

The Techniques of Speech Therapy Management of Voice and Speech Disorders in Parkinson's Disease

تقنيات إعادة التأهيل الأرتفوني لاضطرابات الصوت والكلام لدى المصاب بمرض الباركنسون

قدور علي* Kaddour Ali

Lecturer in speech therapy at the university center of Tipaza Algeria

Kaddour.ali@cu-tipaza.dz

ORCID: <https://orcid.org/0000-0003-4580-8284>

DOI: 10.46315/1714-014-002-061

Received: 02/01/2025 Accepted: 23/05/2025 Published: 16/06/2025

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Abstract (English):

To date, there is no reliable and scientifically valid study providing evidence of the effectiveness or lack thereof of speech therapy in speech disorders of Parkinson disease (PD), due to sample sizes that are too small. However, starting from the 1980s, objective measures (acoustic and video) and results from self-assessment scales concluding the immediate and medium-term effectiveness (3 to 12 months) of rehabilitation have made it possible to determine principles of rehabilitation. Unfortunately in Algeria, a minority of speech therapists treat voice and speech disorders related to Parkinson's disease. Through a bibliographic research on the website of the Ministry of Health of the United States of America, we were able to identify the main methods currently adopted by speech therapists to manage voice and speech disorders in Parkinson's patients that we will present in detail in this study.

Keywords: Speech therapy; Parkinson disease; voice and speech disorders;

ملخص :

حتى الآن، لا توجد دراسة موثقة وصحيحة علمياً تقدم دليلاً على فعالية عملية إعادة التأهيل الأرتفوني لاضطرابات الصوت والكلام لدى المصاب بمرض الباركنسون، وذلك بسبب أحجام العينات الصغيرة جداً. ومع ذلك، بدءاً من الثمانينات، فإن التدابير الموضوعية (التسجيلات المرئية، التحليل الأكوستيكي) ونتائج مقاييس التقييم الذاتي خلصت إلى الفعالية القورية والمتوسطة المدى (3 إلى 12 شهراً) لإعادة التأهيل الأرتفوني لهذه الاضطرابات، حيث أضحت من الممكن تحديد مبادئ إعادة التأهيل الناجعة.

لسوء الحظ في الجزائر، هناك أقلية من المختصين الأرتفونيين الذين يتكفون باضطرابات الصوت والكلام لدى المصاب بمرض الباركنسون. من خلال بحث ببليوغرافي على موقع وزارة الصحة بالولايات المتحدة الأمريكية تمكنا من التعرف على الطرق الرئيسية التي يعتمد عليها المختصون الأرتفونيون حالياً لإعادة تأهيل اضطرابات الصوت والكلام لدى مرضى باركنسون التي سنعرضها بالتفصيل في هذه الدراسة.

كلمات مفتاحية: إعادة التأهيل الأرتفوني مرض الباركنسون، اضطرابات الصوت والكلام.

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* Corresponding author kaddour ali: kaddour.ali@cu-tipaza.dz

1- Introduction

Second neurodegenerative pathology after Alzheimer's disease Parkinson's disease (PD) has an average prevalence of 827.5 cases per 100,000 inhabitants in occidental countries (Simon, et al., 2020, p. 4). The damage to the basal ganglia in their dopaminergic component is located at the origin of the disease, for which several etiologies exist, whether infectious, linked to olfactory disorders, endocrine, as suggested by Wills in 2008, which identifies insomnia and depression as markers of the disease, or even genetic for 10 to 15% of cases (Beitz, 2014, p. 67). Causes environmental issues are also mentioned, such as the use of pesticides (study in France in 2007 and California in 2009) or insecticides remaining in the environment several decades after their use.

Characterized by motor and non-motor signs, PD is subject to a comprehensive management (Ascherio, & Schwarzschild, 2016, p. 1261). This includes medication, surgery, and rehabilitation interventions. In this regard, the speech therapist intervenes for swallowing, cognitive, and vocal disorders.

