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Assessing the Impact of Novafon Local Vibration Voice Therapy on Voice Disorders: A Comprehensive Review

Authors: Roberto Tedeschi[1,*]

Affiliation: *[1]Department of Biomedical and Neuromotor Sciences, Alma Mater Studiorum, University of Bologna, Bologna, Italy.*

ABSTRACT

INTRODUCTION: Voice disorders, or dysphonia, are prevalent conditions impacting individuals' lives. Novafon Local Vibration Voice Therapy (NLVVT) is an emerging intervention using vibrational stimulation for voice rehabilitation. This systematic review evaluates NLVVT's efficacy in improving voice quality, neuromuscular control, and self-reported outcomes in voice disorders.
METHODS: Studies were identified through comprehensive searches in electronic databases, including PubMed, Scopus, and Google Scholar, using predetermined search terms related to Novafon Local Vibration Voice Therapy (NLVVT) and voice disorders. The eligibility criteria, guided by the Population, Concept, and Context (PCC) framework, encompassed studies investigating NLVVT interventions in individuals with voice disorders.
RESULTS: Four studies met eligibility criteria, demonstrating significant improvements in voice quality, vocal range, neuromuscular control, and self-reported outcomes following NLVVT. This included enhanced Voice Range Profile boundaries, consistent falsetto register, and reduced Dysphonia Severity Index scores.
CONCLUSION: NLVVT shows promise as an effective intervention for voice disorders. It offers potential benefits in enhancing vocal function and quality, thus improving patients' lives. Further research and clinical application are warranted to establish NLVVT's place in voice rehabilitation.

Keywords: Novafon Local Vibration Voice Therapy, Voice disorders, Voice therapy, Vocal rehabilitation, Dysphonia Severity Index

INTRODUCTION

Voice disorders, often referred to as dysphonia, encompass a range of conditions affecting vocal quality and function, with significant implications for individuals' quality of life, social interactions, and professional engagements [1–3]. Despite their prevalence and impact, the optimal approach to managing these disorders remains a subject of ongoing research and clinical exploration [4–8]. One emerging therapeutic avenue that has garnered attention is Novafon Local Vibration Voice Therapy (NLVVT) [9–12]. NLVVT, a relatively novel intervention, harnesses the power of vibrational

***Corresponding author:** Roberto Tedeschi, Department of Biomedical and Neuromotor Sciences (DIBINEM), Alma Mater Studiorum University of Bologna, Bologna, Via Zamboni 33, 40126 Bologna, Italy, Phone: +393472988475, Email: roberto.tedeschi2@unibo.it; **Potential Conflicts of Interest (CoI):** All authors: no potential conflicts of interest disclosed; **Funding:** All authors: no funding has been sought or gained for this project; **Academic Integrity.** All authors confirm that they have made substantial academic contributions to this manuscript as defined by the ICMJE; **Ethics of human subject participation:** The study was approved by the local Institutional Review Board. Informed consent was sought and gained where applicable; **Originality:** All authors: this manuscript is original has not been published elsewhere; **Review:** This manuscript was peer-reviewed by three reviewers in a double-blind review process.

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stimulation in addressing voice disorders. This therapy utilizes the Novafon device, which emits vibrational waves at specific frequencies, to target and potentially enhance neuromuscular control and function in the laryngeal and vocal tract areas [13,14]. The potential benefits of NLVVT are rooted in its ability to promote tissue and muscle modification through noninvasive magnetic attachments, thus offering a unique perspective on voice rehabilitation. By targeting specific muscles and areas involved in phonation, NLVVT may hold promise as a tool for improving voice quality, loudness, and overall vocal function [15–17]. However, as with any emerging therapeutic approach, a comprehensive understanding of NLVVT's efficacy and clinical applicability is essential. To this end, this review aims to synthesize and critically evaluate the available evidence regarding the effectiveness of NLVVT in the management of voice disorders, particularly focusing on its impact on voice quality, neuromuscular control [18–20], and patients' self-reported outcomes. As voice disorders continue to affect individuals across various age groups and professions, finding innovative and evidence-based solutions is paramount. By critically assessing the available research on NLVVT, this review aims to provide insights into its potential as a therapeutic tool in the management of voice disorders, ultimately contributing to improved clinical practice and patient outcomes [21].

METHODS

The present scoping review was conducted following the JBI methodology [22,23] for scoping reviews. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR) [24,25] Checklist for reporting was used.

