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Presentation of the Therapy Program for Management of Chronic Cough

Apresentação do Programa de Terapia para Manejo da Tosse Crônica

ABSTRACT

Purpose: To present a proposal for speech-language pathology rehabilitation called the Therapy Program for Management of Chronic Cough (TMCC) for the treatment of refractory chronic cough. **Methods:** TMCC was developed based on two stages: literature and clinical analysis. The literature analysis stage was carried out through the following procedures: electronic and manual search for articles and books published until June 2019 that included adult participants with chronic cough and intervention with speech-language pathology therapy; selection of sources; analysis of articles and books included; and, preparation of the initial version of the therapy program. The initial version of the therapy program resulting from literature analysis stage was submitted to clinical analysis stage through the following procedures: analysis by three judges; revision of the proposal by the authors; judges' re-analysis; elaboration of the final version called the Therapy Program for Management of Chronic Cough (TMCC). **Results:** TMCC synthesizes scientific knowledge and current clinical experience on the behavioral management of refractory chronic cough into a program with three main components, each one with specific objectives and strategies. TMCC consists of four sessions, with weekly frequency and duration between 30-45 minutes per session, executed in hierarchical phases, with specific objectives and strategies per session. **Conclusion:** TMCC is a program structured to offer global cough rehabilitation. To obtain scientific evidence about its effectiveness is necessary, so that it can be used in clinical practice.

RESUMO

Objetivo: Apresentar uma proposta de reabilitação fonoaudiológica denominada Programa de Terapia para Manejo da Tosse Crônica (TMTC) para tratamento da tosse crônica refratária. **Método:** O TMTC foi elaborado com base em duas etapas: análise de literatura e análise clínica. A etapa de análise de literatura foi realizada por meio dos procedimentos: busca eletrônica e manual por artigos e livros publicados até junho de 2019 que contemplassem participantes adultos com tosse crônica, e intervenção com terapia fonoaudiológica; seleção das fontes; análise dos artigos e livros incluídos; e, elaboração da versão inicial do programa de terapia. A versão inicial do programa de terapia resultante da etapa de análise de literatura foi submetida a etapa de análise clínica por meio dos procedimentos: análise de três juízes; revisão da proposta pelos autores; reanálise dos juízes; elaboração da versão final denominada Programa de Terapia para Manejo da Tosse Crônica (TMTC). **Resultados:** O TMTC sintetiza o conhecimento científico e a experiência clínica atual sobre o manejo comportamental da tosse crônica refratária em um programa com três componentes principais, cada um com objetivos e estratégias específicos. O TMTC é composto por quatro sessões, com frequência semanal, e duração entre 30 e 45 minutos por sessão, executadas em fases hierárquicas, com objetivos e estratégias específicos por sessão. **Conclusão:** O TMTC é um programa estruturado para oferecer uma reabilitação global da tosse. Faz-se necessário obter evidências científicas sobre sua efetividade para que ele possa ser utilizado na prática clínica.

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INTRODUCTION

The larynx has several functions, including phonation, breathing and protection of the lower airways. The laryngeal function of protecting the lower airways is vital for survival and occurs from a protective reflex, called cough. Cough is a reflex resulting from the activation of irritating receptors in the airway⁽¹⁾. This is a maneuver of forced expiration against an initially closed glottis, with subsequent opening of the glottis and the production of an expulsive sound⁽²⁾.

Cough can be classified into acute, subacute and chronic, according to persistence duration. Cough is considered chronic when it persists for more than eight weeks⁽³⁾. Cases of cough that persist after medical treatment are called refractory⁽⁴⁻⁶⁾. Chronic cough affects up to 20% of the adult population⁽²⁾ and is refractory to medical treatment in up to 46% of cases^(5,7,8). Refractory chronic cough is more common in women^(2,9), beginning in middle age^(2,9).

Currently, chronic cough is considered a primary condition characterized by afferent neuronal hypersensitivity⁽⁸⁾. Central neural mechanisms are believed to be involved since patients with refractory chronic cough have abnormal laryngeal sensations such as discomfort, pain, or tingling; increased sensitivity to stimuli that do not trigger coughing or that are subliminal for that sensation; and, cough triggered in response to non-coughing stimuli or urgency-to-cough⁽⁸⁾.