Speech rehabilitation in PD offers a wide range of approaches that are not all presented in this document. Likewise, we do not evaluate the observed rehabilitation methods, but we compare the effects of management approaches (Armstrong, & Okun, 2020, p. 551; Dashtipour, et al., 2018, p. 340). Focused exclusively on Parkinsonian dysarthria, on a sample of 10 patients. To date, there is no reliable and scientifically opposable study providing proof the effectiveness or otherwise of speech therapy treatment for speech disorders of objectives (acoustic and video) and the results of self-assessment scales concluding that the immediate and medium-term (3 to 12 months) effectiveness of the rehabilitation allowed to determine the principles of rehabilitation in 2001 (Ramig, et al., 2018, p. 1779). MP, due to too small samples. However, from the 1980s, measures. The catch support must be early, from the appearance of the first symptoms and must also be targeted. Simple and intensive (daily sessions over a short period, 10 sessions over 2 weeks for example), it relies on auditory and visual feedback for the patient who must continue their exercises at home, supported by those around them. Effectiveness requires objective post-rehabilitation measurement (Theodoros, & Anderson, 2024, p. 1255) Classical techniques consist of an individualized approach that relies on diaphragmatic breathing, control of intensity and speed, strategies reducing word loss and voice and articulation exercises (Goldman et al., 2024, p. 140) Bi-weekly, the sessions consist of rehearsals in a limited number of processing tasks (Dean et al, 2001, p. 226). There are various techniques in the speech therapy treatment of these disorders which range from the improvement of prosody to LSVT® (Ramig et al, 2018, p. 1782), including a more diversified approach focused on breathing, articulation, voice, flow, prosody and visual feedback.

Within the Algerian hospital setting, the availability of speech therapists specializing in voice and speech disorders for Parkinson's patients remains regrettably limited. In this article, we aim to

highlight a non-exhaustive overview of techniques and approaches currently adopted on an international level for the rehabilitation of voice and speech impairments. To achieve this, we will endeavor to address the following question.

Study question:

What are the methods and techniques of speech therapy rehabilitation for voice and speech disorders in patients with Parkinson's disease?

2- Speech and voice in Parkinson's disease (Parkinsonian dysarthria)

Dysarthria concerns the quality and intelligibility of speech and is caused by the dysfunction of the motor neuron. She translated as troubles breathing, laryngeal function, direction of breath and articulation (Ma, et al., 2020, p. 5). There are 6 main types of dysarthria, depending on the Darley classification (Darley, et al., 1969, p. 250):

- Flaccid or flabby dysarthria, linked to the deficit of the peripheral nerves, the muscular junction, and speech effector muscles,
- Spastic dysarthria, linked to damage to the first motor neuron, linked to the zones motor functions of the cerebral cortex,
- Ataxic dysarthria mainly caused by dysfunction cerebellar,
- Hyperkinetic dysarthria
- Hypokinetic dysarthria. The latter 2 being linked to the damage to the system extra-pyramidal
- Mixed dysarthrias found particularly in lateral sclerosis amyotrophic disease.

Concerning PD, speech disorders “appear early but slowly and insidiously and are often neglected before becoming severe and leading to loss intelligibility, social withdrawal, withdrawal and loss of self-esteem. ». We distinguishes early signs, such as loss of intensity or alteration of quality vocal, and later signs which affect flow or articulatory precision. The voice and speech disorders concern more than 89% of PCPs and make them complicated social interactions, contributing to the isolation of the patient and participating in deterioration of his quality of life (Selikhova, et al., 2016, p. 75).

Parkinsonian dysarthria is a disorder of the motor execution of speech, linked to a dysfunction of the NGC motor loop. Even if he it is a parkinsonian hypophonia, it is “an arthritic dysfunction (articulatory) and/or phonatory of neurological origin” (Pinto, et al., 2004, p. 554)

Hypokinetic parkinsonian dysarthria has the following characteristics:

prosodic insufficiency, reduction of accentuation, variable flow, imprecision of consonants, hoarse and breathy voice. It is accompanied by a deficit in integration auditory-motor impacting both the

Pcp's own vocal perception and its production. Spontaneous speech, requiring planning at the time of initiation, execution and control, is more achieved than repetition or reading aloud, which offers relief in this planning via visual or auditory input. Other signs such as hypophonia, loss of variation in vocal intensity or even inappropriate silences regularly worsen over the course of the illness (Pinto, et al., 2024, p. 2830).

