The rehabilitation nurse's intervention in elderly people with dysphagia: systematic literature review

A intervenção do enfermeiro de reabilitação em idosos com disfagia: revisão sistemática da literatura

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ABSTRACT
Context: Dysphagia in aging is associated with malnutrition and cognitive changes resulting from the natural decline of the body's homeostasis at the end of life. It is a permanent challenge for the rehabilitation nurse (RN) to ensure a safe nutrition of the elderly person by re-educating swallowing. Objective: To identify the current scientific evidence on the effectiveness of swallowing rehabilitation interventions in older people with dysphagia. Methodology: Systematic Literature Review (SLR) conducted according to the methodology proposed by the Joanna Briggs Institute, based on studies published between 2017 and 2022, in the databases: CINAHL Complete, MEDLINE Complete, Nursing & Allied Health Collection: Comprehensive Edition and Cochrane Central Register of Controlled Trials and PubMed. Critical appraisal, data extraction and synthesis were performed by two independent reviewers. Results: Initially 647 articles were identified, however only 7 were included in this Review as they met the defined criteria. We found very disparate oropharyngeal rehabilitation plans, particularly regarding the type of exercises/techniques and the use of devices. As for the devices, we tested the Gentle Stim® for transcutaneous electrical neurostimulation (TENS); the IQoro® to stimulate sensory input and strengthen facial, oral, and pharyngeal muscles; the Tongue Pressure Strengthening (TPS) for tongue muscle exercise with resistance training. Conclusion: The elderly person can improve swallowing ability if subjected to a personalized oropharyngeal rehabilitation plan, minimizing the risk of complications. Further research by RN is recommended.
Keywords: Dysphagia, swallowing, elderly, rehabilitation nursing.

RESUMO
Contexto: A disfagia no envelhecimento está associada à desnutrição e às alterações cognitivas decorrentes do declínio natural da homeostase do organismo no final da vida. É um desafio permanente para o enfermeiro de reabilitação (Enfermeiro) garantir uma alimentação segura ao idoso através da reeducação da deglutição. Objetivo: Identificar as evidências científicas atuais sobre a eficácia das intervenções de reabilitação da deglutição em idosos com disfagia. Metodologia: Revisão Sistemática da Literatura (RSL) realizada segundo metodologia proposta pelo Joanna Briggs Institute, com base em estudos publicados entre 2017 e 2022, nas bases de dados: CINAHL Complete, MEDLINE Complete, Nursing & Allied Health Collection: Comprehensive Edition e Cochrane Central Registro de Ensaios Controlados e PubMed. A avaliação crítica, a extração e a síntese dos dados foram realizadas por dois revisores independentes. Resultados: Inicialmente foram identificados 647 artigos, porém apenas 7 foram incluídos nesta Revisão por atenderem aos critérios definidos. Encontrámos planos de reabilitação orofaríngea muito díspares, nomeadamente no que diz respeito ao tipo de exercícios/técnicas e à utilização de dispositivos. Quanto aos aparelhos, testamos o Gentle Stim® para neuroestimulação elétrica transcutânea (TENS); o IQoro® para estimular a entrada sensorial e fortalecer os músculos faciais, orais e faríngeos; o Fortalecimento da Pressão da Língua (TPS) para exercícios musculares da língua com treinamento de resistência. Conclusão: O idoso pode melhorar a capacidade de deglutição se for submetido a um plano de reabilitação orofaríngea personalizado, minimizando o risco de complicações. Recomenda-se mais pesquisas por RN.

Palavras-chave: Disfagia, deglutição, idosos, enfermagem de reabilitação.

1 INTRODUCTION
Swallowing is a complex process that is essential to life. Not only is it essential for existence, but it also plays an important role in happiness and socialisation. With ageing, changes in the swallowing process begin to manifest themselves. Some of these changes are subtle, leading to changes in the consistency, volume and speed with which food is swallowed (Baijens et al., 2016); others reflect neurological and cognitive-behavioural changes, with more serious manifestations (Capelari & Budni, 2019).

Dysphagia refers to impaired or difficult swallowing, resulting from an abnormal delay in the transit of the food bolus, whether liquid or solid. From an anatomical point of view, the delay can occur during the oropharyngeal or oesophageal phase of swallowing (Park et al., 2021). Despite its enormous impact on functional capacity, health and quality of life, dysphagia is underestimated and
underdiagnosed, and is the cause of the main nutritional and respiratory complications in elderly patients. Dysphagia can lead to decreased swallowing efficiency, leading to malnutrition and dehydration, decreased swallowing safety, leading to tracheobronchial aspiration resulting in aspiration pneumonia, and can even lead to death (Rofes et al., 2011; Capelari & Budni, 2019; Batista et al, 2023).