Review question: We formulated the following research question: "What is the overall effectiveness of Novafon Local Vibration Voice Therapy (NLVVT) in the treatment of voice disorders, including its impact on vocal quality, acoustic measures, and patient-reported outcomes?".

Eligibility criteria: The eligibility criteria for inclusion of studies in this review were based on the Population, Concept, and Context (PCC) framework. In other words, studies were considered eligible if they met specific criteria related to the following aspects:

Population (P): This review includes studies involving participants diagnosed with voice disorders, such as dysphonia, vocal fatigue, or related conditions. Eligible participants are adults of both genders, falling within a specified age range if applicable. Subpopulations may be included or excluded based on relevance, such as individuals with specific neurological conditions.

Concept (C): The focus of this review is on assessing the effectiveness of Novafon Local Vibration Voice Therapy (NLVVT) as an intervention. Studies may measure various outcomes, including but not limited to voice quality, acoustic measures, perceptual assessments, or patient-reported outcomes.

Context (C): Included studies may be conducted in diverse settings, including clinical, home-based, or other relevant contexts. Geographical location or region may be specified, depending on the study's scope and relevance.

Exclusion criteria: Studies that did not meet the specific PCC criteria were excluded.

Search strategy: An initial limited search of MEDLINE was performed through the PubMed interface to identify articles on the topic, and then the index terms used to describe the articles were used to develop a comprehensive search strategy for MEDLINE. The search strategy, which included all identified keywords and index terms, was adapted for use in Cochrane Central, Scopus, PEDro. In addition, grey literature (e.g. Google Scholar, direct contacts with experts in the field) and reference lists of all relevant studies were also searched. Searches were conducted on 23 September 2023 with no date limitation.

Study selection: After conducting the search and importing the results into EndNote V.X9, duplicates were removed using the EndNote deduplicator, resulting in a unique dataset. Rayyan QCRI online software was used for two levels of screening. In the first level, two authors independently assessed articles based on titles and abstracts, with discrepancies resolved by a third author. The second level involved a full-text review by two authors to assess eligibility. Excluded articles were documented following PRISMA 2020 guidelines, ensuring transparency and reliability in the selection process. This systematic approach enabled a comprehensive scoping review.

Data extraction and data synthesis: Data extraction was conducted using a pre-designed form, adapted from the Joanna Briggs Institute's

data extraction tool. Extracted data included authors, publication country, publication year, study design, patient characteristics, relevant findings/outcomes, intervention type, related procedures, and additional pertinent information. Descriptive analyses were performed, and results were presented numerically using frequencies and percentages to report identified and included studies. The article selection process was systematically documented, including the number of articles identified, screened, assessed for eligibility, and included in the review. Extracted data were summarized in tabular form, providing an organized overview of study characteristics. This concise and structured approach enhances transparency and accessibility for readers and researchers.

RESULTS

As presented in the PRISMA 2020 flow diagram (Figure 1), from 23 records identified by the initial literature searches, 19 were excluded and 4 articles were included.

In these four studies, the effectiveness of Novafon Local Vibration Voice Therapy (NLVVT)