Treatment approaches for refractory chronic cough include cough suppression therapy and use of anti-cough drugs^(5,9,10). Speech-Language Pathology therapy is a potentially efficient intervention in managing refractory chronic cough and seeks to break the cycle of reciprocal irritation of cough receptors when medical intervention fails⁽¹⁾. The mechanism underlying the improvement is not fully understood, but it may include active cough suppression, reduced cough reflex sensitivity, or increased cough reflex threshold^(11,12), in addition to reduced laryngeal irritation⁽¹¹⁾.

Little scientific evidence is available to support the effectiveness of Speech-Language Pathology management of refractory chronic cough. However, some studies^(13,14) point to reduced sensitivity to cough reflex; respiratory, cough, and voice symptoms; improvement in maximum phonation time, acoustic parameters and cough-related quality of life. Furthermore, no method is described in the literature with sufficient details to allow its replication, and evidence of effectiveness proven through studies with high methodological rigor. A specific rehabilitation method that meets the real needs of individuals with refractory chronic cough needs to be developed.

Thus, the objective of the present study was to present a proposal for Speech-Language Pathology rehabilitation called the Therapy Program for Management of Chronic Cough (TMCC) for the treatment of refractory chronic cough.

METHODS

TMCC was developed based on two steps: a literature analysis and a clinical analysis.

The literature analysis stage was carried out based on the following procedures:

- a) Electronic and manual search for articles and books published until June 2019 that included the following characteristics: Participants: adult individuals with chronic cough; Intervention: Speech-Language Pathology therapy;
- b) Electronic search in the Clinical Trials, Cochrane Library, Embase, LILACS, PUBMED and Science Web databases, from a search strategy elaborated with the keywords “cough” and “therapy”;
- c) Manual search performed by scanning references of the selected articles, from the inclusion of at least one of the keywords in the title: “cough” and “therapy”;
- d) From the selection, ten articles^(2,4,5,7-9,11-14) and two books^(6,15) were included;
- e) Analysis of the articles and books included;
- f) Elaboration of the initial version of the therapy program considering the most frequent techniques in the consulted literature and their specific objectives.

The initial version of the therapy program resulting from the literature analysis stage was submitted to the clinical analysis stage using the following procedures:

- a) Analysis of three judges, Speech-Language Pathologist, voice and/or dysphagia specialists, with experience in treating chronic cough, independently. The judges were instructed to consider the characteristics and clinical needs of the patients, and the applicability of the therapy. For changes or exclusion of techniques, the agreement between at least two judges was considered;
- b) Proposal review by the authors;
- c) Re-analysis of the judges, together;
- d) Elaboration of the final version called the Therapy Program for Management of Chronic Cough (TMCC).

RESULTS

The TMCC proposed as a Speech-Language Pathology intervention has three main components with specific objectives and strategies. The three components of the program are 1) Counseling on cough and laryngeal well-being; 2) Cough suppression, control and replacement; 3) Respiratory and laryngeal control in the functions of breathing, coughing and phonation.

The cough counseling component and laryngeal well-being seek to provide simple and useful information on chronic cough, laryngeal well-being and control of laryngeal irritants. The strategies used for this purpose are to provide counseling with the support of educational material on the larynx, cough, triggers and the development of voluntary cough control; as well as on laryngeal well-being and the control of irritating factors.

The cough suppression, control and substitution component seek to enable the patient to learn to anticipate when a cough will occur and thus prevent and/or interrupt coughing episodes through the use of cough suppression, control and substitution techniques. For this purpose, the strategies used are: a) Mapping the cough, b) Performing a hierarchical training with distraction techniques from the focus of attention, suppression techniques and cough control techniques, performed in four phases: 1) Train in a clinical situation without the cough trigger (learn); 2) Train outside the clinical environment when asymptomatic (automate); 3) Train outside the clinical environment when symptomatic

to replace or suppress cough in risky situations; 4) Continuous use of techniques with exposure to triggers.

The respiratory and laryngeal control component seeks to train respiratory coordination, work on pneumophonoarticulatory coordination (PPAC), reduce the tension of the accessory laryngeal muscles, adjust the resonance focus, mobilize the vocal fold mucosa, decrease phonatory effort and constriction supraglottic and stabilize glottic closure. The strategies used for this axis are respiratory and vocal training through guidance and exercises.

