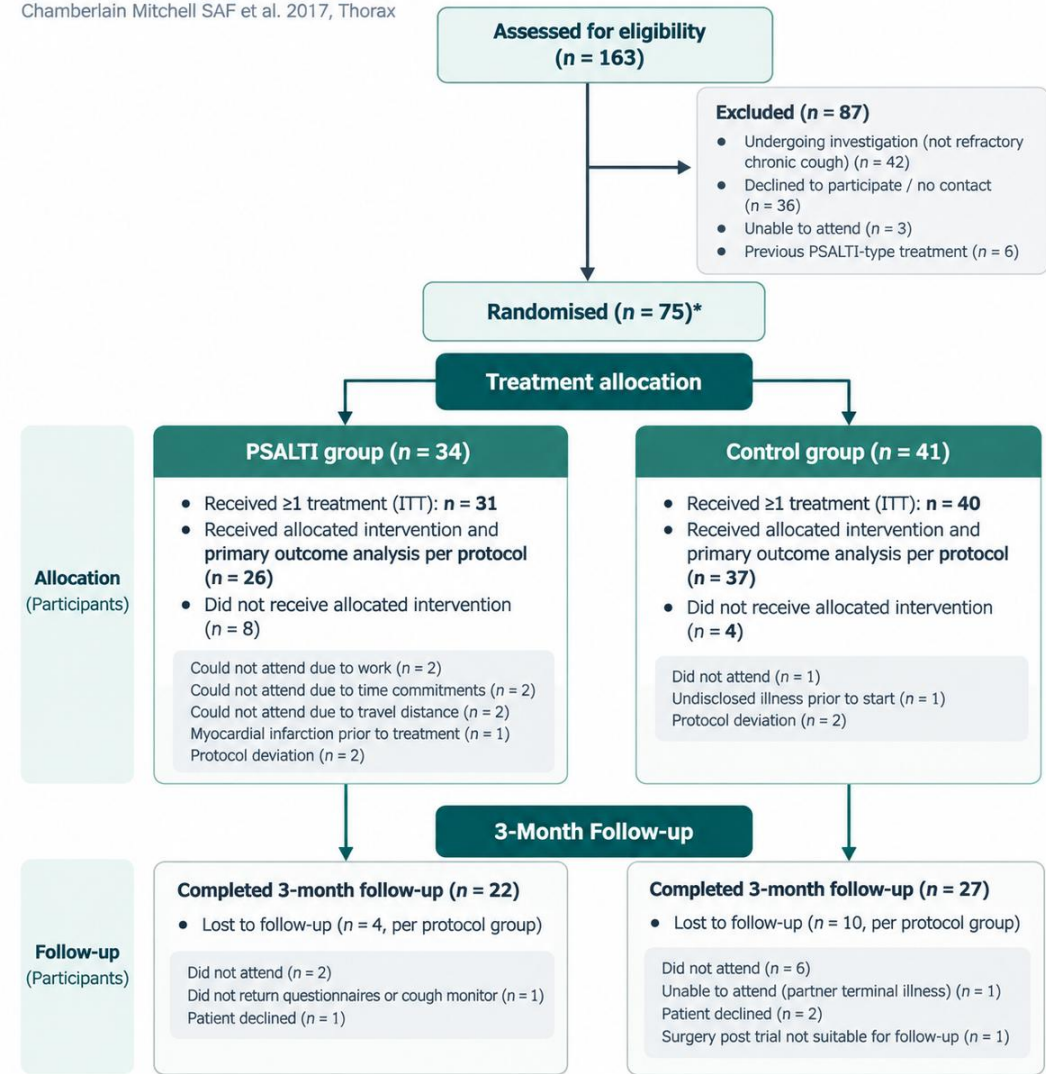
These physiotherapy techniques are combined with education, laryngeal hygiene and hydration, cough suppression strategies, and psychoeducational counselling in the PSALTI protocol.