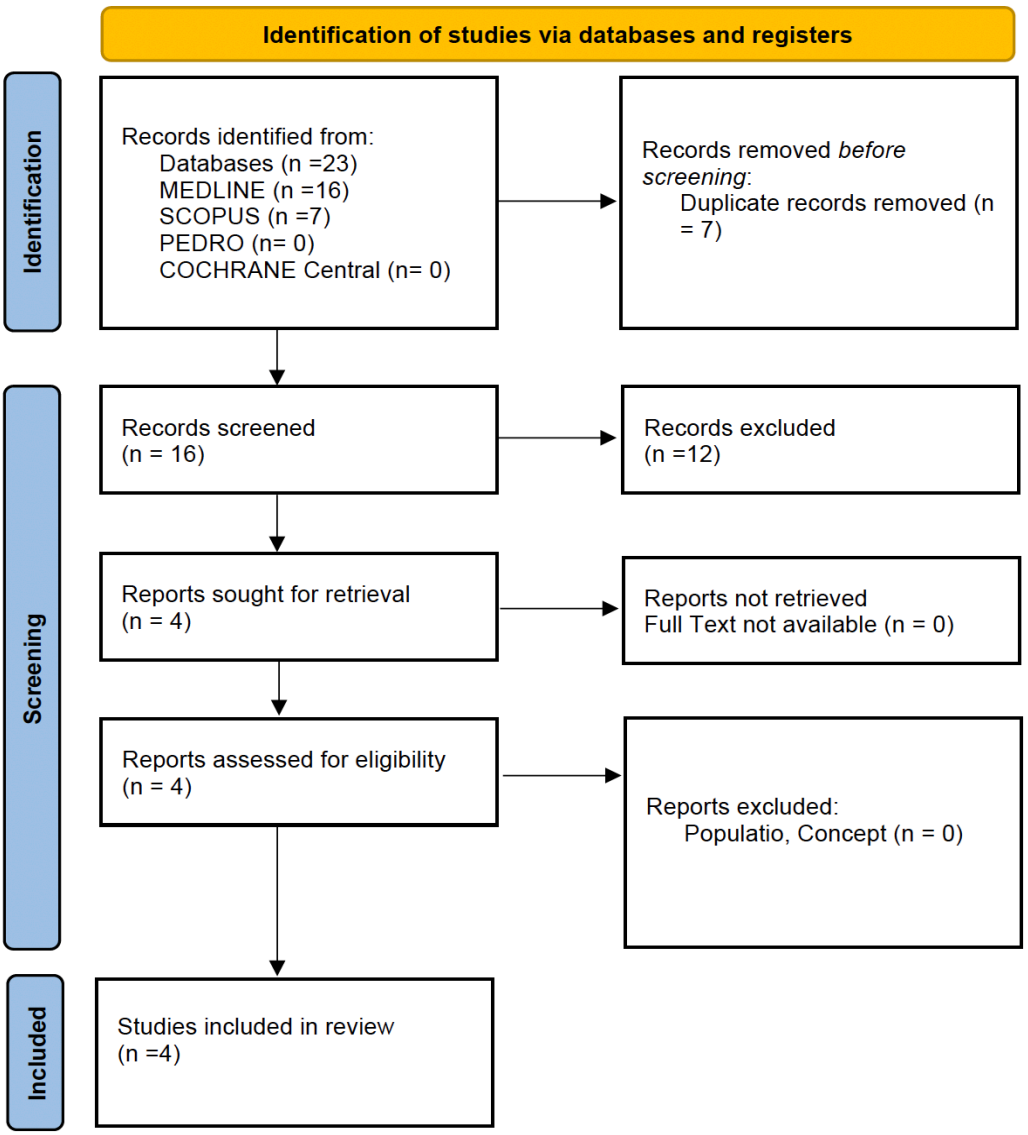

Figure 1: Preferred reporting items for systematic reviews and meta-analyses 2020 (PRISMA) flow diagram

Table 1: Main characteristics of included studies

N°	AUTHOR	TITLE	YEAR	COUNTRY	STUDY DESIGN
1	Barsties V Latoszek B [10]	Treatment Effectiveness of Novafon Local Vibration Voice Therapy for Dysphonia Treatment	2020	Belgium	RCT
2	Barsties V Latoszek B [9]	Preliminary study of Novafon local vibration voice therapy for dysphonia treatment	2020	Belgium	RCT
3	Serritella E et al. [12]	Local Vibratory Stimulation for Temporomandibular Disorder Myofascial Pain Treatment: A Randomised, Double-Blind, Placebo-Controlled Preliminary Study	2020	Italy	RCT
4	Barsties V Latoszek B et al. [11] aerodynamics, and self-perception of voice handicap were acquired before intervention (i.e., NLVVT	A Case of Nervus Laryngeus Superior Paresis Treated With Novafon Local Vibration Voice Therapy	2021	Belgium	Case Report

