

# The role of speech therapy in the rehabilitation of people with chronic cough

## Znaczenie terapii logopedycznej w rehabilitacji osób z przewlekłym kaszlem

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### ABSTRACT:

**Introduction:** Cough is the most common symptom of respiratory diseases. It has a significant impact on the quality of life of patients.

**Aim:** Examination and comparison of cough intensity, symptoms associated with cough, head and neck muscle's tonus, breathing type and maximum phonation time in patients with chronic cough before and after speech therapy.

**Material and methods:** The study comprised 10 patients, including 8 women and 2 men from 30 to 73 years of age. All participants completed The Visual Analogue Scale (VAS), Reflux Symptoms Index (RSI), Voice Tract Discomfort (VTD), Voice Handicap Index (VHI). Additionally, the breathing track, muscle tension within the head and neck, maximum time of phonation were evaluated.

**Results:** The results Visual Analogue Scale, Voice Handicap Index and the maximum phonation time after speech therapy were statistically significant ( $p < 0.05$ ) lower compared to the pre-therapy results. Not all results of the Reflux Symptoms Index and Voice Tract Discomfort were consistent with the normal distribution ( $p > 0.05$ )

**Conclusions:** Speech therapy therapy has a significant impact on the severity of chronic cough, symptoms associated with cough, the normalization of head muscle tension, improvement of the breathing track and the elongation of the maximum time of phonation. It is the future direction in the therapy of patients with chronic cough.

### KEYWORDS:

chronic cough, MTD, SPL therapy

### STRESZCZENIE:

**Wprowadzenie:** Kaszel jest najczęstszym objawem chorób układu oddechowego. W znacznym stopniu wpływa na jakość życia pacjentów.

**Cel pracy:** Ocena wpływu rehabilitacji logopedycznej jako metody wspomagającej terapię chorych z przewlekłym kaszlem.

**Materiał i metody:** Badaniem objęto 10 pacjentów, w tym 8 kobiet oraz 2 mężczyzn w wieku od 30 do 73 lat, leczonych z powodu przewlekłego kaszlu w Klinice Pulmonologii SP CSK. Wszyscy chorzy podlegali terapii zgodnie z jednolitym protokołem: przeszkolenie z zasad higieny głosu i emisji głosu; ćwiczenia oddechowe, rozluźniające, fonacyjne. Przed i po rehabilitacji pacjenci wypełniali badania kwestionariuszowe: stopień nasilenia kaszlu w skali VAS, Wskaźnik Objawów Refluksowych (RSI), Skalę Dyskomfortu Traktu Głosowego (VTD), Kwestionariusz Samooceny Niepełnosprawności Głosowej (VHI). Dodatkowo logopeda oceniał tor oddychania, napięcie mięśni w obrębie głowy i szyi, maksymalny czas fonacji.

**Wyniki:** Wyniki Skali Nasilenia Kaszlu, Wskaźnika Niepełnosprawności Głosowej oraz maksymalnego czasu fonacji po terapii logopedycznej były istotnie statystycznie ( $p < 0,05$ ) niższe w porównaniu z wynikami przed terapią. U wszystkich chorych stwierdzono obniżenie napięcia mięśni w obrębie traktu głosowego oraz poprawę toru oddychania.

**Wnioski:** Terapia logopedyczna ma znaczący wpływ na obniżenie dolegliwości zgłaszanych przez pacjentów z przewlekłym kaszlem, normalizację napięcia mięśni zewnętrznych krtani, poprawę toru oddychania oraz wydłużenie maksymalnego czasu fonacji. Stanowi przyszłościowy kierunek w terapii pacjentów z tym schorzeniem.

**SŁOWA KLUCZOWE:** przewlekły kaszel, MTD, terapia logopedyczna

## LIST OF ABBREVIATIONS:

**GERD** – Gastroesophageal Reflux Disease

**MPT** – Maximum Phonation Time

**RSI** – Reflux Symptom Index

**SP CSK** - Independent Public Central Clinical Hospital

**VAS** – Visual Analogue Scale

**VHI** – Voice Handicap Index

**VTD** – Voice Tract Discomfort

## INTRODUCTION

Cough is the most common symptom of respiratory diseases [1]. As a protective reflex, it aims to remove excess secretions or foreign bodies from the respiratory tracts.