Dysphagia is very prevalent among the elderly due to ageing itself, coexisting medical problems, age-related neurological and neurodegenerative diseases (stroke, Parkinson's disease, dementia), non-neurological diseases (heart failure, rheumatoid arthritis, etc.), frailty and sarcopenia (Baijens et al., 2016).

Educating healthcare professionals about the early identification of patients with dysphagia, the diagnosis and treatment of dysphagia and its complications, and improving therapeutic strategies to provide patients with safe and effective swallowing, are the cornerstones for enabling maximum recovery potential for elderly patients with dysphagia (Rofes et al., 2011). According to the Preamble to Regulation 392/2019 published in the Official Gazette of May 2019, the intervention of the Rehabilitation Nurse (RN) plays an important role in maintaining patients' functional capacities, preventing complications, and preserving capacities, improving residual functions, preserving and recovering independence in life activities and minimising the impact of existing disabilities (Regulation 329/2019).

Intervention at the level of functional motor and sensory re-education and feeding function is essential for the person's recovery, with the aim of optimising and/or re-educating their independence, as the NB teaches, demonstrates, and trains techniques with a view to promoting self-care and continuity of care in different contexts (Regulation No. 329/2019).

Aware of the issues surrounding older people with swallowing disorders and the interest felt as an RN, a systematic literature review (SLR) was carried out, and the research question was defined as: "Is there evidence of rehabilitation interventions that improve swallowing dynamics in older people with dysphagia?". To answer this question, the aim of this study was to identify the current scientific evidence on the effectiveness of rehabilitation interventions for swallowing dynamics in older people with dysphagia. In the initial phase of a systematic review, it is necessary to develop a review protocol. The protocol is a document that is
completely separate from the systematic review report and pre-defines the objectives and methods of the systematic review, which makes the process transparent and allows the reader to see how the conclusions and recommendations were reached (Aromataris & Munn, 2020). The review protocol was carried out and followed by the authors, although it has not been published. However, it can be provided on request.

2 METHODOLOGY

The phase of formulating the research question, according to Donato & Donato (2019), guides the entire process and must consider its possible limitations. If the question is too narrow, the number of studies may be limited and generalisation may be restrictive; if the question is too broad, it becomes difficult to obtain conclusions applicable to a given population.

According to Aromataris & Munn (2020) this question must be clear, objective, and feasible. Sousa et al. (2018) add that a poorly formulated question makes it difficult to access adequate and relevant information and can also lead to an increase in research time. If the question is well formulated at the beginning of the study, it can be successfully answered.

The most widely used method in evidence-based medicine and health science disciplines for RSL of quantitative studies is the model defined by the acronym PICO (Sousa et al., 2018): P - population; I - intervention (therapeutic, diagnostic, preventive, prognostic); C - comparison or control; O - outcome.

Based on this premise, the following research question was drawn up to guide our RSL: "Is there evidence that rehabilitation interventions for older people with dysphagia are effective in improving swallowing dynamics?", conducted using the PICO method.

Eligibility criteria were defined according to the PICO methodology, as explained in Table 1.

<table>
<thead>
<tr>
<th>Eligibility criteria</th>
<th>Inclusion criteria</th>
<th>Exclusion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>População</td>
<td>People aged 65 and over with dysphagia</td>
<td>People with other associated pathologies: stroke, Parkinson's, dementia and head and neck cancer</td>
</tr>
<tr>
<td>Intervenção</td>
<td>Rehabilitation interventions (exercises)</td>
<td></td>
</tr>
</tbody>
</table>
The database searches were carried out on 16 September 2022, according to the defined eligibility criteria, in different stages.

The following MeSH descriptors were used in the search strategy: "deglutition disorders", "aged; "rehabilitation nursing"; "rehabilitation" and "exercise therapy". In order to carry out the search, the MeSH descriptors identified above and keywords were used in conjunction with the Boolean operators AND and OR. The search strategy adopted was as follows: "deglutition disorders" [MeSH] OR "dysphagia" AND "aged" [MeSH] AND "rehabilitation nursing" [MeSH] OR "rehabilitation" [MeSH] OR "exercise therapy" [MeSH].