The details of the strategies can be seen in Chart 1. The strategies are distributed in the sessions to allow the execution

Chart 1. Description of the components and strategies of the Therapy Program for Management of Chronic Cough

COMPONENT	STRATEGIES
Counseling on cough and laryngeal well-being	<ul style="list-style-type: none"> • Conduct counseling with the support of educational material on: <ul style="list-style-type: none"> ○ Larynx (function, anatomy, normal movement, abnormal movement during cough) ○ Chronic cough (cough physiology, protective function, threshold that triggers cough) ○ Identification of triggers and development of voluntary control of cough (cough cycle; negative effects of repeated cough; laryngeal sensitivity as a source of cough; triggers; need and form of behavioral management to suppress cough from the cough cycle) ○ Well-being and control of laryngeal irritating factors (type and mode of breathing; hydration; humidification of inhaled air; sucking non-medicinal gums; exposure to cigarettes and other drugs; exposure to sensory stimuli; consumption of dehydrating substances; management of Laryngopharyngeal Reflux)
	<ul style="list-style-type: none"> • Map the cough (identify cough triggers/alerts, anticipate when a cough is about to occur to implement a suppression, control or substitution strategy) • Hierarchical training of techniques: <ul style="list-style-type: none"> ○ Distraction techniques <ul style="list-style-type: none"> ▪ Drink water, suck ice/lollipop, chew gum/candy or wait for 5 to 10s to check if the urge to cough passes ○ Technique for suppressing coughing or clearing throat with swallowing <ul style="list-style-type: none"> ▪ Swallow suppression: swallow hard when you feel a tickle in the throat and the urge to cough or clear the throat (dry mouth/saliva, with a sip of water or with a non-medicated lollipop) - bending the head towards the chest and an isometric push with hands together (in public it can be performed without the use of hands) ○ Breathing technique of cough control <ul style="list-style-type: none"> ▪ Simulation of respiratory control in cough - Breathe gently, preferably through the nose, monitor breathing, identify breathing mode and type with hand support, blow quickly through the contracted lips simulating glottal closure/airway obstruction during cough. The patient should feel the effort in a similar way to coughing ▪ Diaphragmatic breathing - inhale through the nose and exhale through the mouth, slow exhalation in maximum phonation time producing a dull fricative sound, using synesthetic tactile feedback with the hand on the abdomen <ul style="list-style-type: none"> ▪ Sniff
	<ul style="list-style-type: none"> • Breathing training <ul style="list-style-type: none"> ○ Guide and identify breathing rhythm and type ○ Guide on body posture ○ Pressure biofeedback technique - patient standing with an elastic resistance band around the abdomen for respiratory type localization feedback, inhale through the nose and exhale slowly through the mouth, decrease focus on inhalation and increase focus on the exhalation • Vocal training <ul style="list-style-type: none"> ○ Reduce tension in the laryngeal accessory musculature • Cervical spine movements associated with facilitating sounds <ul style="list-style-type: none"> ○ Adjust resonance focus • Humming sound <ul style="list-style-type: none"> ○ Mobilize the vocal fold mucosa • Phonation in a latex tube immersed in water at a depth of 2 cm <ul style="list-style-type: none"> ○ Decrease phonatory effort and supraglottic constriction • Humming sound <ul style="list-style-type: none"> • Aphonic breath in a latex tube immersed in water at a depth of 2 cm • Fricative sound ○ Stabilize glottic closure • Phonation with frequency modulation in a latex tube immersed in water at a depth of 2 cm
	<ul style="list-style-type: none"> • Phonation with frequency modulation in a latex tube immersed in water at a depth of 2 cm

of the program hierarchically. The hierarchy follows three stages: sensory awareness - seeks to identify and recalibrate the sensory system; voluntary behavioral substitution – seeks to use sensory awareness to execute strategies voluntarily; and, generalization – seeks to modify the body demand and automate the practice so that the strategies are implemented involuntarily.

The TMCC consists of four sessions, with weekly frequency, and duration between 30 and 45 minutes per session. Adaptations in the number of sessions can be performed

according to the time of learning and development of the patient, and two additional sessions can be inserted to fix phonatory and respiratory adjustments, and automate the distraction techniques of the focus of attention, suppression and cough control. Besides, the patient must perform the exercises at home, five times a day, except for exercises that have specific recommendations.

The description of the TMCC execution methodology can be seen in Chart 2.