Because of its duration, cough is divided into:

1. Acute - lasts less than 3 weeks;
2. Subacute - lasts from 3 to 8 weeks;
3. Chronic - lasts over 8 weeks [1,2].

GERD is the most common cause of chronic cough [3]. The symptoms of extra-oesophageal reflux can also include: grunting, hoarseness, symptoms of laryngitis, feeling a lump in the throat, dysphagia in the pharyngeal and esophageal phase, discharge of secretions down the back of the throat [3,4,5,6].

In cough therapy, specialists try to introduce causative treatment when possible, e.g., in the case of gastro-oesophageal reflux, heart failure, respiratory infections, COPD or lung cancer. Patients also receive symptomatic treatment to reduce the severity of symptoms [7]. There is currently little evidence of the efficacy of antitussives.

Due to the annoyance of problems and difficulties in introducing effective treatment, it seems that changes in the functioning of patients with chronic cough should also be taken into account during rehabilitation. In this group of patients, we can observe a weakened function of the chest and abdomen mus-

cles, abnormal breathing pattern, increased tension in the head and neck muscles, distorted activity of the ciliary apparatus and excessive mucus viscosity.

This study aimed to assess the impact of speech therapy on the severity of complaints reported by patients with chronic cough, accompanying symptoms, improvement of the breathing pattern, normalization of head and neck tone and improvement of the maximum time of phonation.

## MATERIAL AND METHODS

### Materials

Consent of the Bioethics Committee of the Medical University of Warsaw was obtained for conducting the study. The study was conducted from December 2017 to March 2018. The study was attended by 10 people - 8 women and 2 men. Patients were diagnosed at the Department of Pulmonology of the Medical University of Warsaw. The age range in the study group was 30-73; average: 52.5; median: 55.5. The criterion of inclusion in the group was: cough over 8 weeks and no prior speech therapy. Each patient gave voluntary consent to participate in the study.

### Methods

All patients were examined according to a unified protocol. Examination included: assessment of cough severity according to the VAS Scale, Reflux Symptom Index (RSI) questionnaire, Voice Tract Discomfort (VTD), Voice Handicap Index (VHI) and a short interview. In addition, the breathing pattern and muscle tension in the head and neck were assessed, and measurements of the maximum time of phonation (MPT) was performed.

On the VAS scale, the patient assesses the degree of cough intensity in the range from 0 to 10; where "0" means no cough, "5" moderate cough, "10" the most severe cough possible.

VHI questionnaire is used to self-assess voice quality. The patient answers every question on a 5-point scale, where "0" means

never, while “4” always means. The total VHI score ranges from 0 to 120 points. Obtaining 0-30 points indicates minor voice disorders; 31-60 points indicates average disability of the voice; a result above 61 points to serious disability of the voice [8, 9].

The VTD questionnaire describes 8 symptoms (burning, tension, dryness, pain, scratching, tenderness, irritation, sensation of a noodle in the throat), assessed in the subscale of frequency and severity of symptoms. Each symptom is described by the patient on a scale from “0” - never, none to “6” - always, significant.

RSI questionnaire is used to assess the severity of symptoms associated with laryngopharyngeal reflux. It evaluates 9 symptoms including hoarseness or voice disorders, scratching in the throat, cough after eating on a scale of 0 to 5, where “0” means no problem, while “5” stands for a very serious problem.

Logopedic rehabilitation consisted of 12 individual meetings lasting 45 minutes. Classes were held in a specialist office at the SP CSK Phoniatic Center. Both the interview and physical examination took place before speech therapy and after 11 meetings. The proper rehabilitation cycle lasted 10 meetings. The first classes consisted of discussing the principles of proper voice hygiene, proper breathing pattern and dietary guidelines (in persons with laryngopharyngeal reflux) [10]. Patients performed relaxation, breathing and phoning exercises during each class. Therapy began with exercises relaxing and stretching the muscles of the head and neck. These included, among others, sternocleidomastoid muscle massage according to Mathieson; adduction of the head to the chest, shoulders and folding towards the back; relaxation exercises for articulatory organs.