The search was limited to studies between 1 January 2017 and 31 September 2022, available in full text, with the aim of providing a foundation based on the latest state of the art. Data was collected from various electronic databases, namely: Cumulative Index to Nursing and Allied Health Literature (CINAHL) Complete, Medical Literature Analysis and Retrieval System Online (MEDLINE) Complete, Nursing & Allied Health Collection: Comprehensive Edition and Cochrane Central Register of Controlled Trials and PubMed (from the EBSCOhost search engine). After searching the databases, as explained in the previous chapter, a total of 647 articles were obtained (Table 2).

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Outcome</th>
<th>Study Design</th>
<th>Language</th>
<th>Inclusion period</th>
</tr>
</thead>
<tbody>
<tr>
<td>not applicable</td>
<td>Effectiveness of rehabilitation interventions</td>
<td>Experimental and Quasi-Experimental studies; Randomised controlled trials; Case studies;</td>
<td>Portuguese, English and Spanish</td>
<td>Studies published from 2017 to 2022</td>
</tr>
</tbody>
</table>

Source: Elaborated by the authors

Table 2 – Identified Studies

<table>
<thead>
<tr>
<th>Search Engine</th>
<th>Databases</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>EBSCOhost</td>
<td>CINAHL Complete</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>MEDLINE Complete</td>
<td>282</td>
</tr>
<tr>
<td></td>
<td>Nursing &amp; Allied Health Collection: Comprehensive Edition</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Cochrane Central Register of Controlled Trials</td>
<td>55</td>
</tr>
<tr>
<td></td>
<td>PubMed</td>
<td>267</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>647</td>
</tr>
</tbody>
</table>

Source: Elaborated by the authors
To assess eligibility, the titles and abstracts of the studies were analysed by two independent reviewers, who determined by consensus the studies to be included in this review. After removing duplicates, the article libraries were distributed by the reviewers for independent selection, and after this procedure, the libraries were reconciled to analyse the concordance of the selection.

The study selection process is described in the diagram shown in Figure 1, following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow chart protocol. The diagram visually summarises the selection process. It initially records the number of articles found and then makes the selection process transparent by describing the decisions followed in the various stages of the systematic review. The number of articles is recorded in 3 phases: study identification, screening and inclusion (Page et al., 2020).
Of the 7 articles included in this RSL, 4 were randomised studies, 2 were case series studies and 1 was a case-control article (Table 3).

Any disagreements that arose between the reviewers at each stage of the study selection process were resolved through discussion or with a third reviewer.

Table 3 - Identification of the studies included in the RSL.

<table>
<thead>
<tr>
<th>Study</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Study 2</strong></td>
<td>Balou, M., Herzberg, E. G., Kamehar, D., &amp; Molfenter S. M. (2019). An intensive swallowing exercise protocol for improving swallowing physiology in older adults with radiographically confirmed dysphagia. Clinical Interventions in Aging, 14, 283-</td>
</tr>
</tbody>
</table>
3 RESULTS

After fully reading and analysing the seven articles that make up the corpus of this RSL and to facilitate the systematisation and understanding of the information, we extracted the relevant information from each study, as shown in Table 4. It shows the main aspects related to the type of study, objective and participants, relevant interventions and results/conclusions obtained from each article. In this way, the results are presented in a table summarising the studies included, following the JBI guidelines, according to which the presentation of the results can map the material reviewed in a logical, diagrammatic, or tabular way and/or in a descriptive format, if it is in line with the aim of the review. It is important to emphasise that the articles were ordered according to the year of publication.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Objective</td>
<td>To investigate the effect of transcutaneous electrical neurostimulation (TENS) using interferential current (IFC) in the treatment of patients with dysphagia.</td>
</tr>
<tr>
<td>Study Design</td>
<td>Double-blind, randomised controlled trial</td>
</tr>
<tr>
<td>Participants</td>
<td>Dysphagia rehabilitation was prescribed to 67 patients during the Study period. Of these, 47 were included in the Study after determining that they met the eligibility requirements. However, 4 patients (two in each group) were excluded because they</td>
</tr>
</tbody>
</table>
died before the Study was completed; thus, 43 patients (mean age, 84.3±7.5 years; 58 per cent women) were included in the final analysis.

**Interventions**

A portable device (Gentle Stim®) was used to perform TENS. This device was designed to stimulate the nerves inside the neck by placing two pairs of electrodes of different frequencies (2,000 and 2,050 Hz) along the neck. The 15-minute sensory stimulation was carried out twice a day (morning and afternoon), 5 days a week for 2 weeks.

**Results/Conclusions**

The study revealed that in relation to the effectiveness of TENS using IFC during dysphagia rehabilitation, the cough latency time (representing protection against aspiration) was longer in the sensory stimulation group than in the simulated stimulation group. The amount of oral intake also improved more in the sensory stimulation group than in the simulated group. TENS using IFC has been shown to have a favourable impact on airway defence and nutrition in patients with dysphagia.

