STARS Education and Research Alliance

CREATING KNOWLEDGE | TRANSFORMING CARE

The University Of Queensland
AUSTRALIA

Metro North Health | Queensland Government

STARS Critically Appraised Topic (CAT) Group: Dysphagia Rehabilitation

Specific Question:

What is the best evidence for dysphagia rehabilitation of adults with oropharyngeal dysphagia following acquired brain injury?

Clinical bottom line

High quality evidence shows that dysphagia rehabilitation can improve swallowing outcomes for patients with neurogenic oropharyngeal dysphagia. Behavioural treatment approaches, including chin tuck against resistance (CTAR), expiratory muscle strength training (EMST), Shaker and jaw opening exercises, may be particularly effective. Further evidence for the clinical application of these approaches is required. There is some evidence from a limited number of studies demonstrating the effectiveness of neuromuscular electrical stimulation (NMES) (e.g. for hyoid excursion), however evidence for this approach is flawed and inconclusive at a systematic level.

Why is this important?

Oropharyngeal dysphagia is a common complication for patients with acquired brain injury. Appropriate management of dysphagia within the hospital setting is vital to reduce the risk of complications such as infection (Langdon, Lee, & Binns, 2007), distress, malnutrition and dehydration (Foley, Martin, Salter, & Teasell, 2009) as well as the long term cost to the health service (Altman, et al., 2010; Bonilha et al., 2014).

The STARS Speech Pathology team provides intensive rehabilitation to patients with oropharyngeal dysphagia across inpatient, day hospital and outpatient procedural services using a combination of indirect behavioural and direct (e.g. diet/fluid) intervention. Clinicians' understanding and access to the latest evidence for dysphagia rehabilitation, particularly newer approaches such as EMST and NMES, varies.

This CAT group aims to identify the best evidence for dysphagia rehabilitation for adults with acquired brain injury to ensure STARS patients are receiving the most effective, evidence-based care for their swallowing difficulties.

Inclusion Criteria

- Adults with oropharyngeal dysphagia following acquired brain injury (stroke/TBI), or surgical interventions such as tumour resection
- Rehabilitation in any setting, focusing on speech pathology/therapy
- Higher levels of evidence, including randomised controlled trials (RCTs) or reviews including umbrella, meta-analyses, systematic and scoping which have used a systematic methodology.
- English language
- Publications from 2010-2024

Search dates

2010-2024

Type of Study

Higher levels of evidence, including RCTs or reviews including umbrella, meta-analyses, systematic and scoping which have used a systematic methodology.

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Date CAT completed: 18/12/24; To be reviewed DD/MM/YYYY

PICOT

	Description	Search terms
Population and Setting	Adults over 18; diagnosis of oropharyngeal dysphagia (dysphagia/ swallow difficulty/ impairment/ dysfunction / disorder). Refining aetiology options considered: acquired brain injury (ABI, such as stroke or traumatic brain injury); surgical intervention (eg: tumour resection) – decision not to limit search at this stage and keep broad: adults with dysphagia.	Date: after 2009 Adults with dysphagia Oropharyngeal dysphagia Swallow difficulty/ impairment/ dysfunction / disorder Neurological NOT: Progressive neuro (motor neuron disease / Parkinson's Disease (PD)) NOT: other ie cancer / paediatric NOT: oesophageal dysphagia
Intervention or Exposure (ie what is being tested)	Not limited to setting (ie: rehabilitation/ treatment in any setting). Any intervention to target oropharyngeal dysphagia to be included.	Swallow/dysphagia rehabilitation Speech pathology (therapy/intervention) Neuromuscular stimulation NOT: acupuncture NOT: brain stimulation: Transcranial Magnetic Stimulation (TMS) / Transcranial Direct Current Stimulation (tDCS)
Comparison, if any	Options considered: Speech pathology only treatment; multidisciplinary team treatment; no treatment. Decision not to include a comparator due to the broadness of topic and potential to miss evidence from studies including studies without a comparator given emerging evidence in some areas.	n/a
Outcomes of interest	Potential outcomes of interest considered: Discharge destination; quality of life; length of stay. No standardised measure uniformly used – so prefer to determine during screening.	n/a
Types of studies	Randomised controlled trials or reviews (including umbrella/ meta / systematic / scoping).	English only NOT: qualitative reviews