3- Methods

Conducting bibliographic research on speech therapy techniques and methods for addressing voice and speech disorders in patients with Parkinson's disease necessitates a systematic and thorough approach. The research objectives were clearly defined at the outset, specifically: identifying the most effective strategies to enhance speech intelligibility, address hypophonia, and improve prosody. Subsequently, an in-depth search of the scientific database on the United States Ministry of Health's PubMed platform was initiated to compile pertinent clinical studies, systematic reviews, and meta-analyses. The primary keyword utilized was: speech therapy for dysarthria in Parkinson's patients. Particular emphasis was placed on evidence-based methods, such as the Lee Silverman Voice Treatment (LSVT), renowned for its proven efficacy in this domain.

4- Results

According to the results that we have obtained from 1965 to 2025, the main speech therapy methods and techniques for the rehabilitation of voice and speech disorders in Parkinson's patients are:

4-1- Singing and music therapy

In the rehabilitation of speech disorders, singing has multiple benefits: it calls upon memory functions, supported by the melody, it promotes control respiratory in coordination with phonation, it naturally produces more intensity and it represents a real source of pleasure, even more so when practiced in a group. In addition, it allows you to produce a carried voice without effort, in a context of efficiency. Among the vocal functions implemented in singing, we can retain a broader exploration of the vocal range, increased intensity, finer bodily sensations which contribute to strengthening the audio-phonatory loop and a lengthening of vowels favorable to better articulation.

For voice disorders in PD, Haneishi uses a music-based protocol which consists of vocal warm-ups and singing exercises with emphasis on phonation and breathing (Wan et al., 2010)(73). Vocal intensity and intelligibility improve after 12 or 14 sessions.

For Parkinson's patients suffering from mild dysarthria, "singing allows them to restore a natural character to speech, to relaunch communication." Furthermore, he avoids the development of sometimes harmful compensation mechanisms. For moderate or severe dysarthria, "singing helps maintain the ability to communication, to revitalize the patient and improve their quality of life" (Machado, et al., 2021, p. 1118).

4-2- Straw rehabilitation

As proposed by B.A de la Bretèque, it aims to balance the pressures above and subglottic for less laryngeal effort. It increases the capacity of breath, improve cord work and increase tone without vocal forcing. So, in the case of laryngeal hypotonia, we will increase the subglottic pressure by doing blow the patient through narrow straws, even pinched, so as to promote the rapprochement of the vocal cords and arytenoids. The patient recovers intra-laryngeal sensations without any forcing through a massage of the vocal cords and larynx relief; these sensations subsequently become references used in phonation (Radhakrishnan, 2022, p. 94).

4-3- The relaxation approach

“Therapeutics of vocal disorders” as presented by F. Le Huche consists of a re-educational approach which is based on three stages:

- The control of psychomotor energy through relaxation, allowing the patient to release tension and mobilize small amounts of energy. She also contributes to the improvement of the body image.
- Breathing technique and vocal behavior requiring the abdominal strap and promoting verticality.
- Vocal practice itself. Various relaxation techniques are possible, such as that of Schultz, known in France since the 1950s, soliciting dissociated auto-suggestions for each member focused on gravity and heat. Conversely, the technique presented by Ajuriaguerra targets resistance to relaxation by calling on the intervention of another person, who helps the patient to become aware of the feeling of relaxation, out of everything suggestive process. Le Huche himself offers a so-called “open eyes” practice which is more akin to “managing the level of psychomotor tension” (1989) than to true relaxation. It consists of breathing-sighs interspersed with apneas comfortable accompanying relaxation/crispation movements. This phase of relaxation helps the patient to become better aware of the points of tension throughout their body body, to be more attentive to your sensations, to reduce your anxiety (Le huche & Allali, 1989, p. 2016).