**Study 2**

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Case series</th>
</tr>
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<tbody>
<tr>
<td>Participants</td>
<td>9 healthy elderly people (6 women, mean age 75.3 years) who had evidence of dysphagia confirmed in a modified barium swallow study.</td>
</tr>
<tr>
<td>Interventions</td>
<td>Each participant completed an 8-week swallowing exercise protocol. The treatment sessions were held once a week in an outpatient clinic and lasted 45 minutes. The swallowing exercises included strained swallows, Masako manoeuvres, supraglottic swallows, Shaker exercises, Mendelsohn manoeuvres and, finally, strained pitch slides - saying the sound “eee” straining from a low sound to a high sound. The number of repetitions for each series of exercises was 20, except for the pitch glide with effort, where the target was 10 per series (total swallowing exercises per treatment session = 110). If any participant could not tolerate the 20 repetitions of a given exercise at the beginning, a modified incremental increase was carried out. At the end of the 8 weeks, all participants were able to tolerate completing the desired repetitions per set. In addition to the weekly treatment sessions, participants were expected to complete three additional sets of daily tasks, with a total of 330 swallowing repetitions per day.</td>
</tr>
<tr>
<td>Results/Conclusion</td>
<td>The exercise protocol improved swallowing physiology scores by analysing the Modified Barium Swallow Impairment Profile (a method that assesses 17 components of swallowing physiology). There were improvements in the overall ratings of the &quot;total oral&quot; and &quot;total pharyngeal&quot; components. The results concluded that there were significant improvements in swallowing physiology, including improvements in the onset of pharyngeal swallowing, laryngeal elevation and pharyngeal residues. The improvement in the location of the food bolus at the start of swallowing is justified by the training in closing the airway during the supraglottic swallowing manoeuvre. The improvement in pharyngeal residues may be the result of improving the strength of the pharyngeal constrictor muscles through training in straining and swallowing, tongue retention and/or prolonged opening of the upper oesophageal sphincter during Mendelsohn manoeuvres. Improvements in laryngeal elevation seem to be related to effort-induced shortening, strengthening of the laryngeal muscles in the Shaker exercise and/or laryngeal elevation during the Mendelsohn manoeuvre. Swallowing physiology can be improved using this standardised high-intensity exercise protocol in healthy adults with evidence of dysphagia.</td>
</tr>
</tbody>
</table>

**Study 3**

<table>
<thead>
<tr>
<th>Study Design</th>
<th>Prospective, randomised controlled trial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective</td>
<td>To investigate the effect of oral neuromuscular training on elderly people in intermediate care with swallowing difficulties.</td>
</tr>
</tbody>
</table>
### Participants
385 elderly people from 36 intermediate care units were screened for swallowing dysfunction between October 2013 and February 2016. After screening, 172 participants showed no swallowing impairment and were excluded, while 209 participants showed impaired swallowing, 97 of whom refused to take part in the Study. The remaining 116 participants were randomly assigned to receive oral neuromuscular training (n=49) or usual care with a change in feeding consistency and postural correction (n=67) for 5 weeks.

### Interventions
This study used an oral neuromuscular training device, IQoro®. The device is designed to stimulate sensory input and strengthen the facial, oral and pharyngeal muscles. The training was carried out as follows: (1) the device is placed in the mouth, pre-dentally, behind closed lips; (2) the participant pulls the handle of the device forwards, as if to pull it out of the mouth, for approximately 5 to 10 seconds. The manoeuvre is performed three times, with a 3-second rest between each manoeuvre. The pulling force should be as high as possible, without losing the grip of the device.

### Results/Conclusions
Oral neuromuscular training had a positive effect on swallowing dysfunction in elderly intermediate care patients. Participants in the intervention group significantly increased their swallowing rate and reduced clinical signs of aspiration, such as coughing and/or voice change when swallowing, after 5 weeks of oral neuromuscular training compared to the control group. Oral neuromuscular training is a promising new method for rehabilitating swallowing dysfunction in elderly people in intermediate care.

### Study 4


**Objectives**
To see if tongue pressure resistance training improves both tongue function and hyoid movement during swallowing.

**Study Design**
Case series

**Participants**
18 elderly people (mean age 76.8±6.2 years): 11 men and 7 women, with presbyphagia presenting symptoms such as coughing and choking during feeding.