Illustrations: GPT Astra. Original figures reproduced and assembled from cited sources.

PSALTI Protocol (+Exercise)

PSALTI Trial Flow Diagram

Chamberlain Mitchell SAF et al. 2017, Thorax



Characteristic	Control (n=41)	PSALTI (n=34)	p Value
Age (years)	56 (48–67)	61 (53–67)	0.239
Female, n (%)	26 (63)	25 (71)	0.459
Cough duration (months)	48 (24–126)	60 (30–126)	0.279
FEV ₁ (L, observed), mean (SD)	2.7 (0.9)	2.6 (0.7)	0.517
FEV ₁ /FVC (%), mean (SD)	76 (8.2)	76 (5.0)	0.686
LCQ, mean(SD)	11.9 (3.5)	10.4 (3.6)	0.073
Cough severity VAS	65 (40–83)	63 (49–75)	0.652
SF-36 PCS,	47.1 (41.7–53.6)	41.1 (35.6–49.1)	0.033*
SF-36 MCS	47.7 (38.3–54.9)	49.9 (40.5–57.0)	0.763
HADS—Anxiety	7 (3–10)	7 (4–10)	0.785
HADS—Depression	4 (1–8)	5 (2–6)	0.620
VPQ	17 (11–22)	21 (13–27)	0.158
CF _{per hour} †	17.0 (0.4)	17.0 (0.4)	0.983
C2 (μm)†	4.01(0.69)	4.74 0.62)	0.677
C5 (μm)†	9.33 (0.56)	8.25 (0.51)	0.708

* One additional participant was randomised and withdrew before baseline assessments.

PSALTI Protocol (+Exercise)

: Feel better

+1.53

LCQ points vs control (MCID; 1.3)

95% CI 0.21–2.85 | P = 0.024

PSALTI

LCQ: 10.4 → 14.4

Within-group improvement: +3.40

Control

LCQ: 11.9 → 13.4

Within-group improvement: +1.66

PSALTI produced a significantly greater improvement in cough-related quality of life than active control.

PSALTI Protocol (+Exercise)

: Patients Did Not Just Feel Better — They Coughed Less

41% ↓

24-h objective cough frequency vs control

Adjusted fold change 0.59 (95% CI 0.36–0.95) | p=0.030

PSALTI

17.0 → 9.0 coughs/hour
p=0.002

Control

17.0 → 16.0 coughs/hour
p=0.205

The quality-of-life benefit was supported by an objective reduction in coughing.

PSALTl Protocol (+Exercise)

: What Improved — and What Did Not?

Outcome	Effect vs control	p value	Interpretation
LCQ	+1.53	0.024	Significant ✓
24-h cough frequency	0.59 fold	0.030	Significant ✓
Cough severity VAS	−9.72 mm	0.084	Not significant
Capsaicin C2	1.11 fold	0.575	No difference
Capsaicin C5	1.11 fold	0.512	No difference

PSALTI Protocol (+Exercise)

: Clinical Benefit Without Clear Normalisation of Capsaicin Cough Reflex Sensitivity

Clinical efficacy ✓

- Better cough-related quality of life
- Lower objective cough frequency
- No adverse or serious adverse events reported
- 3M persistency of efficacy

Mechanism remains uncertain

- No between-group difference in C2 or C5
- Individual PSALTI components were not isolated
- Optimal number/frequency of sessions remains unknown

**PSALTI changes cough-related behaviour and outcomes
, but this trial does not establish which component or which neural mechanism—drives the effect.**

Cochrane 2019: Promising Signals, but a Small Evidence Base

Two heterogeneous RCTs (162 adults); outcomes could not be pooled across trials.

