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Evidence-Based Systematic Review and Meta-Analysis of Speech-Language Therapy for Exercise-Induced Laryngeal Obstruction: A Multi-Database Integrated Study from 2005 to 2025

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ADMINISTRATIVE INFORMATION

Support - Project Funding.

Review Stage at time of this submission - Preliminary searches.

Conflicts of interest - All members of the working group declare that: Within the past 3 years, they have not received direct funding, consulting fees, speaking fees, or equity from enterprises related to EILO intervention (such as speech-language therapy technology R&D companies, inhaled anticholinergic drug manufacturers, and laryngoscope/biological feedback device manufacturers); nor have they participated in the design or data interpretation of clinical trials led by the aforementioned enterprises.
All members declare that they have no binding personal academic viewpoints related to EILO diagnosis and treatment (e.g., no exclusive studies supporting only a specific type of SLT technology have been published); no positional biases caused by holding leadership positions in EILO-related disease societies (e.g., International Society for Laryngeal Dysfunction); and the recommendations in the guideline are based solely on the strength of evidence after GRADE classification, without any personal or institutional academic preferences.
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Amendments - This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 4 October 2025 and was last updated on 4 October 2025.

INTRODUCTION

Review question / Objective ① This study systematically evaluates the short-term/long-term efficacy and safety of speech-language therapy (SLT) for exercise-induced laryngeal obstruction (EILO); ② clarifies the impact of different SLT techniques, intervention durations, and population characteristics on therapeutic efficacy; ③ grades the strength of evidence and proposes clinical recommendation protocols; ④ analyzes the limitations of existing studies and provides references for future research directions. This study can provide evidence-based support for the clinical development of standardized SLT protocols and promote the standardization process of EILO diagnosis and treatment.

Condition being studied Computerized searches were conducted in PubMed, Embase, the Cochrane Library, Web of Science, China National Knowledge Infrastructure (CNKI), and Wanfang Data Knowledge Service Platform to identify

randomized controlled trials (RCTs), cohort studies, and systematic reviews on speech-language therapy (SLT) for exercise-induced laryngeal obstruction (EILO). Two reviewers independently screened the literature, extracted data, and assessed the methodological quality using the Cochrane Risk of Bias Tool (for RCTs), Newcastle-Ottawa Scale (NOS, for cohort studies), and AMSTAR 2 (for systematic reviews).

METHODS

Participant or population 1.Meet the diagnostic criteria for EILO: Abnormal movement of laryngeal structures is demonstrated by exercise challenge test combined with laryngoscopy, with exclusion of diseases such as asthma and vocal cord dysfunction (ATS/ERS, 2022);
2. Age ≥ 6 years;
3. No restrictions on gender or ethnicity.

Intervention Speech-Language Therapy.

Comparator 1.Experimental group: Adopts single or combined speech-language therapy (SLT) protocols (such as laryngeal relaxation training, breath-voice integration training, psychobehavioral intervention, among others);
2. Control group: Receives routine care, pharmacological treatment (e.g., anticholinergic drugs), wait-list treatment, or sham treatment.

Study designs to be included To systematically evaluate the efficacy and safety of speech-language therapy (SLT) for exercise-induced laryngeal obstruction (EILO) from 2005 to 2025, and to clarify the impacts of different SLT techniques, population characteristics, and intervention durations on therapeutic efficacy.

Eligibility criteria Study Types
Randomized controlled trials (RCTs), prospective cohort studies, and retrospective cohort studies;
Systematic reviews and Meta-analyses (limited to studies with methodological quality ≥ moderate);
Case reports, cross-sectional studies, and uncontrolled trials were excluded.
Study Participants
Meet the diagnostic criteria for EILO: Abnormal movement of laryngeal structures is demonstrated by exercise challenge test combined with laryngoscopy, with exclusion of diseases such as asthma and vocal cord dysfunction (ATS/ERS, 2022);
Age ≥ 6 years;
No restrictions on gender or ethnicity.
Exclusion Criteria
Patients with organic laryngeal lesions (e.g., vocal cord polyps) or neuromuscular diseases;
Intervention measures involving surgical treatment or without clear specific SLT protocols;
Incomplete data with inability to contact the authors for supplementary information;
Duplicate published studies (with retention of the latest ones or those with the largest sample sizes).