**Interventions**
To carry out the tongue thrust resistance training, the participants first pushed their tongue against their palate as hard as possible for 10 seconds with their mouth closed and then rested for 10 seconds. They repeated the exercise and rest period 5 consecutive times and performed 2 sets a day for a month. To confirm each participant's viability to perform tongue thrust resistance training, the examiner observed and verified the hyoid elevation resulting from the contraction of the suprahyoid muscle using videofluoroscopy during tongue thrust resistance training. Videofluoroscopy confirmed that all participants could perform tongue thrust resistance training.

**Results/Conclusions**
Tongue pressure resistance training improved tongue strength and dexterity, anterior and superior hyoid elevation, and swallowing function. Tongue pressure resistance training can improve the function of the tongue and suprahyoid muscles simultaneously and contribute to the prevention of sarcopenic dysphagia.

### Study 5

**Park, J. S., Lee, S. H., Jung, S. H., Choi, J. B., & Jung, Y. J. (2019). Tongue strengthening exercise is effective in improving the oropharyngeal muscles associated with swallowing in community-dwelling older adults in South Korea: A randomized trial.**

**Objectives**
To investigate the effect of tongue strengthening exercises on the oropharyngeal muscles associated with swallowing in the elderly.

**Study Design**
Randomised study trial

**Participants**
40 elderly people living in 2 residential homes for the elderly in Busan, South Korea, were divided into 2 groups: the experimental group (n=20) and the control group (n=20) performed a tongue strengthening exercise. The exercise was divided into an isometric and isotonic part. The control group (n=20) did not perform the exercise.

**Interventions**
The experimental group performed tongue strengthening exercises using the Tongue Pressure Strengthening (TPS) device.
The TPS system is a tongue muscle exercise device designed for resistance training. The TPS system consists of a pressure sensor, connecting tube with air bag and display (e.g. tablet, smartphone) for resistance training. The sensor and tablet are connected via Bluetooth. The external force applied to the pressure sensor is automatically displayed on the tablet screen in kPa.

The experimental group performed the tongue strengthening exercise using the TPS system. The 1-repetition maximum (1-RM) was measured for all subjects before training to determine the baseline resistance value, the pressure sensor was placed between the tongue and palate of each participant in both groups and they were asked to press their tongue as hard as possible against the sensor.

The exercise performed by the experimental group was divided into isotonic and isometric. The isotonic type was performed by repeating the contraction and relaxation of the tongue muscle 30 times in 3 sets per day. The isometric type was performed by contracting the tongue muscle for 30 seconds in a total of 3 sets.

Results/Conclusions

The experimental group showed a statistically significant increase in the strength and thickness of the tongue muscle in the oral phase by 18% and 5% respectively. In the pharyngeal phase, the experimental group showed a statistically significant increase in the mylohyoid and digastric muscles (suprahyoid muscles) (P= 0.045 and 0.019, respectively). The control group showed no statistically significant changes. Therefore, tongue strengthening exercises are an effective method for increasing tongue strength and thickness in the elderly.

Study 6


Objectives

To investigate whether the combined isotonic technique of proprioceptive neuromuscular facilitation (PNF) is superior to Shaker exercises in improving swallowing function.

Study Design

Randomised controlled study

Participants

50 elderly people (30 women and 20 men; mean age 68 ±3.98 years) with swallowing difficulties.

The patients who took part in the Study were divided into two treatment groups: the Shaker group (69±4.93 years) and the PNF group (67±2.05 years).

15 women and 10 men in each group.

Interventions

Participants in the Shaker group performed Shaker exercises consisting of isometric repetitions (3 repetitions) and isotonic contractions (30 repetitions) for the neck flexor muscles. In the isotonic exercises, the patients were instructed to raise their heads thirty consecutive times. When performing the isometric exercises, the patients raised their heads and held them in this position for 1 minute three times, followed by 1 minute of rest. Each exercise was performed once a day, 3 days a week for 6 weeks.

The PNF group used a combined isotonic technique including concentric contractions, stabilising contractions, and eccentric concentric traction without relaxation. The patients were asked to move their heads against resistance, from the end of left rotation-extension to the end of right flexion-rotation, keeping their mouths open diagonally (concentric contraction), at the end of the movement they held the position for 6 seconds against resistance (stabilising contraction) in a sitting position.

Results/Conclusions

The main finding of this study was that strengthening exercises with PNF techniques using combined isotonic tractions reduced the severity of dysphagia as much as Shaker exercises. The secondary finding was that the PNF technique increased the mean peak contraction amplitude obtained during maximal voluntary contraction of the suprahyoid muscles more than the Shaker exercises. The third finding was that both exercise methods increased the speed, capacity and amount of water swallowed.