Evidence base

2 RCTs • 162 adults
Different interventions and endpoints
No meta-analysis across the two trials

Certainty

GRADE: LOW for reported outcomes
Each key outcome was informed by a single study

Short-term efficacy

PSALTI: LCQ +1.53 vs control
Objective cough count ratio 0.59
Both favoured therapy at 4 weeks

Safety

no serious AEs

WHAT THE REVIEW COULD NOT ESTABLISH

Durability

Between-group HRQoL benefit was not demonstrated beyond the short-term comparison; **longer-term evidence remained uncertain.**

Best component

The trials used multicomponent interventions, so the active ingredient could not be isolated.

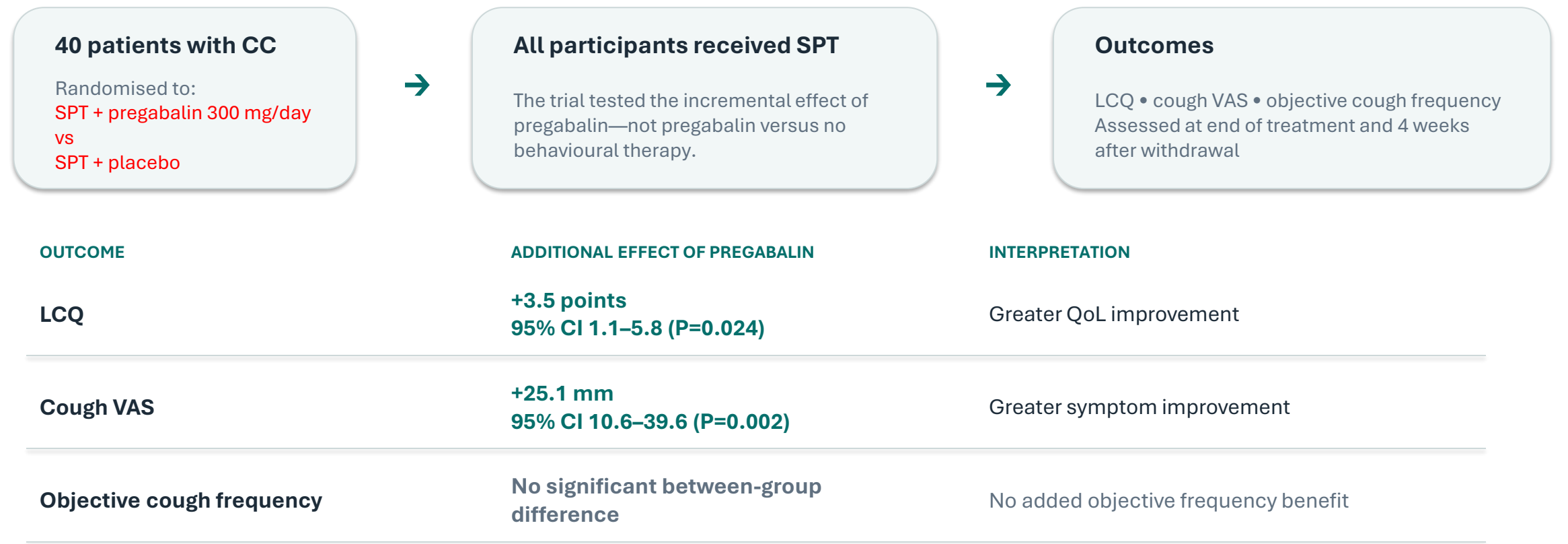
Mechanism

No significant between-group change in capsaicin C5; efficacy does not establish a specific reflex mechanism.

Take-home: evidence supported short-term benefit, but Cochrane explicitly judged the evidence too sparse for robust conclusions.

Pregabalin + SLPT: Better Symptoms and QoL, Not Cough Counts

Important comparator: both groups received speech pathology treatment (SPT).





Clinical Implications

Guidelines and Clinical Statements Support a Trial of Cough Control Therapy

The strength of the recommendation and the type of document should be distinguished.