Chart 2. Description of the execution of the Therapy Program for Management of Chronic Cough

SESSION	PHASE	OBJECTIVES	STRATEGIES
1	-Sensory awareness	-Provide information about chronic cough	-Counseling on chronic cough, laryngeal well-being and control of laryngeal irritating factors with the support of educational material
		-Provide information on laryngeal well-being	-Map the cough
		-Anticipate when a cough will occur and control, suppress or replace the cough with strategies that interrupt its cycle	-Train distraction, control and suppression techniques in a clinical situation without the cough trigger (20 repetitions of 5 to 10 seconds each)
		-Train respiratory muscles	-Guide and identify breathing type and rhythm
		-Work PPAC	-Pressure biofeedback technique (3 minutes)
		-Reduce tension in the laryngeal accessory muscles	-Deaf fricative sound /s/ (1 minute)
			-Cervical movements associated with fricative deaf sound /s/ (2 minutes)
At home (5 times a day) -Train distraction, control and suppression techniques when asymptomatic (20 repetitions with 5 to 10 seconds each) -Deaf fricative sound /s/ (3 minutes) -Cervical movements associated with deaf fricative sound /s/ (3 minutes)			-Read educational counseling material
2	-Sensory awareness	-Anticipate when a cough will occur and control, suppress or replace the cough with strategies that interrupt its cycle	-Resume counseling and ask questions
	-Voluntary behavioral substitution	-Train respiratory muscles	-Train distraction, control and suppression techniques when symptomatic, exposing them to risky situations (20 repetitions with 5 to 10 seconds each)
		-Work PPAC	-Pressure biofeedback technique (3 minutes)
		-Reduce tension in the laryngeal accessory muscles	-Aphonic blow in latex tube immersed in water (3 minutes)
		-Adjust resonance focus	-Fricative sound in sound passage (1 minute)
		-Reduce phonatory effort and supraglottic constriction	-Cervical movements associated with fricative sound /v/ (2 minutes)
	- Nasal sound /m/ (3 minutes)		
At home (5 times a day) -Fricative sound in sonority passage (1 minute) -Cervical movements associated with fricative sound /v/ (2 minutes) - Nasal sound /m/ (3 minutes)			-Train distraction, control and suppression techniques when symptomatic, exposing to risk situations (20 repetitions with 5 to 10 seconds each)
3	-Voluntary behavioral substitution	-Anticipate when a cough will occur and control, suppress or replace the cough with strategies that interrupt its cycle	-Resume counseling and ask questions
		-Train respiratory muscles	-Map the cough
		-Work PPAC	-Train the continuous use of distraction and suppression techniques with exposure to cough triggers (30 seconds each and gradually increasing the duration of exposure according to the patient's tolerance)
		-Reduce tension in the laryngeal accessory muscles	-Pressure biofeedback technique (3 minutes)
		-Adjust resonance focus	- Nasal sound /m/ (3 minutes)
		-Mobilize vocal fold mucosa	-Cervical movements associated with fricative sound /v/ (1 minute)
		-Reduce phonatory effort and supraglottic constriction	-Fricative sounds in sequence /v/ /z/ /j/ (2 minutes)
	-Phonation in latex tube immersed in water (3 minutes)		

Chart 2. Continued...

SESSION	PHASE	OBJECTIVES	STRATEGIES
At home (5 times a day) -Rotation of shoulders associated with the fricative sound /v/ (3 minutes) -Nasal sound /m/ (3 minutes)			-Train continuous use of distraction and suppression techniques with exposure to cough triggers (30 seconds in the first workout and gradually increase the duration of exposure by 1s according to tolerance)
4	-Generalization	-Anticipate when a cough will occur and control, suppress or replace the cough with strategies that interrupt its cycle	-Resume counseling and ask questions
		-Train respiratory muscles	-Resume suppression and distraction techniques and ask questions
		-Work PPAC	-Nasal sound /m/ followed by vowels (3 minutes)
		-Adjust resonance focus	-Fricative sound /v/ followed by vowels (3 minutes)
		-Mobilize vocal fold mucosa	-Phonation in latex tube immersed in water with frequency modulation (3 minutes)
		- Reduce phonatory effort and supraglottic constriction	
		-Stabilize glottic closure	
At home (5 times a day) -Nasal sound /m/ followed by vowels (3 minutes) -Fricative sound /v/ followed by vowels (3 minutes)			-Train continuous use of distraction and suppression techniques with exposure to cough triggers (gradual increase in the duration of exposure as tolerated)

DISCUSSION

TMCC was developed based on scientific knowledge and clinical experience, from the clinical characteristics and general needs of patients with refractory chronic cough, treatable with Speech-Language Pathology rehabilitation. A structured program to provide global cough rehabilitation that can be clinically reproduced in the Speech-Language Pathology treatment of this population.