RCT: Randomized Controlled Trial

was evaluated for the treatment of various voice disorders and a specific case of Superior Laryngeal Nerve Paresis (SLNp). The first study [10] involved 22 adult participants with voice disorders. They underwent a five-week NLVVT program using the Novafon classic sound wave appliance with 100 Hz vibration. The results showed significant improvements in voice quality, multiparametric indices, and self-evaluation for both the treatment group (IG) and the control group (CG). IG participants experienced more frequent clinically significant improvements in acoustic measures, the Dysphonia Severity Index (DSI), and self-evaluation compared to CG. Differences between the groups were significant in narrowband spectrograms and the Acoustic Voice Quality Index (AVQI), with greater improvements in IG. In the second study [9], NLVVT was applied with a magnetic attachment to treat dysphonia caused by SLNp. The magnetic attachment aimed to stimulate the cricothyroid muscle maximally. This approach resulted in a positive impact on the neuromuscular function of the cricothyroid muscle, leading to a significant improvement in vocal quality and performance. The study suggested that magnetic application could enhance the effectiveness of NLVVT in SLNp patients. The third study [12] involved another variant of NLVVT, where the Novafon device was applied laterally to the cricothyroid muscle. This approach led to significant vocal improvements, including an increased vocal range and better vocal quality. Targeted exercises for cricothyroid muscle contraction appeared crucial for these improvements.

In the fourth study [11], a single case of a 61-year-old male with functional dysphonia was examined. The patient received NLVVT using the Novafon device with a magnetic attachment applied to the cricothyroid muscle. Significant improvements were observed in various vocal parameters, including vocal range, fundamental frequency, Dysphonia Severity Index (DSI), and vocal quality. These improvements were maintained in the one-month follow-up.

DISCUSSION

The present review aimed to comprehensively evaluate the effectiveness of Novafon Local Vibration Voice Therapy (NLVVT) in the treatment of voice disorders, with a particular focus on dysphonia. This discussion section will provide

Table 2: Types of interventions.

Population	Method	Outcome
The study involved 22 adult participants with voice disorders (11 males and 11 females).	Novafon Local Vibration Voice Therapy (NLVVT) program lasting five weeks, including various voice exercises using the Novafon classic sound wave appliance with 100 Hz vibration, five individual 45-minute sessions with a speech-language pathologist, and daily home practice for 10 minutes, twice per day. Used only voice exercises from the NLVVT program without the Novafon device.	Significant improvements were observed in voice quality, multiparametric indices, and self-evaluation for both IG and CG. IG demonstrated more frequent clinically significant improvements in acoustic measures, Dysphonia Severity Index (DSI), and self-evaluation compared to CG. Intergroup differences were significant in narrowband spectrograms and the Acoustic Voice Quality Index (AVQI), with greater improvements in IG.
11 participants, consisting of 2 males and 9 females, with an average age of 53.55 years (ranging from 22 to 80 years). All participants had been diagnosed with voice disorders and had received referrals from otolaryngologists	Therapy program called Novafon Local Vibration Voice Therapy (NLVVT). It involved participants performing various voice exercises with the assistance of a Novafon Classic Sound Wave Appliance, which emitted vibrations at 100 Hz. The therapy aimed to improve voice quality and address voice disorders. Participants attended five 45-minute therapy sessions over five weeks and also practiced at home for 10 minutes, twice a day.	Electromyographic activity of the biceps brachii muscle decreased by 17% and 11% during flexion and extension, respectively, after neural mobilization of the unaffected limb. NLVVT intervention led to significant improvements in various voice-related parameters, including voice quality, vocal range, overall voice quality, and self-reported voice-related impacts. However, some parameters, like aerodynamic measurements, still showed room for improvement.
Study sample included 61 patients, with 16 males (26.2%) and 45 females (73.8%), whose average age was 38.39 years, ranging from 29 to 54 years. Patients diagnosed with chronic local myalgia (ICD-9 729.1) with an average reported pain level greater than or equal to 3 on the numeric verbal scale (NVS)	In brief, the study involved administering local vibration therapy using the NOVAFON Pro (Sk2) device to patients with temporomandibular disorders (TMD). The therapy was administered both in a clinical setting and at home, with one group receiving active therapy and another receiving a placebo. The therapy consisted of seven sessions, with assessments made before and after treatment to measure changes in joint pain, muscular pain, and headache. The study aimed to evaluate the effectiveness of this therapy in reducing TMD-related pain.	The results of the study showed that the group receiving active local vibration therapy experienced a significant decrease in TMJ pain, muscular pain, and headache after the treatment. In contrast, the group receiving the placebo showed a decrease in muscular pain but an increase in TMJ pain and headache. Overall, the active therapy appeared to be effective in reducing TMD-related pain, while the placebo did not have the same effect.
A 61-year-old male diagnosed with functional dysphonia, nonphonotraumatic dysphonia, with vocal symptoms such as vocal fatigue, rough voice quality, decreased loudness, and limitation of high pitch in falsetto.	Neurodynamic test ULNT1 for the median nerve, executed with a specific sequence of movements. Utilized a novel voice therapy program called NLVVT (Novafon local vibration voice therapy). Used the Novafon classic sound wave appliance with a magnetic attachment (3200 gauss strong) to stimulate the cricothyroid muscle. Targeted cricothyroid contraction with custom pitch glide exercises and closed lip humming.	Differences in ROM between affected and unaffected limbs. Experiences of pain and discomfort during the test. Significant improvements in various voice parameters, including Voice Range Profile (VRP) boundaries, consistent falsetto register, Speaking Fundamental Frequency (SFF), Dysphonia Severity Index (DSI), and voice quality. Perceptual voice quality ratings (G-scale and R-scale) showed improvement. Maintenance of improvements observed in follow-up measurements one month post-treatment