ERS 2020

“We suggest a trial of cough control therapy”

Adults with chronic cough

Recommendation
Conditional

Evidence certainty
Moderate

Experienced practitioners • short-term HRQoL / cough-frequency benefit

BTS 2023

Cough hypersensitivity is a treatable trait

For RCC, effective options include non-pharmacological therapy, low-dose morphine and gabapentin.

Document type
Clinical Statement

Service delivery
Specialist SLT + physiotherapy

BTS does not assign an ERS-style formal evidence grade to this statement.

**Clinical message: cough control therapy is a supported option
—particularly for refractory cough or patients preferring a non-drug approach—
but it should be delivered as a skilled, multicomponent intervention.**

Holistic evaluation + Physiotherapy + SLPT

Example: My Cough Assessment (real-world)

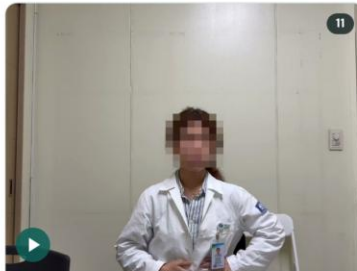
Cough burden (symptoms)	CAT 1 : 3 기침기간 (주) : 아급성 강도 : 5 기침빈도(CSS) - 낮 : 3 기침빈도(CSS) - 밤 : 4 COAT COAT 1. 기침을 얼마나 자주 하나요? : 3 COAT 2. 일상생활에 지장이 있나요? : 2 COAT 3. 잠자기 힘든가요? : 3 COAT 4. 피곤한가요? : 2 COAT 5. 먼지 많을 때, 자극성 냄새, 찬공기를 마실 때 기침이 심해지나요? : 3 COAT Score : 13
Sensory symptoms	CHQ Sensation Itchy throat : 4 Irritation in throat : 3 CHQ Sensation Score : 7
Triggers	CHQ Trigger Cold : 5 CHQ Trigger Score : 5 CHQ Score : 12
Functional impact	SGRQ-c 1 나는 기침을 한다. : A 10.a 기침 때문에 고통을 받는다. : Y 10.b 기침 때문에 피곤하다. : Y 10.e 수면을 방해한다. : Y 11.a 당혹스러울 때가 있다. : N
Additional notes	Comments *강한삼킴(±)



"It's not just the cough, but how it affects my daily life."
— Patient's perspective