Breathing exercises were aimed at learning the proper breathing pattern, proper breathing-phonation-articulation coordination, strengthening of respiratory muscles, extension of the exhalation phase. These included, among others, exercises consisting in activation of the respiratory muscles, breathing exercises in combination with phonation of sound [s], Lax Vox breathing exercises in combination with phonation of sound [u].

### Methodology of statistical analysis

Statistical analysis was performed using Statistica 13. In the case of the VHI Questionnaire, VAS, RSI and VTD scales, Wilcoxon signed rank test for paired samples was conducted. It was assumed that the variables used in the study are dependent and ordered. As for MPT, Student's t-test was applied for quantitative, dependent variables. Normal distribution was determined using the Shapiro-Wilk test.

Prior to comparing the differences in results before and after

**Tab. I.** Mean values, standard deviations, medians and VAS scale ranges.

	VAS BEFORE REHABILITATION	VAS AFTER REHABILITATION
Average ± SD	6,8 ± 2,61	3,75 ± 1,70
Median	7,2	3,75
Range	3–10	1,5–6,5
P	0,00506	

**Tab. II.** Average values, standard deviations, medians and MPT ranges.

	MPT BEFORE REHABILITATION	MPT AFTER REHABILITATION
Average ± SD	13,05 ± 3,04	19,85 ± 3,04
Median	13,35	19,90
Range	7–17	15,71–26
p	0,000148	

**Tab. III.** Mean values, standard deviations, medians and VHI ranges.

	VHI IN GENERAL BEFORE REHABILITATION	VHI IN GENERAL AFTER REHABILITATION
Average ± SD	26,65 ± 12,26	18,2 ± 9,29
Median	29,5	21,5
Range	6–46	4–26
P	0,00768	

rehabilitation for each of the analyzed variables, it was checked whether the consistency of distribution correlates with normal distribution. The value <0.05 indicated that the result was in accordance with the standard distribution, whereas the value > 0.05 meant that the result was inconsistent with the standard distribution.

Average, standard deviation, median, range (minimum-maximum) were calculated.

## RESULTS

VAS scale (table I): Differences in patients' results before and after logopedic rehabilitation were found to be statistically significant ( $p = 0.005$ ). Before rehabilitation, 60% of patients showed intensification in cough above “7”. In 20% it reached the maximum value. After rehabilitation, none of the patients assessed the severity of cough above “6.5”. In 70%, the severity of cough was below “5”. MPT (table II): Differences in patients' results before and after logopedic rehabilitation turned out to be statistically significant ( $p = 0.000$ ). In all patients before rehabilitation, an incorrect result of maximum phonation time was observed (<20s.). After rehabilitation, 70% of patients had normal results.

**Tab. IV.** Average values, standard deviations, medians and ranges of RSI parameters with the greatest improvement in results.

PARAMETER	AVERAGE $\pm$ SD	MEDIAN	RANGE	P
Thick mucus in throat, flowing secretion before rehabilitation	3,4 $\pm$ 9,66	3,5	2–5	0,011719
Thick mucus in throat, flowing secretion after rehabilitation	2 $\pm$ 0,816	2	1–3	
Exhausting, irritating cough before rehabilitation	3,9 $\pm$ 0,56	4	3–5	0,005062
Exhausting, irritating cough after rehabilitation	2 $\pm$ 0,47	2	1–3	

**Tab. V.** Mean values, standard deviations, median values and ranges of VTD parameters with the highest improvement of results in the frequency subscale.