Databases Searched

PubMed, CINAHL Complete, Embase, Cochrane Library

Date of search

3/10/2024

Search Strategies (including subject headings)

Search strategy, include key concepts and limits:
(dysphagia**) AND (**rehabilitation**) AND (**higher levels of evidence/relevant study types including systematic reviews and meta-analyses**) AND (**English language**) AND (**Humans**) AND (**publication year range**)**

PubMed 531 results
Includes MeSH

("Deglutition Disorders"[Mesh] OR "dysphagia"[ti] OR "deglutition disorder"[ti] OR "deglutition disorders"[ti] OR "swallowing disorders"[ti] OR "swallowing disorder"[ti] OR "swallowing impairment"[ti] OR "swallowing impairments"[ti] OR "difficulty swallowing"[ti] OR "swallowing difficulty"[ti] OR "swallowing difficulties"[ti] OR "swallowing dysfunction"[ti] OR "swallowing dysfunctions"[ti] OR "swallowing problems"[ti]) AND ("Rehabilitation"[Mesh] OR "rehabilitation"[tiab]) AND ("Systematic Reviews as Topic"[Mesh] OR "Systematic Review" [Publication Type] OR "Meta-Analysis as Topic"[Mesh] OR "Meta-Analysis" [Publication Type] OR "Controlled Clinical Trials as Topic"[Mesh] OR "Controlled Clinical Trial" [Publication Type] OR "systematic review"[ti] OR "systematic reviews"[ti] OR "systematic literature review"[ti] OR "systematic scoping review"[ti] OR "systematic evidence review"[ti] OR "systematic quantitative review"[ti] OR "systematic critical review"[ti] OR "systematic mixed studies review"[ti] OR "systematic mapping review"[ti] OR "Cochrane review"[ti] OR "Cochrane reviews"[ti] OR "systematic search and review"[ti] OR "systematically"[tiab] OR "meta analysis"[ti] OR "meta analyses"[ti] OR "meta-analysis"[ti] OR "meta-analyses"[ti] OR

"metanalysis"[ti] OR "metanalyses"[ti] OR “metaanalysis”[ti] OR “metaanalyses”[ti] OR "meta review"[ti] OR "meta reviews"[ti] OR "meta-review"[ti] OR "meta-reviews"[ti] OR "metareview"[ti] OR "metareviews"[ti] OR "umbrella review"[ti] OR "umbrella reviews"[ti] OR “overview”[ti] OR “overview”[ti] OR “review of reviews”[ti] OR “rapid review”[ti] OR “rapid reviews”[ti] OR “rapid evidence assessment”[ti] OR “mapping review”[ti] OR “mapping reviews”[ti] OR “scoping review”[ti] OR “scoping reviews”[ti] OR "randomized"[tiab] OR "randomised"[tiab] OR "randomly"[tiab] OR "trial"[tiab]) AND (eng[la] OR und[la]) NOT (animals [mh] NOT humans [mh]) AND 2010:2024[dp]

CINAHL Complete (EBSCOhost) 283 results
Includes CINAHL Subject Headings

(MH "Deglutition Disorders" OR TI(“dysphagia” OR “deglutition disorder” OR “deglutition disorders” OR “swallowing disorders” OR “swallowing disorder” OR “swallowing impairment” OR “swallowing impairments” OR “difficulty swallowing” OR “swallowing difficulty” OR “swallowing difficulties” OR “swallowing dysfunction” OR “swallowing dysfunctions” OR “swallowing problems”)) AND (MH "Rehabilitation+" OR TI(“rehabilitation”) OR AB(“rehabilitation”)) AND (MH "Systematic Review" OR MH "Meta Analysis" OR MH "Scoping Review" OR MH "Clinical Trials+" OR TI("systematic review" OR "systematic reviews" OR "systematic literature review" OR "systematic scoping review" OR "systematic evidence review" OR "systematic quantitative review" OR "systematic critical review" OR "systematic mixed studies review" OR "systematic mapping review" OR "Cochrane review" OR "Cochrane reviews" OR "systematic search and review" OR "systematically" OR "meta analysis" OR "meta analyses" OR “meta-analysis” OR “meta-analyses” OR "metanalysis" OR "metanalyses" OR “metaanalysis” OR “metaanalyses” OR "meta review" OR "meta reviews" OR "meta-review" OR "meta-reviews" OR "metareview" OR "metareviews" OR "umbrella review" OR "umbrella reviews" OR “overview” OR “overview” OR “review of reviews” OR “rapid review” OR “rapid reviews” OR “rapid evidence assessment” OR “mapping review” OR “mapping reviews” OR “scoping review” OR “scoping reviews” OR "randomized" OR "randomised" OR "randomly" OR "trial") OR AB("systematically" OR "randomized" OR "randomised" OR "randomly" OR "trial")) AND (LA English) NOT ((MH "Animals+" OR MH "Animal Studies" OR TI animal model*) NOT MH "Human") AND PY 2010-2024