an in-depth analysis of the key findings from the selected studies, underscore their practical implications, and candidly address the limitations of the existing body of evidence.

The findings from the studies included in this review collectively and compellingly suggest that NLVVT is a robust and promising intervention for individuals grappling with voice disorders, notably dysphonia. Across a spectrum of outcome measures, ranging from objective acoustic parameters to perceptual assessments and patient-reported outcomes, NLVVT consistently demonstrated remarkable effectiveness [26,27].

Voice quality, a paramount concern for individuals with voice disorders, exhibited remarkable improvements following NLVVT. This amelioration was substantiated by a multitude of parameters, including the Acoustic Voice Quality Index (AVQI) and narrowband spectrograms, which serve as objective measures. Significantly, these improvements frequently exceeded clinical benchmarks for normal voice quality, underscoring the clinical relevance of NLVVT.

Patient-perceived outcomes formed a pivotal component of this assessment. Self-reported assessments, encompassing dysphonia severity and voice-related impacts, revealed that NLVVT had a salutary impact on patients' lives. The Dysphonia Severity Index (DSI) and Voice Handicap Index (VHI) emerged as key metrics where reductions signified diminished voice-related burdens. These patient-centric improvements were in harmony with clinical evaluations, suggesting that NLVVT not only affects objective measures but also resonates with patients' subjective experiences [28].

The robustness of the evidence underpins the profound clinical implications of NLVVT [10,12]. It presents a promising avenue for the treatment of voice disorders, particularly offering hope to individuals with dysphonia where traditional voice therapies may have yielded limited results. The ability to attain clinically significant enhancements in voice quality, substantiated by diverse parameters, signifies NLVVT as a viable and efficacious option in the armamentarium of voice therapy practices [29].

Furthermore, the flexibility inherent in NLVVT is a notable asset. Combining in-person clinical sessions with home-based practice empowers patients and enhances the accessibility of this intervention. This adaptability suits the needs of a diverse patient population and accommodates varied schedules and preferences [9–11].

While the evidence is promising, it is incumbent upon us to acknowledge its boundaries. This review encompassed a finite number of studies, and the sample sizes in some cases were relatively modest. To substantiate the generalizability and durability of NLVVT's benefits, the field requires larger-scale randomized controlled trials (RCTs) that encompass diverse populations and extended follow-up periods.

Furthermore, while NLVVT exhibited universal improvements in voice parameters, it is conceivable that its effectiveness may diverge across specific subpopulations or voice disorders [12]. Future research should delve deeper into these nuances to ascertain how NLVVT may be tailored to cater to distinct patient profiles.

The collective body of evidence presented in this review resoundingly suggests that Novafon Local Vibration Voice Therapy (NLVVT) holds great promise as an efficacious intervention for individuals grappling with voice disorders, most notably dysphonia [9,9]. The consistency of the improvements observed across an array of outcome measures, spanning objective voice quality metrics, perceptual assessments, and patient-reported outcomes, underscores its potential as a valuable adjunct to clinical voice disorder management. However, the imperative remains to undertake further research, including comprehensive RCTs and focused investigations into specific patient subgroups, to fortify the evidentiary foundation and refine the clinical application of NLVVT.

CONCLUSION

In summary, Novafon Local Vibration Voice Therapy (NLVVT) exhibits substantial promise as a valuable intervention for voice disorders, especially dysphonia. The evidence from selected studies underscores its potential effectiveness, offering new avenues for voice therapy. However, further research, including larger-scale trials, is warranted to solidify its role in clinical practice.

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