ARTYKUŁ ORYGINALNY / ORIGINAL RESEARCH ARTICLE

INDEX COPERNICUS INTERNATIONAL

Developing voice intensity in clients with dysarthria with the use of specialized technical devices

Zwiększanie natężenia głosu u pacjenta z dyzartrią poprzez zastosowanie specjalistycznych urządzeń technicznych

Miglena Simonska

South-West University „Neofit Rilski", , Bulgaria

Article history: Received: 09.11.2016 Accepted: 20.12.2016 Published: ??.??.2016

ABSTRACT: The purpose of this article is to present the results of a one-month voice intensity treatment with specialized technical devices in a client with hyperkinetic dysarthria. The main aim of the study was to assess the effects of voice treatment software in people with dysarthria. The results show a gradual improvement in voice intensity after one month of voice treatment.

KEYWORDS: Dysarthria, Voice treatment, Technical devices, Breathing control, Rehabilitation

STRESZCZENIE: Celem niniejszego artykułu jest przedstawienie wyników miesięcznego leczenia służącego poprawie natężenia głosu u pacjenta z dyzartrią hiperkinetyczną. Terapia przeprowadzono z zastosowaniem specjalistycznych urządzeń technicznych. Głównym założeniem badania jest obserwacja efektów użycia oprogramowania służącego leczeniu zaburzeń głosu u osób z dyzartrią. Wyniki wskazują na zdolność do stopniowej zmiany natężenia głosu po okresie miesięcznego leczenia zaburzeń głosu.

SŁOWA KLUCZOWE: Dysarthria, leczenie zaburzeń głosu, urządzenia techniczne, kontrola oddychania, rehabilitacja

INTRODUCTION

Dysarthria is a neuromuscular speech disorder that affects both children and adults due to lesions of the central and peripheral nervous system. During adulthood, it can be caused by stroke, brain injury, tumors, degenerative neurological diseases, etc. The type and severity of the disorder depend on the affected area of the nervous system. The lesions affect respiration, phonation, resonance, articulation and/or prosody. The main symptoms of the disorder are characterized by slurred speech, incorrect breathing control, nasal and stained voice, incorrect articulation, slow and rushed speech and reduced speech intelligibility. According to Duffy (2007), disturbances of control or execution are due to one or many sensorimotor abnormalities that most often include weakness, spasticity, incoordination, involuntary or excessive movements and reduced or variable muscle tone.

The most widely used classification of dysarthria is that initially presented by Darley, Aronson and Brown (1975) and later developed by Duffy (2005). They classified six different types of dysarthria:

- Flaccid dysarthria – dysfunction of the lower motor neuron
- Spastic dysarthria – dysfunction of bilateral upper motor neurons
- Hypokinetic dysarthria – dysfunction of the basal ganglia (extrapyramidal)

- Hyperkinetic dysarthria – dysfunction of the basal ganglia (extrapyramidal)
- Ataxic dysarthria - dysfunction of the cerebellum
- Mixed dysarthria – dysfunction of more than one system (Duffy, 2005; 2007).

HYPERKINETIC DYSARTHRIA

Hyperkinetic dysarthria is a motor speech disorder due to dysfunction of the cerebellum; it is coded as R47.1 in the International Classification of Diseases/ICD-10 (WHO, 2016).

Hyperkinetic dysarthria is usually caused by degenerative diseases, vascular disorders, toxic-metabolic conditions, infectious processes, neoplasms and other disorders. It can manifest in one or all of the following systems - respiration, phonation, resonation, articulation, prosody and rate of speech. The abnormal speech characteristics result from inadequate, rhythmic or irregular and unpredictable, rapid or slow, involuntary speech movements (Duffy, 2007).

PHONATORY DYSFUNCTION

Physiologic investigations of respiratory function have shown that some hyperkinetic clients have a reduction in the vital capacity. The voice quality in hyperkinetic dysarthria varies and may include one or any combination of the following abnormalities: inappropriate interruption of phonation, spasmodic dysphonia, organic voice tremor, harsh voice, monoloudness, monopitch, hypernasality, strained-strangled-hoarse voice (Brookshire, McNeil, 2015; Duffy, 2007; Nicolosi, Harryman, Kreshech, 2004). The most common type is the adductor spasmodic dysphonia. An adductor type of dysphonia has also been identified in which voice is suddenly interrupted by a temporary adduction of vocal folds (Schaeffer, 2011).

AIMS

The main aim of this study is to present the results of a one-month voice intensity treatment with specialized technical devices in a client with hyperkinetic dysarthria.

METHODOLOGY

A sixty-year-old man was included in the study. He was diagnosed with a severe form of hyperkinetic dysarthria in 2009 as a result of intoxication with antifreeze. He presented with the following symptoms: unsteadiness in vocal tone during vowel prolongation, harshness, breathiness, unstable loudness, adventitious movements of jaw and tongue, interference of abnormal body movements before articulation and dystonia.