4-4- LSVT LOUD®: Lee Silverman Voice Treatment

It was retained as “as a reference method during the consensus meeting on Parkinson's disease”. It is the only method that has been the subject of the most methodologically rigorous randomized studies (Spielman, et al., 2011, p. 690). This vocal rehabilitation technique is based on a simple and cognitive approach. intensive which promotes a healthy increase in vocal intensity resulting in improvements in the voice, but also in articulation and intelligibility. There are also improvements in swallowing, expressions facial and brain functions. In addition to this perceptual aspect, this technique targets the characteristics of voice disorders in PCPs which are the overall reduction of the amplitude in the vocal mechanism and the difficulty in gauging one's efforts. The objective being improve

functional communication for 6 to 12 months without further rehabilitation complementary. This is an approach recommended in the Care Pathway guide. PD from the beginning phase of the condition.

LSVT LOUD® is based on 5 principles which are "improving the intensity of the phonatory production", "the improvement of the sensory perception of effort, that is to say the calibration", "a significant effort during the session, intensively (4 times per week, i.e. 16 sessions over a month)", "each voice and speech sample is quantified" (Fox et al., 2012, p. 325). With LSVT LOUD®, the patient practices effortlessly producing a strong voice that triggers effects on the entire speech (voice, articulation, frequency) from the simple indication "think hard", avoiding focusing the training on breathing or the joint. Through daily exercises that aim to establish an internal level effort required to be heard and understood, LSVT LOUD® reinstates the process.

sensorimotor for the generalization of progress in the daily life of PCPs. To the Unlike other rehabilitative approaches, LSVT LOUD® is based on exercises intensive and requiring effort, in accordance with the fundamental principles of motor training known to contribute to plasticity and cerebral reorganization according to Kleim and Jones, 2008, cited in (Spielman et al., 2011. P. 695). A 1995 study led by Ramig et al. concludes that LSVT LOUD® is effective on the improvement of glottic closure and respiratory control leading to strengthening of subglottic pressure and airflow, as well as a better level vocal sound. In addition, 2 years later, patients treated in LSVT LOUD® are the only ones to present a vocal intensity greater than that before rehabilitation. She would also have an effect on friendship . An experiment carried out in 2010 intended to study the effects of LSVT LOUD® in post-DBS highlights an improvement in the vocal intensity of patients who followed the LSVT LOUD® program in post-rehabilitation and 6 months later, an increase of the VAI* ratio in the 2 groups following the LSVT LOUD® program meaning a improvement of articulation. However, it is impossible to draw a conclusion considering given the weakness of the samples and the heterogeneity of the groups.

5- Discussion

The discussion of the results of the bibliographic survey on the techniques and methods of speech therapy for voice and speech disorders in Parkinson's patients highlights the importance of a multidimensional and individualized approach. The analyzed studies emphasize that voice disorders, such as hypophonia, and speech disorders, like hypokinetic dysarthria, are common in these patients and have a significant impact on their quality of life. Among the most effective techniques, the Lee Silverman Voice Treatment (LSVT LOUD) stands out for its effectiveness in improving vocal intensity and articulation through intensive exercises focused on the amplitude of vocal movements. Other approaches, such as breathing exercises, rhythmic auditory stimulation, and visual or auditory feedback techniques, complement this management by targeting specific aspects like respiratory control or prosody. Research also highlights the growing interest in integrating digital technologies,

such as mobile applications and interactive software, which allow for home monitoring and better adherence to rehabilitation programs. However, the effectiveness of interventions varies according to the individual characteristics of patients, notably the stage of the disease and personal motivation. Finally, there is a need for standardized protocols and longitudinal studies to better assess long-term outcomes and optimize therapeutic strategies.

6- Conclusion

The field of intervention of speech therapists continues to expand, soon the proportion of elderly people in the Algerian population will undoubtedly expand, which requires the adoption of a preventive vision in order to better care for patients. in the health sector which present the so-called diseases of the elderly. We hope that this article will contribute to raising awareness among speech therapists practicing in Algeria to better care for Parkinson's patients properly.

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