Impartial and reliable scientific evidence on the effectiveness of TMCC, compared to traditional behavioral vocal therapy, in cases of refractory chronic cough, needs to be obtained by conducting a randomized clinical trial, already underway. Such data may assist the clinician in deciding on the best procedure for the rehabilitation of patients with refractory chronic cough.

CONCLUSION

TMCC synthesizes scientific knowledge and current clinical experience on the behavioral management of refractory chronic cough in a program with three main components, with specific objectives and strategies. The TMCC consists of four sessions, executed in hierarchical phases, with specific objectives and strategies per session.

REFERENCES

- Vertigan AE, Theodoros DG, Gibson PG, Winkworth AL. The relationship between chronic cough and paradoxical vocal fold movement: a review of the literature. *J Voice*. 2006;20(3):466-80. <http://dx.doi.org/10.1016/j.jvoice.2005.08.001>. PMID:16274959.
- Morice AH, McGarvey L, Pavord I. Recommendations for the management of cough in adults. *Thorax*. 2006;61(Supl 1):1-24. <http://dx.doi.org/10.1136/thx.2006.065144>. PMID:16936230.
- Poulose V, Bin Mohd I. Prolonged cough presenting with diagnostic difficulty: a study of aetiological and clinical outcomes. *Singapore Med J*. 2011;52(4):267-70. PMID:21552788.

- Gibson PG, Vertigan AE. Speech pathology for chronic cough: a new approach. *Pulm Pharmacol Ther*. 2009;22(2):159-62. <http://dx.doi.org/10.1016/j.pupt.2008.11.005>. PMID:19061964.
- Vertigan AE, Kapela SL, Ryan NM, Birring SS, McElduff P, Gibson PG. Pregabalin and speech pathology combination therapy for refractory chronic cough a randomized controlled trial. *Chest*. 2016;149(3):639-48. <http://dx.doi.org/10.1378/chest.15-1271>. PMID:26447687.
- Vertigan A, Gibson P. *Speech pathology management of chronic refractory cough and related disorders*. Oxford, UK: Coptom Publishing; 2016.
- Vertigan AE, Kapela SM, Franke I, Gibson PG. The effect of a vocal loading test on cough and phonation in patients with chronic cough. *J Voice*. 2017;31(6):763-72. <http://dx.doi.org/10.1016/j.jvoice.2017.03.020>. PMID:28461166.
- Ryan NM, Gibson PG. Recent additions in the treatment of cough. *J Thorac Dis*. 2014;6(Supl 7):S739-47. <http://dx.doi.org/10.3978/j.issn.2072-1439.2014.03.13>. PMID:25383209.
- Chamberlain S, Birring SS, Garrod R. Nonpharmacological interventions for refractory chronic cough patients: systematic review. *Lung*. 2014;192(1):75-85. <http://dx.doi.org/10.1007/s00408-013-9508-y>. PMID:24121952.
- Gibson P, Wang G, McGarvey L, Vertigan AE, Altman KW, Birring SS, et al. Treatment of unexplained chronic cough chest guideline and expert panel report. *Chest*. 2016;149(1):27-44. <http://dx.doi.org/10.1378/chest.15-1496>. PMID:26426314.
- Ryan NM, Vertigan AE, Bone S, Gibson PG. Cough reflex sensitivity improves with speech language pathology management of refractory chronic cough. *Cough*. 2010;6(1):5. <http://dx.doi.org/10.1186/1745-9974-6-5>. PMID:20663225.
- Chamberlain S, Garrod R, Birring SS. Cough suppression therapy: does it work? *Pulm Pharmacol Ther*. 2013;26(5):524-7. <http://dx.doi.org/10.1016/j.pupt.2013.03.012>. PMID:23524013.
- Vertigan AE, Theodoros DG, Gibson PG, Winkworth AL. Efficacy of speech pathology management for chronic cough: A randomised placebo controlled trial of treatment efficacy. *Thorax*. 2006;61(12):1065-9. <http://dx.doi.org/10.1136/thx.2006.064337>. PMID:16844725.
- Vertigan AE, Theodoros DG, Winkworth AL, Gibson PG. A Comparison of two approaches to the treatment of chronic cough: perceptual, acoustic, and electroglottographic outcomes. *J Voice*. 2008;22(5):581-9. <http://dx.doi.org/10.1016/j.jvoice.2007.01.001>. PMID:17485195.
- Carroll TL. *Chronic cough*. San Diego, CA: LOGO Plural Publishing; 2019.