후두 마사지
후두 주변 근육 긴장을 직접 풀어 기침 과민성을 낮춘다.
후두 이완



이완 발성 기초
힘을 뻗 발성으로 후두를 이완시키는 기본 훈련.
후두 이완



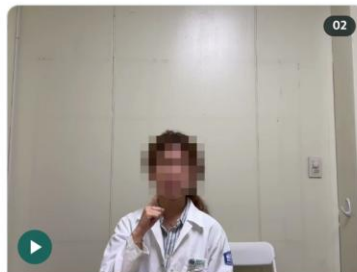
공명 발성 기초
공명 위치를 옮겨 성대 접촉 부담을 줄인다.
후두 이완



호흡 억제 기법
기침 충동이 올라올 때 호흡으로 눌러보낸다.
기침 억제



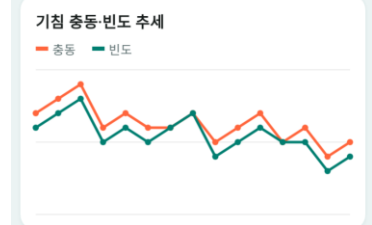
삼킴 억제 기법
삼킴 동작으로 기침 반사를 대체한다.
기침 억제



음성 위생 - 헛기침
습관성 헛기침을 대체 행동으로 바꾼다.
회피 강화



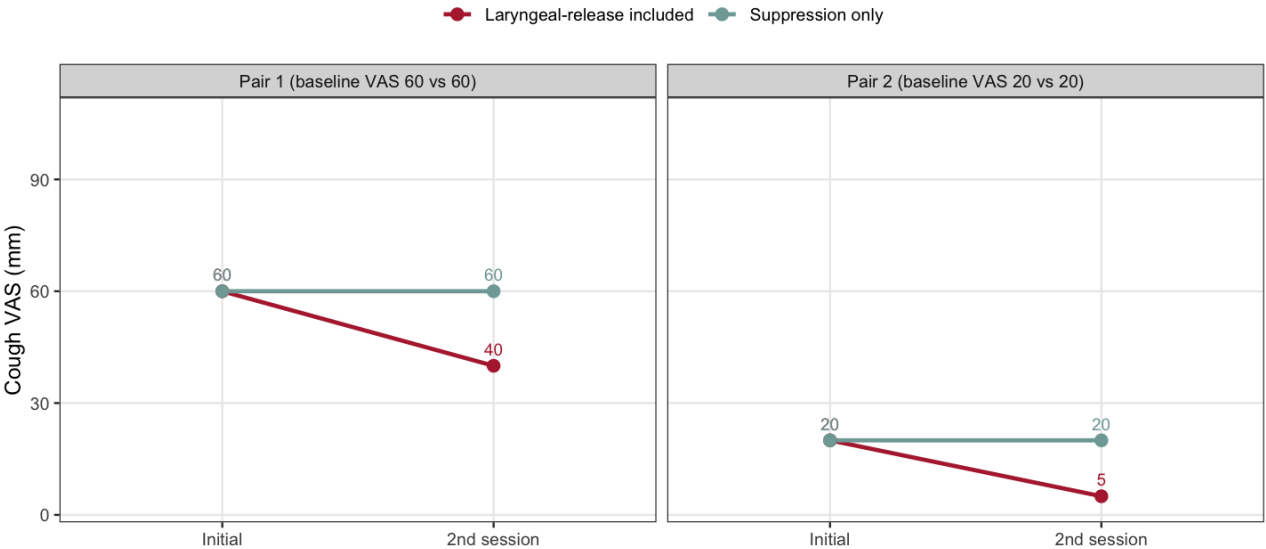
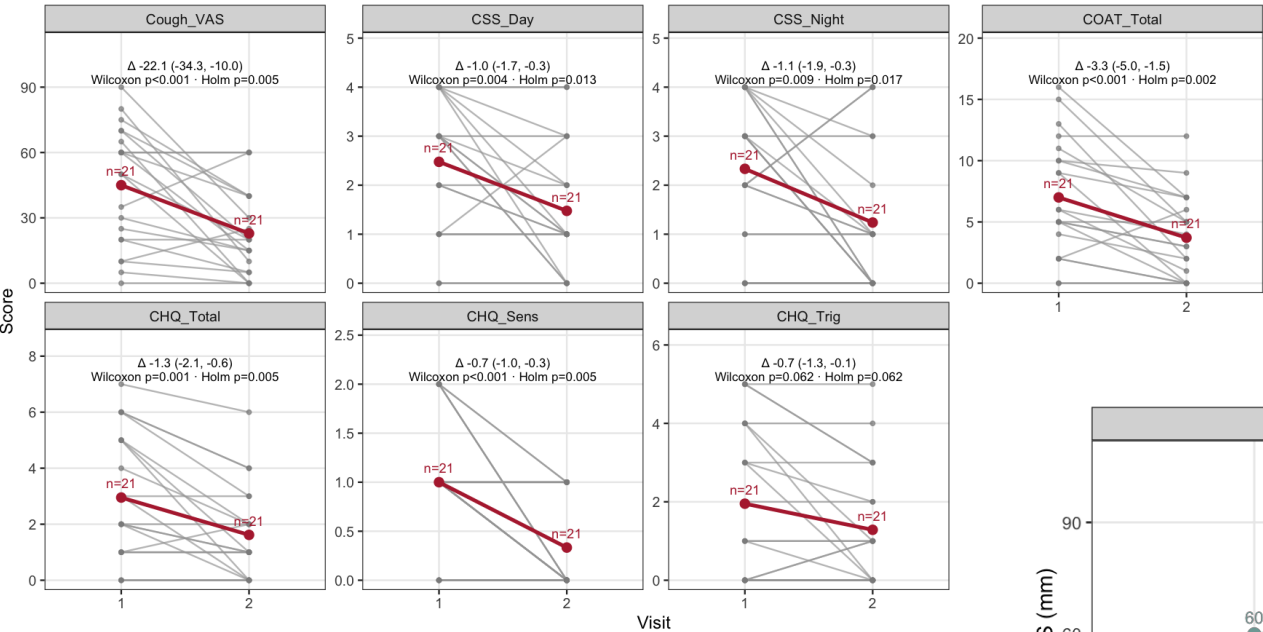
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2026	08	30	08:00	정상	
2026	08	31	09:00	정상	