Study 7


Objectives(s)

Compare the effectiveness of the Chin Tuck Against Resistance (CTAR), submandibular push-pull and Shaker exercises for inducing selective contractions of the suprahyoid and infrahyoid muscles using a simple device such as a plastic bar.

Study Design

Prospective case-control study

Participants

45 participants: 25 healthy participants, 21 men and 4 women (with an average age of
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29.9 ± 4.1 years) and 20 patients with swallowing difficulties, 12 men and 12 women, with an average age of 70.6±9.0 years).

**Interventions**
Each participant was asked to consecutively perform three different types of exercise (10 repetitions in each exercise) in the following order: (1) the Shaker exercise, (2) the CTAR exercise and (3) the submandibular thrust exercise, with a 10-minute rest between each exercise session to avoid-fatiguing the swallowing muscles. For each exercise, participants were instructed to hold the end position for 10 seconds. Participants were instructed to keep their mouths closed during all exercises. Firstly, to perform the Shaker exercise, healthy individuals and patients with swallowing difficulties were instructed to perform the following exercise protocol: lie on the bed in a supine position, lift the head and hold it for 10 seconds. Secondly, when performing the CTAR exercise, the participants were instructed to sit on a chair and press their chin as hard as possible against a CTAR device placed under their chin. Finally, when performing the submandibular thrust exercise, participants were instructed to sit on a chair and increase the pressure in the submandibular region against a plastic device without cervical flexion. They were all instructed to maintain the final posture during the three exercises, and surface EMG data was recorded.

**Results**
In the present study, both the maximum and mean square root values of all the muscles examined showed significant differences according to the different exercises, both in healthy individuals and in patients with swallowing difficulties. However, the muscle contraction patterns during the three exercises showed slightly different results between the participants involved.

The CTAR and Shaker exercises induced similar contractions of the sternocleidomastoid, suprahyoid and infrahyoid muscles in healthy individuals, possibly because both exercises included neck flexion movement patterns. Overall muscle contraction was greater in the Shaker exercise group than in the CTAR group. This is potentially because the Shaker exercise is performed with neck flexion against gravity.

In patients with swallowing difficulties, the degree of contraction of the supra- and infrahyoid muscles with the submandibular thrust exercise was greater than with the CTAR exercise, but similar to the Shaker exercise. However, in patients with swallowing difficulties, the submandibular thrust exercise exhibited less contraction of the sternocleidomastoid muscle than contraction of the supra- and infrahyoid muscles, unlike the other two exercise methods. However, in patients with swallowing difficulties, the submandibular thrust exercise exhibited less contraction of the sternocleidomastoid muscle than contraction of the supra- and infrahyoid muscles, unlike the other two exercise methods.

Although Shaker and CTAR exercises can induce powerful contractions of the muscles involved in swallowing, they may be ineffective from the point of view of selective contraction of the supra- and infrahyoid muscles due to unnecessary contraction of the ECM muscle. Considering its superiority in inducing selective contractions of the supra- and infrahyoid muscles, submandibular thrust exercise may be an effective exercise method in both healthy individuals and patients with swallowing difficulties.

Source: Elaborated by the authors

In this RSL, it was not possible to carry out a meta-analysis due to the lack of clinical homogeneity, so we opted for a narrative synthesis of the 7 selected studies.

**4 DISCUSSION**

This chapter aims to reflect on the selected Studys, with a view to their applicability in the context of clinical practice. It is therefore at this point that the search for an answer to the research question that guided this RSL begins: "Is
there evidence that rehabilitation interventions improve swallowing dynamics in older people with dysphagia?"

The articles included in this review were published in 2017 (S1), 2019 (S2, S3, S4, S5), 2020 (S6) and 2021 (S7) and resulted from studies carried out in different countries, namely the United States of America (S2), Sweden (S3), Japan (S1, S4), Turkey (S6) and South Korea (S5) and the Republic of Korea (S7). The studies selected were mostly carried out on elderly people by various professional groups (physiotherapists; nutritionists, doctors, a nurse, a dentist), in an outpatient setting (S2, S4, S5, S6), one study in a hospital setting (S1) and one in intermediate care (S3).

It should be emphasised that none of the studies were written exclusively by nurses, which reveals the lack of participation of nurses in the research paradigm and, more specifically, in the approach to the subject on which this study is focused. It may also correspond to the divergence of nurses' spheres of care from country to country, particularly in Rehabilitation Nursing (RN), since the fields of action and intervention of the RN are often taken on by other health professionals, such as physiotherapists, speech therapists or occupational therapists.