Tab. I. Results of one-month voice treatment

DATE	TRIAL	50–60 dB	60–70 dB	70–80 dB	80 dB	80–90 dB
24.02.2016	1	28 sec.	35 sec.	40 sec.	50 sec.	NA
	2	28 sec.	34 sec.	NA	40 sec.	48 sec.
23.03.2016	1	7 sec.	10 sec.	14 sec.	16 sec.	21 sec.
	3	14 sec.	18 sec.	20 sec.	23 sec.	28 sec.

A one-month voice intensity treatment, twice per week, was applied at the Logopedics Center of South-West University, Blagoevgrad. A voice-like task was a stable phonation for a maximum of 3 seconds with an appropriative intensity range. The treatment approach included:

- Massage of the face and neck muscles;
- Breathing exercises;
- Sona - Speech II, Model 3650 of Kay Pentax – visual and auditory biofeedback device for control of voice intensity;
- Measurement of performance of voice intensity treatment – a special form was developed for reporting results.

RESULTS AND DISCUSSION

Table 1 presents the results from the first and the last treatment sessions. Data show the time of stable voice intensity for each trial. For example, during the first trial on February 24, 2016, the client achieved stable phonation in the range of 50-60 dB after 28 sec.; the next intensity range of 60-70 dB was achieved 7 sec. later (35sec.); the third range of 70-80 dB was achieved after 5 sec. after the previous range (40 sec.), etc.

Voice intensity range was defined during the first session. It was 50-90 dB. The results indicate that the client was able to change the power of his voice in that range. A prolonged exhalation flow and coordination of the muscles of articulation, laryngeal and respiratory organs are needed to control the power of voice. The greatest difficulties were experienced in the range of 50-60 dB and 80-90 dB. A greater ease was seen in the range of 60-70 dB and 70-80 dB (Figure 1).