2026-08-11	충동 5 · 빈도 4 · 불안 4 · 과제 2/3
2026-08-10	충동 4 · 빈도 3 · 불안 3 · 과제 2/3
2026-08-09	충동 6 · 빈도 5 · 불안 5 · 과제 2/3
2026-08-08	충동 5 · 빈도 5 · 불안 4 · 과제 2/3

Holistic evaluation + Physiotherapy + SLPT

Individual trajectories, initial visit to 2nd session (n = 21)
Grey = individual patients; red = observed mean (n shown). Single-arm, uncontrolled; median 28 days apart.



ILLUSTRATIVE CASES — not a group comparison. Pairs were matched on baseline Cough VAS; selection used baseline severity only, never outcomes. Patients with baseline VAS < 20 mm were excluded a priori for floor effect (one such pair existed, in which the laryngeal-release case worsened, 10 to 25 mm). In the full cohort the between-group difference was not significant: -2.8 mm (95% CI -27.4 to 21.9), $p = 0.815$; baseline-adjusted $p = 0.200$; $n = 8$ vs 14.

NeuroCough CRC meeting in ERS 2026



ERS CRC – NEuroCOUGH (New Understanding in the tReatment Of COUGH)

NEuroCOUGH CRC meeting

September 6th, 2026

12.00pm-13.45pm CET

4 Mainstream of Chronic Cough Treatment in NeuroCough Registry



Which treatment would you choose for chronic cough?

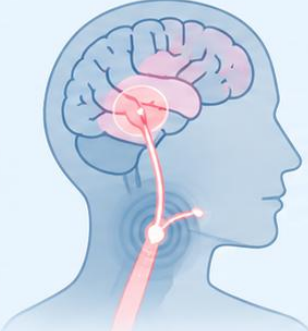
Select one option

Less cough.
Better life.

1

Neuromodulation

(Gabapentin)



Modulates cough reflex sensitivity

Gabapentin reduces the sensitivity of the cough reflex through neuromodulation.

2

Codeine



Codeine suppresses cough through central antitussive effects.

3

Opioid

(e.g., low-dose morphine)



Opioids suppress cough by acting on central opioid receptors.

4

SPLT

(Speech and Language Therapy)



Breathing Control
Vocal Techniques
Cough Suppression Strategies

SPLT helps reduce cough through behavioural techniques and cough suppression strategies.

Take Home Messages

1 Combination Therapy in Chronic Cough What Have We Learned?

One randomized trial has evaluated a neuromodulator + speech pathology therapy in refractory chronic cough.

Pregabalin + Speech Pathology Therapy (Vertigan et al. 2016) CHEST. 2016;149:639–648
Randomised, double-blind, placebo-controlled trial in refractory chronic cough (n = 40)

Outcome	SPT + Pregabalin (change from baseline)	SPT + Placebo (change from baseline)	Between-group difference
LCQ (quality of life)	+3.5 (95% CI 1.1–5.8)	+0.5	Significant improvement (p = 0.024)
VAS (cough severity)	+25.1 (95% CI 10.6–39.6)	+1.3	Significant improvement (p = 0.002)
Objective cough frequency	No significant difference	-	No additional benefit (NS)

✓ Adding pregabalin to speech pathology therapy improved **perceived cough severity and quality of life**, but did not further reduce objective cough frequency.