PARAMETER	AVERAGE $\pm$ SD	MEDIAN	RANGE	P
Dryness before rehabilitation	3,9 $\pm$ 1,59	4	0–6	0,029975
Dryness after rehabilitation	2,9 $\pm$ 0,99	3	1–4	
Scratching before rehabilitation	4,2 $\pm$ 1,47	4,5	2–6	0,005062
Scratching after rehabilitation	2,3 $\pm$ 1,63	2,5	1–5	
Feeling of having a noodle stuck in the throat before rehabilitation	3,4 $\pm$ 2,27	4,5	0–6	0,017961
Feeling of having a noodle stuck in the throat after rehabilitation	1,9 $\pm$ 1,28	2	0–4	

**Tab. VI.** Mean values, standard deviations, median values and ranges of VTD parameters with the highest improvement of results in the intensity subscale.

PARAMETER	AVERAGE $\pm$ SD	MEDIAN	RANGE	P
Dryness before rehabilitation	3,5 $\pm$ 1,35	4	0–5	0,0114129
Dryness after rehabilitation	2,7 $\pm$ 0,82	2,5	2–4	
Scratching before rehabilitation	3,9 $\pm$ 1,37	4	2–6	0,007686
Scratching after rehabilitation	2,1 $\pm$ 1,59	2	1–4	
Feeling of having a noodle stuck in the throat before rehabilitation	2,9 $\pm$ 2,02	4	0–6	0,017961
Feeling of having a noodle stuck in the throat after rehabilitation	1,7 $\pm$ 1,15	2	0–3	

VHI questionnaire (table III): Differences in patients' results before and after logopedic rehabilitation turned out to be statistically significant ( $p = 0.007$ ). Before rehabilitation, in 50% of patients the result remained in the range of average voice handicap. After rehabilitation, in 90% the result remained in the range of minor voice handicap. RSI questionnaire (table IV): Statistically significant improvement was obtained for the following symptoms: "Swallowing problems (food, lotions, pills)" ( $p = 0.067$ ) and "heartburn, chest pain, dyspepsia, acid reflux" ( $p = 0.075$ ). VTD questionnaire (tables V and VI): The biggest difference in the results of the frequency and severity subscale was observed in the parameter "scratching", "lump in the throat" and "dryness". Not all differences in the results of patients before and after logopedic rehabilitation were statistically significant. In the frequency range, these included "sensitivity" ( $p = 0.654$ ) and "tension" ( $p = 0.067$ ), while in the range of severity: "sensitivity" ( $p = 0.189$ ) and "burning" ( $p = 0.108$ ).

The breathing pattern and tension of the head and neck muscles: Before speech rehabilitation, 60% of patients had a peak breathing patterns accompanied by increased tension in the exter-

nal laryngeal muscles; 20% of persons used a variable pattern, while 20% used a thoracoabdominal pattern. After completing rehabilitation, 90% of patients breathe using the thoracoabdominal pattern, while 10% - variable. Before rehabilitation, 90% of people showed increased muscular tone of the submandibular region and side walls of the throat. They were rated on a scale from 0 to 3, where "0" meant relaxed, and "3" - very tense. The mean tension before therapy was 2.1, and 0.4 after therapy.

## DISCUSSION

As an interdisciplinary problem, cough concerns patients who report to doctors of various specialties. It should be emphasized that at present, there are no units dealing with the problem of chronic cough in a comprehensive way - through diagnostics, rehabilitation and education related to the principles of proper breathing and diet.

In the case of the examined group, the average VAS score before rehabilitation was 6.8, while after rehabilitation it was 3.7, which

proves the positive impact of speech therapy on the severity of ailments. This seems important, considering that in a study conducted by Haque et al., 42% of patients did not show improvement, despite implementation of causal treatment of chronic cough [10]. An earlier study of these authors showed a significant reduction in the severity of cough in only 55% of patients suffering from chronic cough. In a survey, the lack of efficacy of causative treatment was confirmed in approximately 36% of patients with chronic cough. It is worth emphasizing that between 5 and 10% of cases of persistent cough cause therapeutic difficulties [11].