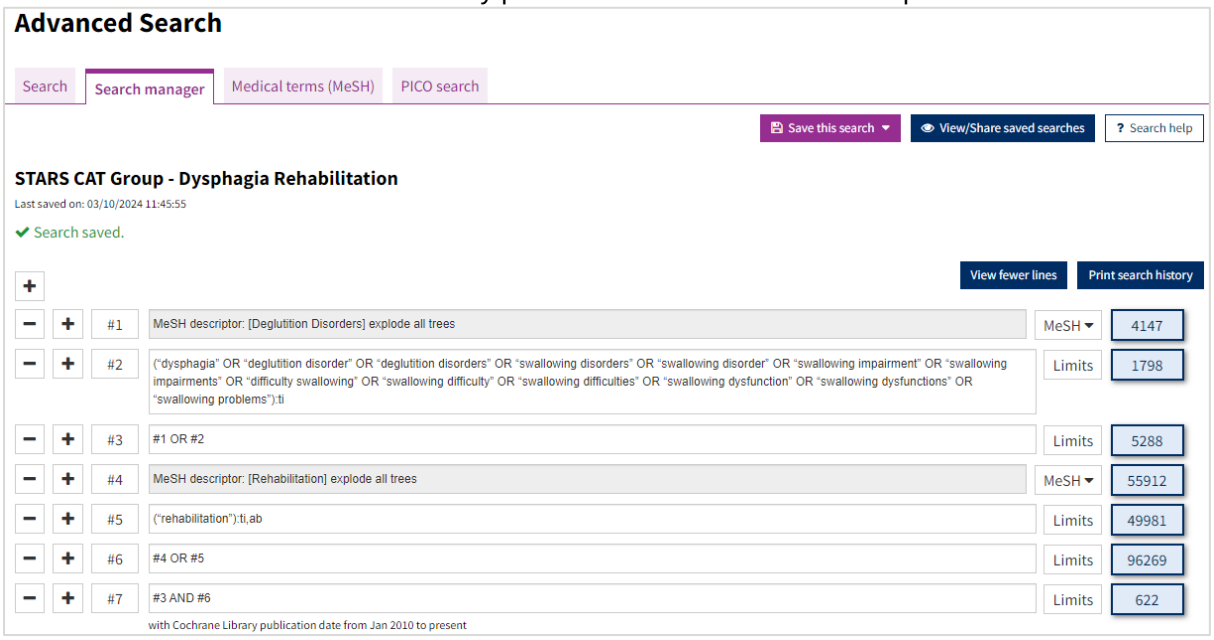
Embase (Elsevier) 647 results
Includes Emtree, and limited to relevant publication types (articles, articles in press and reviews)