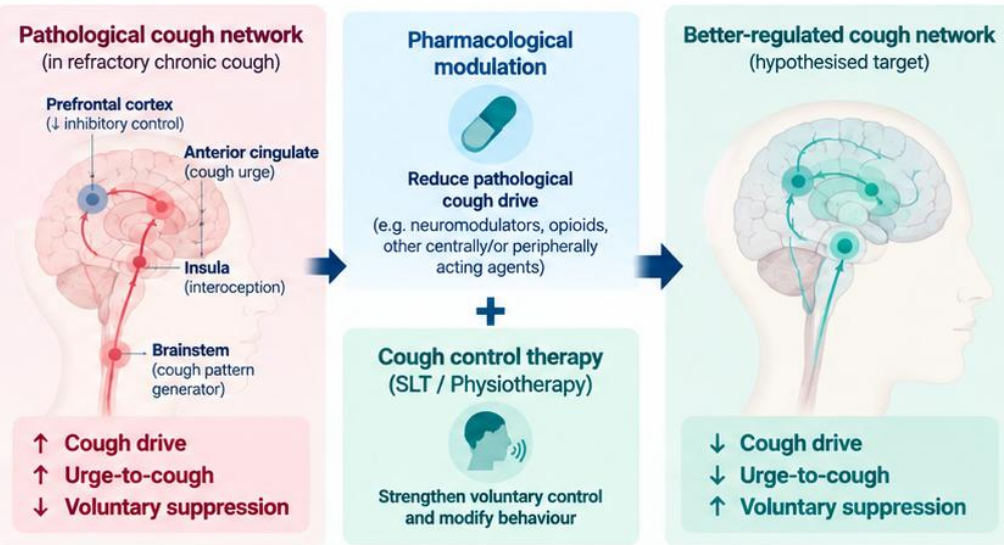
Key points from this study



❓ **Research gap**
This is the only randomized trial of a pharmacological agent combined with cough control therapy. No RCTs have evaluated codeine, morphine or other agents in combination with cough control therapy.

2 From Evidence to the Next Trial Next Step: Modulate the Circuit, Then Retrain the Cough

Cough hypersensitivity involves abnormal neural processing and impaired inhibitory control. Combining pharmacological modulation with behavioural therapy may provide complementary benefits.



Proposed clinical study

Objective To determine whether combination of a neuromodulator and cough control therapy produces superior and more durable improvement in refractory chronic cough compared with either alone.	Design (example) - Multicentre, randomized, factorial design - Population: refractory chronic cough (RCC) - Interventions: drug + SLT vs drug alone vs SLT alone vs placebo/standard care - Duration: 8–12 weeks + follow-up	Outcomes - Primary: LCQ (quality of life) - Secondary: objective cough frequency, cough severity (VAS), cough reflex sensitivity, neuroimaging/biomarkers (exploratory) - Safety and durability after tapering
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💡 **Key hypothesis**
Reducing pathological cough drive may create a **therapeutic window for more effective behavioural retraining**. Combination therapy may achieve greater—and more durable—benefit than either approach alone.

Chronic Cough, unsolved case

58세 여성

3년째 마른기침

유발 상황

향수, 찬 공기, 대화

동반 감각

기침 직전 목이 간질거림

생활 영향

수면 방해, 회의 회피, 요실금

현재까지

ICS | OCS → no effect

Anti-histamine | LTRA → no effect

PPI or P-CAB → no effect

Codeine → effect (+) → 3 months / year

- S/E: Constipation, Headache etc

+SLPT?

Why not? Let's Do It

Thanks for your attention

E-mail: ds31316@gmail.com