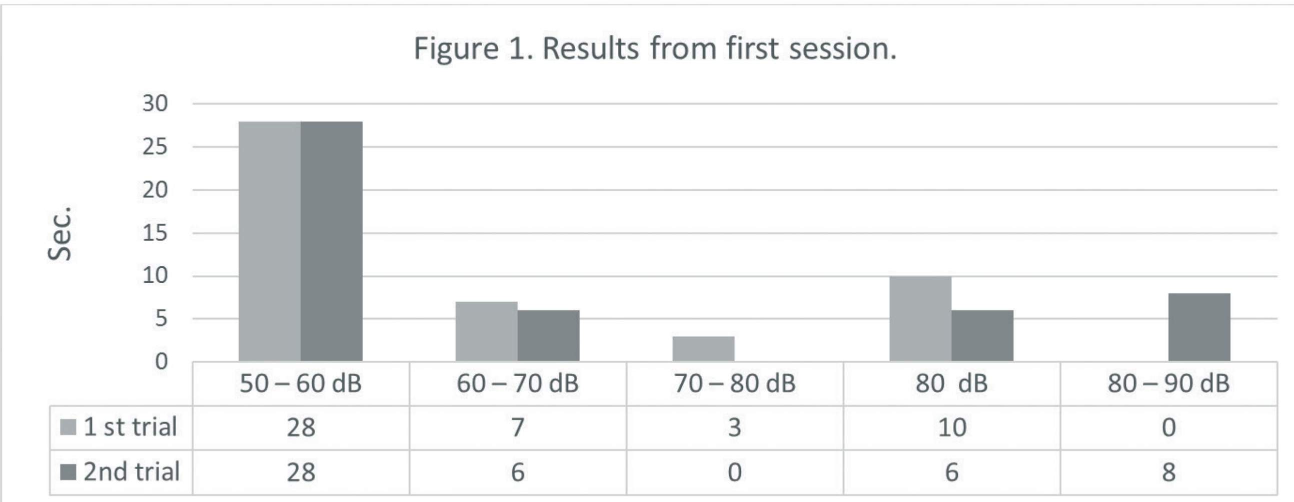

Fig. 1. The results of the last session

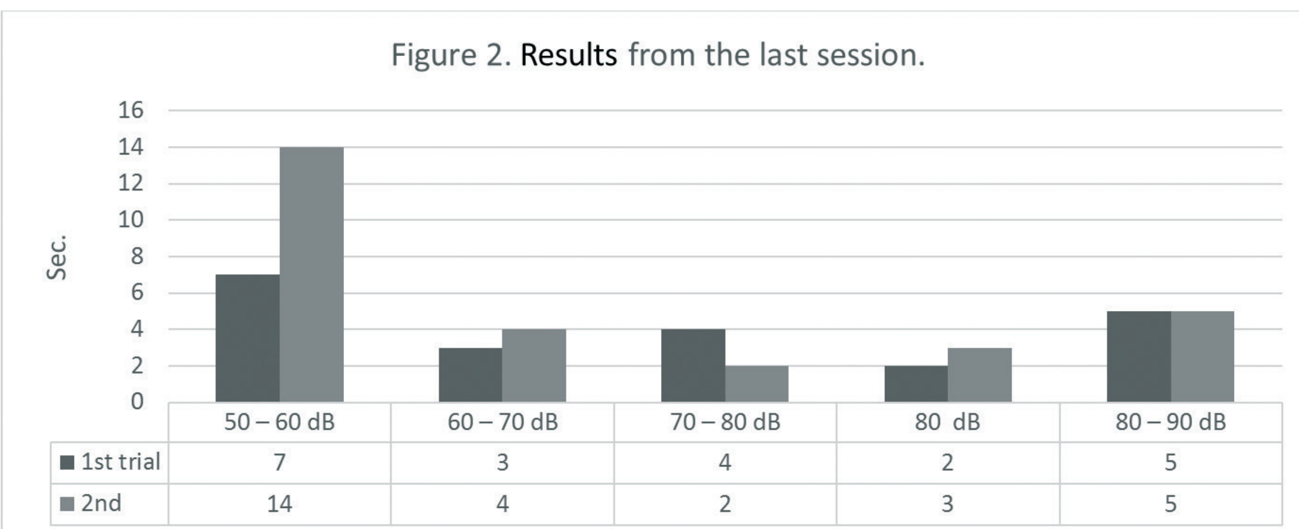

Fig. 2. The results of the last session

As shown in Figure 1 and Figure 2, the time for achieving prolonged and stable voice intensity range was reduced as well. The total time for changing voice intensity range during the first session was between 40 and 50 sec. This phonation time for the last session was between 21 and 28 sec. (Table 1). After one month of treatment, the client was able to gradually change voice intensity from 50 dB to 90 dB (Figure 2).

In order to achieve the best results, in addition to massage, it is important to suppress hyperkinesia in the abdominal and chest muscles, and to build skills for awaiting/skipping phonation during manifestations of dystonia. Another important goal of treatment is to achieve mandibular control which is necessary to maintain a continuous and stable phonation. Elimination of excessive tremor or dyskinetic movements of the mandibula is a precondition for efficient respiration as well. Postural control, massage, sensory tricks and biofeedback are different approaches recommended by Duffy (2007).

Speech intelligibility is the most important goal in dysarthria treatment. It can be achieved by postural stabilization, increased respiratory capacity, controlled loudness and voice pitch. Clients may be helped to voluntary adjust the loudness of their voice. Also, they can be helped to increase the efficiency of their speech and voice by speech exercises, breathing exercises and visual feedback.

CONCLUSION

Although the results concern only one client, it could be concluded that the application of technical devices enhances the control over the voice intensity in individuals with neurological communication disorders. A prolonged exhalation flow and coordination of the muscles of articulation, laryngeal and respiratory organs are needed to control the power of voice. To achieve the desired treatment outcomes, it is necessary to determine the baseline range of voice intensity and, after having established control over this range, to expand it. Further investigations need to be performed in order to reveal the mechanisms of improvement in voice quality by implementation of specialized treatment devices.

ACKNOWLEDGEMENTS

This study is part of project № RP-B11/16 "Implementation of aids to improve speech breathing in persons with communication disorders" funded by a research program at South-West University "Neofit Rilski", Blagoevgrad.

References

1. Brookshire R.H., McNeil M.R.: Introduction to Neurogenic Communication Disorders. 8th ed. St. Louis, MO: Mosby; 2015.
2. Darley F.L., Aronson A.E., Brown J.R.: Motor Speech Disorders. Ed. Saunders WB, editor. Philadelphia; 1975.
3. Duffy J.R.: Motor speech disorders: substrates, differential diagnosis and management. 2nd ed. St. Louis, MO: Elsevier; 2005.
4. Duffy J.R.: Motor speech disorders: substrates, differential diagnosis and management. 3td ed. Elsevier. 2007, 11 p.: 191–221.
5. Nicolosi L., Harryman E., Kreshech J.: Terminology of Communication Disorders: speech-language-hearing. 5th ed. Baltimore, MD: Lippincott, Williams & Wilkins; 2004:107.
6. Schaeffer N.: Assessment of Voice Disorders, in: A Guide to Clinical Assessment and Professional Report Writing in Speech-Language Pathology. Stein-Rubin C., Fabus R., ed. Cengage Learning; 2011: 312.
7. WHO [Internet]. World Health Organization. International Classification of Diseases (ICD). Version: 2016; [cited 2016]; Available from: http://apps.who.int/classifications/icd10/browse/2016/en.

Word count: 1300 Tables: 1 Figures: 2 References: 7

Access the article online: DOI: 10.5604/20845308.1226623 Full-text PDF: www.otorhinolaryngologypl.com/fulltxt.php?ICID=1226623

Corresponding author: Miglena Simonska; South-West University „Neofit Rilski", 66 Ivan Mihailov str., Blagoevgrad – 2700, Bulgaria; e-mail: miglena_simonska@swu.bg, msimonska@yahoo.com

Competing interests: The authors declare that they have no competing interests.

Cite this article as: Simonska M.,: Developing voice intensity in clients with dysarthria with the use of specialized technical devices; Pol Otorhino Rev 2016; 5(4): 36-39