('dysphagia'/exp OR “dysphagia”:ti OR “deglutition disorder”:ti OR “deglutition disorders”:ti OR “swallowing disorders”:ti OR “swallowing disorder”:ti OR “swallowing impairment”:ti OR “swallowing impairments”:ti OR “difficulty swallowing”:ti OR “swallowing difficulty”:ti OR “swallowing difficulties”:ti OR “swallowing dysfunction”:ti OR “swallowing dysfunctions”:ti OR “swallowing problems”:ti) AND ('rehabilitation'/exp OR “rehabilitation”:ti,ab) AND ('systematic review (topic)'/exp OR 'systematic review'/exp OR 'meta analysis (topic)'/exp OR 'meta analysis'/exp OR 'umbrella review'/exp OR 'scoping review'/exp OR 'rapid review'/exp OR 'controlled clinical trial (topic)'/exp OR 'controlled clinical trial'/exp OR "systematic review":ti OR "systematic reviews":ti OR "systematic literature review":ti OR "systematic scoping review":ti OR "systematic evidence review":ti OR "systematic quantitative review":ti OR "systematic critical review":ti OR "systematic mixed studies review":ti OR "systematic mapping review":ti OR "Cochrane review":ti OR "Cochrane reviews":ti OR "systematic search and review":ti OR "systematically":ti,ab OR "meta analysis":ti OR "meta analyses":ti OR “meta-analysis”:ti OR “meta-analyses”:ti OR "metanalysis":ti OR "metanalyses":ti OR “metaanalysis”:ti OR “metaanalyses”:ti OR "meta review":ti OR "meta reviews":ti OR "meta-review":ti OR "meta-reviews":ti OR "metareview":ti OR "metareviews":ti OR "umbrella review":ti OR "umbrella reviews":ti OR “overview”:ti OR “overview”:ti OR “review of reviews”:ti OR “rapid review”:ti OR “rapid reviews”:ti OR “rapid evidence assessment”:ti OR “mapping review”:ti OR “mapping reviews”:ti OR “scoping review”:ti OR “scoping reviews”:ti OR "randomized":ti,ab OR "randomised":ti,ab OR "randomly":ti,ab OR "trial":ti,ab) AND [english]/lim NOT (‘animal experiment’/de NOT (‘human experiment’/de OR ‘human’/de)) AND [2010-2024]/py AND ([article]/lim OR [article in press]/lim OR [review]/lim)

Cochrane Library (Wiley) 593 results, including 6 Cochrane Reviews and 587 Trials
Advanced search > Search manager (further limited Trials to year first published 2010-2024)
Includes MeSH

ID	Search	Hits
#1	MeSH descriptor: [Deglutition Disorders] explode all trees	4147
#2	(“dysphagia” OR “deglutition disorder” OR “deglutition disorders” OR “swallowing disorders” OR “swallowing disorder” OR “swallowing impairment” OR “swallowing impairments” OR “difficulty swallowing” OR “swallowing difficulty” OR “swallowing difficulties” OR “swallowing dysfunction” OR “swallowing dysfunctions” OR “swallowing problems”):ti	1798
#3	#1 OR #2	5288
#4	MeSH descriptor: [Rehabilitation] explode all trees	55912

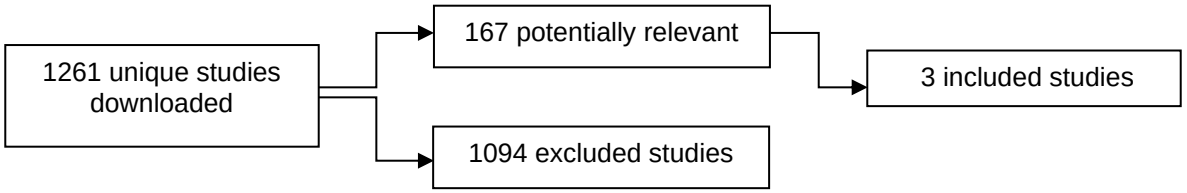
#5 ("rehabilitation"):ti,ab 49981
#6 #4 OR #5 96269
#7 #3 AND #6 with Cochrane Library publication date from Jan 2010 to present 622



Search process

Developed search in PubMed and translated for other health databases. Exported results to EndNote Library. Removed duplicates using the SR Accelerator Deduplicator tool - https://sr-accelerator.com/#/deduplicator. Imported deduplicated results into new EndNote Library for identifying potentially relevant results. For potentially relevant results, copied formatted references in an annotated style into Word document for CAT Group to select studies for critical appraisal

Results



Three studies were prioritised for review based on the level of evidence (scoping or systematic reviews) and relevance to the research question and clinical practice. In terms of relevance to the research question, studies were prioritised for review if they described and compared a range of behavioural rehabilitation approaches (commonly used in clinical practice) and/or more novel but readily available approaches that are not currently routine in our practice. These studies are summarised in the table below.