Four of the studies included: Maeda et al., 2017 (S1), Hägglund et al., 2019 (S3), Park et al., 2019 (S5) and Sayaca et al., 2020 (S6), are randomised controlled trials, two trials are case series: Balou et al., 2019 (S2) and Namiki et al., 2019 (S4) and one study is a case-control: Chang et al., 2021 (S7).

The average age of the participants was 65 or over (S1, S2, S3, S4, S5, S6), which was one of the inclusion criteria. In S7, the group of healthy participants had an average age of 29.9 years and the group of participants with swallowing difficulties had an average age of 70.6 years.

Regarding the number of Interventions and repetitions per day, it was found that there was no standard period, but that they varied between studies. The number of Interventions varied from 2 times a day for 5 days a week (S1), 2 times a day (S4), 3 times a day (S5), 1 time a week (S2) and 3 times a week (S6). In S3, the number of sessions carried out is not mentioned, only that they were applied for 5 weeks. In S7, neither the number of sessions carried out nor their duration is mentioned.
The study by Maeda et al. (2017) (S1) investigated the effects of transcutaneous sensory electrical stimulation with interferential current for 3 weeks in patients undergoing dysphagia rehabilitation. They used a portable device (Gentle Stim) that generates a 50 Hz interferential current, with the aim of stimulating the nerves within the neck by placing two pairs of electrodes of different frequencies along the neck. The study revealed two important results: firstly, cough latency time represents protection of the airways against aspiration and improved to a greater degree in the experimental group than in the control group, increasing the sensitivity of the laryngeal and pharyngeal muscles; and secondly, the amount of oral nutritional intake also showed a greater increase in the first group, due to the increased sensitivity of the airways attributed to transcutaneous sensory electrical stimulation with interferential current. They therefore concluded that facilitative techniques such as transcutaneous sensory electrical stimulation with interferential current could be a potentially viable rehabilitation approach for patients with dysphagia.

Also, in the study of Balou et al. (2019) (S2), the improvement of swallowing function and physiology was investigated through the application of an 8-week rehabilitation protocol that included a swallowing exercise protocol consisting of strained swallows, Masako manoeuvres, supraglottic swallows, Shaker exercises, Mendelsohn manoeuvres and, finally, strained pitch slides. After the protocol implementation, it was found that the physiology of swallowing could be improved. There were statistical improvements in the onset of pharyngeal swallowing, laryngeal elevation, and pharyngeal residues.

Another study S3 (Hagglund et al., 2019), investigated the effect of oral neuromuscular training in elderly people with impaired swallowing with the aim of strengthening the orofacial and pharyngeal muscles, and it was shown that participants in the intervention group, during the 5 weeks of oral neuromuscular training, increased the rate of swallowing and reduced clinical signs of aspiration compared to the control group. Lasting effects on swallowing function were also found 6 months after treatment. Thus, these results showed that oral neuromuscular training is a promising new method for rehabilitating swallowing impairment.
Namiki et al. (2019) (S4) investigated the effect of tongue pressure resistance training on tongue strength and hyoid movement during swallowing. Exercises were carried out applying the rate of oral diadochokinesis, where participants pronounced and repeated syllables and their total was counted by a device, thus assessing tongue dexterity. The results showed that tongue pressure resistance training improved tongue muscle strength, dexterity, anterior and superior hyoid muscle elevation, and swallowing functions. Therefore, tongue pressure resistance training can simultaneously improve tongue and suprahypoid muscle function and contribute to the prevention of sarcopenic dysphagia.

Study 5 (Park et al., 2019) also investigated the effect of tongue strengthening exercise on the oropharyngeal musculature and found a significant difference between the results of the experimental group and the control group. The experimental group that performed tongue strengthening exercises showed a statistically significant increase in tongue muscle strength, tongue muscle thickness and mylohyoid and digastric muscles, while the control group showed an increase that was not statistically significant.