Information sources Computerized searches were conducted in PubMed, Embase, the Cochrane Library, Web of Science, China National Knowledge Infrastructure (CNKI), and Wanfang Data Knowledge Service Platform to identify randomized controlled trials (RCTs), cohort studies, and systematic reviews on speech-language therapy (SLT) for exercise-induced laryngeal obstruction (EILO). Two reviewers independently screened the literature, extracted data, and assessed methodological quality using the Cochrane Risk of Bias Tool (for RCTs), Newcastle-Ottawa Scale (NOS, for cohort studies), and AMSTAR 2 (for systematic reviews). RevMan 5.4 and Stata 17.0 were used to perform Meta-analysis, subgroup analysis, and sensitivity analysis, while the GRADE system was applied to grade the strength of evidence.

Main outcome(s) ① To systematically evaluate the short-term/long-term efficacy and safety of speech-language therapy (SLT) for exercise-induced laryngeal obstruction (EILO); ② To clarify the impacts of different SLT techniques, intervention durations, and population characteristics on therapeutic efficacy; ③ To grade the strength of evidence and propose clinical recommendation protocols; ④ To analyze the limitations of existing studies and provide references for future research directions.

Quality assessment / Risk of bias analysis
1. Randomized Controlled Trials (RCTs)
The Cochrane Risk of Bias Tool (Version 5.1.0) was used to assess risk across 7 domains (low/high/unclear risk): ① random sequence generation (e.g., use of random number tables); ② allocation concealment (e.g., use of sealed envelopes); ③ blinding of researchers/participants (complete blinding is difficult for SLT interventions, and "partial blinding only" must be noted); ④ blinding of outcome assessors (e.g., whether laryngoscopists were aware of group assignments); ⑤ data completeness (attrition rate and handling methods); ⑥ selective reporting (whether all prespecified outcomes were reported); ⑦ other biases (e.g., baseline balance).

2. Cohort Studies (Prospective/Retrospective)
The Newcastle-Ottawa Scale (NOS) was applied, with scoring across 3 domains and 8 items (total score: 9 points): ① selection bias (representativeness of exposed/control groups, clarity of inclusion criteria); ② comparability (adjustment for confounding factors such as age and obstruction type); ③ outcome bias (clarity of outcome definition, follow-up duration ≥ 6 months with a completion rate > 80%). Quality grading: ≥7 points = high quality, 4-6 points = moderate quality, ≤3 points = low quality.
3. Operational Standards
Two reviewers independently conducted assessments; discrepancies were resolved through consultation with a third party, and results were cross-validated.

Strategy of data synthesis Quantitative Synthesis (Meta-analysis): For randomized controlled trials (RCTs) and cohort studies, heterogeneity was first assessed using the I^2 test (a fixed-effects model was used for $I^2 < 50\%$, and a random-effects model for $I^2 \geq 50\%$); for continuous outcomes (e.g., symptom improvement scores), the mean difference (MD) was applied, while for dichotomous outcomes (e.g., response rates), the risk ratio (RR) was used, with 95% confidence intervals (95% CIs) calculated for both.
Qualitative Synthesis: If there was extremely high heterogeneity ($I^2 \geq 75\%$) or incomplete data (e.g., attrition rate > 20%), descriptive synthesis was conducted by study type and quality grade (high/moderate/low), focusing on summarizing trends in SLT efficacy differences.

Subgroup analysis Subgroup and Sensitivity Analyses: Stratified analysis was performed by SLT technique, population age, and intervention duration; low-quality studies were excluded followed by re-synthesis to verify the stability of results.

Sensitivity analysis After excluding low-quality studies (RCTs with high risk of bias, cohort studies with NOS ≤ 3 points), Meta-analysis was re-conducted to compare changes in heterogeneity (I^2 value) and effect sizes (MD/RR) before and after exclusion;
High-weight studies were excluded one by one (those with a weight proportion > 20% calculated by the inverse variance method), and whether there were significant fluctuations in results was observed;
For missing data, different imputation methods (e.g., complete case analysis, multiple imputation) were used for verification. If there were no significant differences in results after the above operations, it indicates the reliability of the synthesized conclusions; otherwise, sources of bias (e.g., quality of high-weight studies) need to be analyzed.

Country(ies) involved China.

Keywords exercise-induced laryngeal obstruction,speech-language therapy,evidence-based medicine,systematic review,Meta-analysis,GRADE grading.

Contributions of each author
Author 1 - Yanli Shi - Be responsible for study design, formulate the literature search strategy, and take charge of the compilation and revision of the manuscript.
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