First Author, year and type of study	Population and setting	Intervention or exposure tested	Study results	Assessment of quality and comments (CASP checklist for systematic reviews used)
Speyer et al. (2022) Systematic review and meta-analysis	Population: 2656 adults with oropharyngeal dysphagia from 37 RCTs. Aetiology: Predominantly stroke. Other: Parkinson's Disease (PD), ABI, multiple sclerosis (MS), nasopharyngeal cancer. Setting: Various rehabilitation settings (results pooled).	Effect of behavioural interventions delivered by a dysphagia expert in people with oropharyngeal dysphagia, based on RCT results only. Pharmacological and surgical interventions excluded. Outcomes of interest not stated in aims but identified through retrieval of studies.	• Behavioural interventions had a larger effect size in treatment of oropharyngeal dysphagia as compared to no treatment, or compensatory treatments. • When comparing selected interventions with commonalities across studies, large effect sizes were identified for Shaker, CTAR and EMST. • When comparing outcome measures, large effect sizes were identified for PAS only. • Moderate effect size for stroke populations but accounted for the majority of RCTs.	• High quality evidence as inclusion of RCTs only; however, some gaps identified in rigor of included RCTs. • Omissions of some key databases (e.g. Cochrane) and search terms (MESH only for PubMed) and excluded non-English published studies. • Not possible to compare a homogeneous behavioural intervention group due to blended configurations of intervention groupings across the RCTs. **Clinical implications**: This study presents high-level evidence in favour of Chin Tuck Against Resistance (CTAR), Shaker and Expiratory Muscle Strength Training (EMST) as effective treatments for dysphagia. CTAR and Shaker are commonly applied to current dysphagia rehabilitation practice at STARS. This study provides evidence to advocate for greater access to EMST.
Wang et al. (2023) Systematic review and meta-analysis	Population: 331 adults with oropharyngeal dysphagia from 9 RCTs / quasi RCTs. Aetiology: Stroke Setting: Not specified	Evaluate whether Neuromuscular Electrical Stimulation (NMES) is better for swallowing outcomes than traditional therapy post stroke AND provide guidance for clinical treatment using NMES in post stroke patients. Clinically-relevant swallow outcome measures used: Functional Oral Intake Scale (FOIS), Penetration-Aspiration Scale (PAS), Swallowing Quality of Life questionnaire (SWAL-QOL).	• NMES combined with traditional therapy improved swallow function significantly when measured by FOIS outcome measure (7 studies). • In 2 studies, there was a significant improvement in PAS scores for diet only. • One study identified a significant improvement in SWAL-QOL.	• Omission of key search terms e.g. stroke, dysphagia, in title/abstract field). • Meta-analysis completed for results from single studies which may conflate results. • Fixed effects modelling used given reported low heterogeneity however, again this may be related to analysis of single or very small numbers of studies. These may substantially reduce our confidence in the findings of the meta-analysis. • Overall, considerable flaws in the application of standardised meta-analysis given the number of results. • Grandiose language did not reflect true significance of findings. **Clinical implications**: insufficient evidence to support use of Neuromuscular Electrical Stimulation (NMES) for the treatment of dysphagia due to methodological flaws.

First Author, year and type of study	Population and setting	Intervention or exposure tested	Study results	Assessment of quality and comments (CASP checklist for systematic reviews used)
Namasivayam-MacDonald et al. (2022) Mapping/scoping review	Population: 975 adults with oropharyngeal dysphagia from 43 studies. Aetiology: 47% of studies: stroke. Other diagnoses: head and neck cancer, PD, other neurological deficits. Setting: Not specified.	Map outcomes of swallow treatment approaches to specific areas of swallowing physiological function, as identified using Modified Barium Swallow Impairment Profile (MBSImp).	• Nine physiological swallowing components (of the 17 components assessed in MBS Imp) improved following swallowing rehabilitation. • Outcomes: Improvements in anterior hyoid, followed by laryngeal elevation, had the greatest number of large effect sizes. • Treatments: Shaker exercise had the greatest effect sizes followed by jaw opening exercises.	• Heat map of behavioural interventions mapped against physiological swallowing components is very clinically relevant. Specific details about treatment dosage included. • Appropriate inclusion/exclusion criteria. • Included non RCTs but these were appropriate for type of mapping review. • Some key databases missing but reasonable search strategy. • Completed grade evidence levels and implemented appropriate rigor strategies for author's review in screening and data extraction. • Detailed and reasonable explanation of how data was pooled. • Identified gaps in research across different parameters. **Clinical implications:** although less rigorous than a systematic review as a scoping/mapping review, this study provides highly accessible and relevant information to guide clinical management of dysphagia, which compliments well-established assessment protocols (VFSS, MBSImp). While caution should be paid with regards to the small number of included studies and lack of evidence for some swallowing deficits, the evidence presented can be used to support speech pathologists' decision making and application of evidence-based practice.