Although there are descriptions of different types of therapies used in treatment of chronic cough in the literature, there is lack of documentation confirming their effectiveness [12]. Chronic cough is not threatening to the lives of patients. However, the accompanying symptoms and the cough itself significantly reduce the patients' quality of life. The physical, psychological and social condition is subject to change [2,13]. The study shows that in all patients, the value of VHI score before rehabilitation did not fall within the norm. In 50% of patients, a minor handicap of the voice was observed, in the remaining 50% - an average voice handicap. After logopedic therapy, there was a decrease in the value of points assessing individual responses. The highest number of points obtained by a patient with chronic cough was 46. At the same time, the biggest difference in the outcome before and after rehabilitation was observed in this patient. After speech therapy, the patient assessed his problems at 24 points. The difference between results of the VHI questionnaire before and after rehabilitation was statistically significant. This testifies to the positive impact of speech therapy in improving the functioning of patients.

Serious problems coexisting with chronic cough are gastroesophageal reflux and laryngopharyngeal reflux. In the literature they are described as the main cause of chronic cough. Analyzing the average results of the study, it turns out that the most common additional ailments in the study group were, among others, scratching in the throat, feeling of discharge on the back of the throat. The average value of the overall results decreased from 2.91 to 1.71. Analysis of the results of VTD questionnaire demonstrates the multidimensionality of problems of patients with chronic cough. These can include "scratching", "feeling the noodles in the throat" and "dry throat". The average of symptoms after therapy decreased from 4.2 to 2.3. The study confirms occurrence of additional ailments associated with chronic cough and the effectiveness of speech therapy in their treatment.

It is noteworthy that 80% of patients had an abnormal breathing pattern before rehabilitation, which was associated with a significantly increased head and neck muscle tone – 2.1 on a scale from 0-3; which in turn affected shortening of the maximum

time of phonation – below 17s. However, after rehabilitation, 90% of patients had a correct breathing pattern, a fivefold reduction in muscle tone within the vocal tract. 70% of patients achieved a correct maximum time of phonation. The study confirms a more frequent occurrence of chronic cough in the female sex. As many as 80% of the study group were women. It is worth emphasizing that women pay more attention to the severity of symptoms. From an interview conducted with women, it was clear that the problem was shameful for them in various everyday situations, for example during travel by public transport, while shopping. The study confirms that chronic cough can be very troublesome not only for the patient, but also for his environment [14]. This has a significant impact on the quality of their lives [15,16], a sense of shame in social relations, and professional work [17]. Approximately 50% of patients with chronic cough have depression [18]. Other generalized symptoms are fatigue and chest pain [19]. It is therefore important that during rehabilitation, not only severity of cough be assessed, but also additional problems of patients.

A limitation of the study was the small number of patients. It is worth noting the difficulties associated with conducting the study. The first was organization of the study group. Initially, about 50 people expressed their willingness to participate in the study. Due to the fact that classes had to be systematically organized once a week, some people did not decide to participate, some of them expressed willingness to participate in therapy, but unfortunately, the meeting did not take place. Rehabilitation was finally undertaken by 15 people, of which only 10 patients managed to complete it in its entirety. Another limitation was constituted by fact that speech therapy was demanding, had to be carried out systematically and required involvement on the part of the patient during the exercises.

The above work is aimed at creating awareness that speech therapy may be the future direction in rehabilitation of chronic cough. It is worth emphasizing that this problem concerns a large group of patients. Because the symptoms do not significantly impede life, few people choose to work with specialists. Most help is given to patients in whom an intensified cough affects their quality of life. It is important to emphasize the additional role of speech therapists - very significant for people who do not obtain results with pharmacotherapy. The next step in assessing the impact of speech therapy on chronic cough may be to conduct a study comparing the subgroup of patients treated classically and patients only subjected to speech therapy.

## CONCLUSIONS

Patients with chronic cough after rehabilitation show signifi-

cantly lower cough intensity than before rehabilitation. This constitutes proof to the effectiveness of speech therapy exercises. Patients with chronic cough show a greater intensity of accompanying symptoms before rehabilitation, i.e., reflux, symptoms on the part of the vocal tract, than after rehabilitation.

The use of breathing and relaxing exercises has improved the breathing pattern and relaxation of the head and neck muscles as well as improvement of the maximum time of phonation. Logopedic rehabilitation should be included in therapeutic recommendations for patients with chronic cough.

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