Sayaca et al. (2020) (S6), in their study, found that strengthening exercises with PNF techniques, using combined isotonic contractions, reduced the severity of dysphagia as much as Shaker exercises. However, the PNF technique increased the mean amplitude values of the peak contraction obtained during the maximum voluntary contraction of the suprahypoid muscles more than the Shaker exercises. The PNF technique and shaker exercises increased the speed, capacity, and quantity of water swallowing. In the study carried out by Chang et al. (2021) (S7), which compared the effectiveness of the CTAR, submandibular thrust and Shaker exercises for inducing selective contractions of the supra- and infrahyoid muscles using surface electromyography using a plastic bar, with the aim of determining the effects of each of the three exercises on each swallowing muscle in healthy individuals and patients with swallowing difficulties. The conclusion of this study was that the contraction of the supra- and infrahyoid muscles with the submandibular exercise was greater than with the CTAR exercise, but like the Shaker exercise; the submandibular thrust exercise requires less contraction of the sternocleidomastoid muscle than the contraction of the supra- and infrahyoid muscle, compared to the other exercises.
Some of the studies included in this review used the Penetration Aspiration Scale (PAS) as a measuring instrument (S1, S2, S4) to quantify swallowing safety. Three studies, S1, S2 and S4, used the videofluoroscopy method of swallowing assessment, which is considered the gold standard, and studies S3 and S6 revealed that they did not use videofluoroscopy as a limitation of their studies, opting to use only the water swallow test to assess swallowing dysfunction. One study (S2) used the Modified Barium Swallow Impairment Profile to quantify 17 components of swallowing physiology based on videofluoroscopic images to characterise clinical signs suggestive of laryngeal penetration or aspiration and the severity of dysphagia.

Some of the authors of the Studys used PAS scores of 3 or more and MBSS scores of 2 or more as inclusion criteria (S2), while in the Maeda et al. study (2017) (S1), PAS was used, but as a comparison of results between participants.

Quality of life was measured using the Swallowing Quality of Life Questionnaire in only one study (S3). Cognitive function was assessed using the Mini Mental State Examination (S1, S5 and S7) and nutritional status using the Body Mass Index (S1, S6), Mini-Nutritional Assessment Short Form (S1). Analysing the results of the seven studies included in this RSL confirms the positive therapeutic effect of rehabilitation interventions on dysphagia, based on the period in which the interventions took place and their duration and frequency.

The seven studies included present various dysphagia rehabilitation techniques such as: facilitation techniques (neuromuscular electrical stimulation, PNF), swallowing manoeuvres and exercises (effort swallowing, supraglottic swallowing, ptich glide, Masako manoeuvre, Mendelsohn manoeuvre, Shaker exercise, CTAR, flexion exercise against resistance, submandibular thrust exercise), oral muscle training. These differ not only in terms of the intervention carried out, but also in terms of sample size, methods of measuring results, intervention times and follow-up times. Positive results included improved nutritional intake (S1), improved swallowing physiology (S2), increased airway protection such as aspiration (S1, S2, S3, S4), improved swallowing efficiency (S1), increased swallowing rate (S3), improved tongue function (S4, S5) and oropharyngeal swallowing muscles (S4, S5, S7), improved swallowing function (S4, S5, S6).
All studies provided information on the short-term effects of the treatment, while minimal data was reported on the long-term effects. Only two studies carried out follow-up, and the longest follow-up period was no more than 6 months (S3). It is therefore difficult to assess the long-term effects of the interventions on swallowing function.

Although the studies show promise for reducing swallowing impairment, they require further studies to determine their clinical applicability (S1, S2, S3, S6, S7). Some of the selected studies, present multiple interventions being administered together, making it difficult to determine the effects of each one separately, as well as making it difficult to observe the scientific evidence and generalise the conclusions. However, we must consider that in dysphagia rehabilitation the procedures used complement each other, increasing the effectiveness of the treatment. Greater consistency between science and clinical practice is needed to allow a comparison between the different techniques.

To sum up, it can be said that all the studies analysed showed that the rehabilitation interventions implemented improved the functional capacity, physiology, and swallowing function of the participants after the intervention used.

5 CONCLUSIONS

Dysphagia is characterised by a person’s difficulty in swallowing, which can happen in the various phases or between the phases of swallowing, preventing the normal process of swallowing from being safe and efficient, leading to changes in nutrition, hydration and even the lungs.

Rehabilitating the elderly person with dysphagia involves several techniques and procedures, the aim of which is to recover or maximise safe, effective, and efficient swallowing, reducing the risk of complications for the person.

This review summarises several rehabilitation techniques, such as swallowing manoeuvres and exercises, neuromuscular electrical stimulation and tongue muscle training, the effect of which has been proven in the studies identified. Rehabilitation nursing needs to invest in research in this area, through the development and implementation of properly designed and systematised
intervention programmes. Long-term studies into oropharyngeal rehabilitation in the elderly are also suggested.

As limitations we consider: the inexperience of the reviewers; the lack of rehabilitation programmes implemented by rehabilitation nurses; language limitations (studies in Portuguese, Spanish and English were included) which may have contributed to the loss of potential studies; the use of few synonyms and the non-use of truncations in the search strategy may have contributed to the loss of potential studies.
REFERENCES