Summary

Dysphagia rehabilitation improves some physiological deficits, primarily anterior hyoid movement and laryngeal elevation, and some clinically relevant outcome measures (Penetration-Aspiration Scale (PAS); and Functional Oral Intake Scale (FOIS) for patients with oropharyngeal dysphagia (Namasivayam-MacDonald et al., 2022; Speyer et al., 2022; Wang et al., 2023). When comparing selected dysphagia rehabilitation interventions with commonalities across studies, the following exercises had the largest effect sizes: Expiratory Muscle Strength Training (EMST), Shaker, Chin Tuck Against Resistance (CTAR), and jaw opening exercises (Namasivayam-MacDonald et al., 2022; Speyer et al., 2022).

The mapping review by Namasivayam-MacDonald et al. (2022) is highly applicable to clinical practice, providing guidance around which treatment approaches are effective in treating specific physiological deficits. Further, the paper addresses some gaps in terms of treatment dose and how approaches are delivered. However, it is important to note that the strength of findings from this review was impacted by small sample sizes within studies included in the review and a lack of studies reporting on improvements to some physiological swallow deficits (e.g. pharyngeal clearance). Additional evidence regarding the optimal clinical delivery of these approaches (e.g. dose, frequency, length of treatment) would be of benefit to further enhance treatment effectiveness.

There is some evidence for benefits of NMES combined with traditional behavioural rehabilitation for improving PAS and FOIS scores; however, overall, the evidence for this approach is limited. Further, flaws in the methodology for the systematic review investigating this approach impact confidence in NMES effectiveness (Wang et al., 2023). Further evidence for the effectiveness of NMES and its application to practice (e.g. protocols, contraindications and equipment) is required for its delivery within clinical practice.

Implications for Practice/research

Following this CAT group, the speech pathology team will re-introduce use of EMST for patients with neurological dysphagia who are deemed clinically appropriate. This evidence has supported the development of a local EMST instruction and protocol to facilitate translation of evidence into practice. Further, the evidence reviewed has confirmed efficacy of approaches currently routinely delivered in practice, including Shaker, CTAR, and jaw opening exercises. There are ongoing questions about optimal dose to maximise effects of these approaches. These questions will be further explored by the STARS speech pathology team through an ongoing quality improvement project, and journal clubs.

Further research into NMES is required to determine whether this is effective and suitable for delivery in clinical practice given the methodological flaws of the evidence reviewed for this approach.

Collectively, the findings from this CAT group will inform the development of a dysphagia evidence map and clinician learning pathway to support upskilling and consistency of practice within the STARS speech pathology team. Results of this CAT will be shared with other speech pathologists across Metro North Health via the Metro North Speech Pathology Research & Quality Improvement Symposium.

What would you tweet? (140 characters)

Dysphagia rehab can improve swallowing function. CTAR, EMST, Shaker & jaw exercises may be particularly effective. NMES shows promise but needs more research.

Critical Appraisal Topic Group Team Members

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References

Namasivayam-MacDonald, A., Rapley, M., Stewart, J., Webster, E., Quon, C., & Rogus-Pulia, N. (2022). Impact of dysphagia rehabilitation in adults on swallowing physiology measured with videofluoroscopy: A mapping review. *American Journal of Speech-Language Pathology*, *31*(5), 2195-2228.

Speyer, R., Cordier, R., Sutt, A. L., Remijn, L., Heijnen, B. J., Balaguer, M., ... & Bergström, L. (2022). Behavioural interventions in people with oropharyngeal dysphagia: a systematic review and meta-analysis of randomised clinical trials. *Journal of clinical medicine*, *11*(3), 685.

Wang, Z., Xiao, Z., Shen, Q., Zhao, N., & Zhang, W. (2024). Neuromuscular electrical stimulation for post-stroke dysphagia treatment: a systemic evaluation and meta-analysis of randomized controlled trials. *Dysphagia*, *39*(3), 424-432.