Clinical Experiences of Voice Therapists in the Rehabilitation of Pediatric Vocal Fold Nodules

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Abstract

Objectives

The purpose of this study was to identify common clinical practices and experiences of voice therapists regarding the treatment of pediatric vocal fold nodules (VFNs) in Flanders, Belgium.

Study design

Observational survey study.

Methods

A 38-item online survey was completed by 35 voice therapists (32 females, 3 males) with experience in treating pediatric VFNs. Demographic characteristics, occupational characteristics, educational characteristics, therapy content, therapy delivery model, and experience of the voice therapist were explored. Experiences of voice therapists were measured using visual analogue scales (score 0 – 100). An extensive descriptive analysis was performed using IBM SPSS version 28.

Results

The majority of voice therapists (93.9%) provide a combination of direct and indirect therapy techniques when treating children with VFNs. The most commonly used direct techniques are breathing exercises (84.4%), semi-occluded vocal tract exercises (71.9%) with a clear preference for resonance tube in water and resonant voice therapy, and relaxation exercises (65.6%). On average, Flemish voice therapists provide 24.80 (SD: 11.5, range: 10 – 50) half-hour sessions, usually at a frequency of once a week. No respondents had experience with intensive therapy or group therapy in the treatment of pediatric VFNs. Regarding the experience of voice therapists with treating VFNs in children, respondents give a mean score of 77.28 (SD: 13.7, range: 50 – 100) on a scale of 0 (negative experience) to 100 (positive experience). Furthermore, 96.2% of voice therapists experience difficulties during treatment and 40% feel there are not enough targeted training opportunities on the topic of pediatric VFNs.

Conclusion

Flemish voice therapists generally feel comfortable treating pediatric VFNs. They usually provide a combination of direct and indirect therapy and use a wide range of different direct therapy techniques. However, there is still some need to organize more focused and tailor-made training initiatives.

Keywords: Voice disorders – Vocal fold nodules – Children – Speech and language therapists – Clinical practice

Declarations of interest: none

Introduction

Pediatric dysphonia is defined as clinician-recognized impaired voice production and represents a broad spectrum ranging from mild hoarseness to complete aphonia.[1,2] Pediatric dysphonia is relatively common in children, with reported prevalence rates between 3.9% and 53.2%.[2-10] The most common medical diagnosis in children with dysphonia is vocal fold nodules (VFNs), which account for 18% to 80% of all cases.[11-13] VFNs are bilateral benign lesions of the membranous vocal folds, commonly seen at the junction between the anterior one-third and two-thirds of the vocal fold.[14] It is generally assumed that VFNs occur as a result of prolonged strain or phonotraumatic behavior, which includes yelling, screaming, and throat-clearing.[15-17] Other risk factors for the development of VFNs are an extraverted personality[18], the presence of siblings[19], and a diagnosis of asthma[20], attention deficit hyperactivity disorder[21], allergic diseases[20], and gastroesophageal or laryngopharyngeal reflux.[22,23]

Evidence-based practice requires the integration of the best research evidence, clinical expertise, and patient values to guide clinical decision-making.[24,25] In the field of pediatric VFNs, a number of scientific studies have already been conducted on different treatment options. Voice therapy is commonly regarded as the preferable treatment option in this population.[14,26] Phonosurgery is more controversial in children because of the phonotraumatic nature of VFNs, immaturity of the vocal folds, frequent failure to respect postoperative vocal rest, and high recurrence rate.[14,26,27] Two types of voice therapy are distinguished. Direct voice therapy focuses on techniques to modify vocal behavior through motor execution, somatosensory feedback, and auditory feedback. Indirect therapy focuses on the cognitive, behavioral, and psychological aspects of voice use or changes the physical environment.[28] According to three recently published systematic reviews, there is still insufficient evidence on the effectiveness of voice therapy in pediatric VFNs, which is mainly due to the many methodological shortcomings in the existing studies.[29-31] These methodological shortcomings include lack of or incorrect use of inferential statistics, weak research designs, and insufficient description of methodological aspects such as the exact therapy content. Thus, there is an urgent need for well-designed effectiveness studies in order to investigate the most effective therapy techniques and therapy dosage in this patient population.

Clinical expertise is also a necessary component of evidence-based practice. A search of the literature revealed few studies which investigated voice therapists' opinions on the treatment of pediatric VFNs. The questionnaire of Allen, Pettit and Sherblom [32] surveyed 32 American SLPs about their management of VFNs in children and adults. Nearly all SLPs (97%) preferred voice therapy as initial treatment for

VFNs and 87% believed that voice therapy is often effective in this population. Regarding education, 45% felt that ‘most’ SLPs are adequately trained to treat VFNs and another 45% felt that ‘some’ colleagues are adequately trained. The questionnaire of Signorelli, Madill and McCabe [33] surveyed 62 Australian SLPs about the management of VFNs in children under 12 years of age. This group of professionals also preferred voice therapy to referral for surgical interventions. The majority of respondents use a combination of direct and indirect techniques when treating pediatric VFNs, and this is also considered the most effective treatment option. Furthermore, the SLPs indicated that they are not always relying on the limited available external evidence in clinical decision-making, but they also approached textbooks, colleagues, and other expert opinions as sources of information.

Despite the lack of standardized evidence-based guidelines, voice therapy remains the first option for treating pediatric VFNs. It is unclear how voice therapists specifically organize the treatment of pediatric VFNs. Moreover, little is known about the clinical experiences of voice therapists while treating this patient population. Therefore, the aim of this study was to identify common clinical practices and experiences of voice therapists regarding the treatment of pediatric VFNs in Flanders, Belgium. The results of this study will contribute to the dissemination of clinical expertise needed for evidence-based practice.

Materials and methods

Ethical approval was obtained from the Ethics Committee of Ghent University Hospital (registration number: THE-2022-0185).

Respondents

Dutch-speaking certified speech-language pathologists (SLPs) who had treated at least one child with VFNs were included in this study. They were recruited between October and December 2022 by e-mail (e-mail addresses were collected from the website of the Flemish Association of Speech and Language Therapists) and through social media (calls on the Facebook pages and groups of the Flemish speech and Language therapists and Flemish voice therapists). Respondents were excluded if they had no experience in treating pediatric VFNs or when they only completed the 'demographics' section of the questionnaire. When respondents dropped out of the questionnaire early, available data were used in the analysis.

Questionnaire

The questionnaire was developed in REDCap electronic data capture tools hosted at Ghent University. [34,35] A link to the questionnaire was distributed to possible respondents by e-mail and through specific social media groups. Respondents gave informed consent by signing an electronic consent form. Completion of the questionnaire was anonymous.

The questionnaire can be found in Appendix A and was based on the questionnaire of Kissel, D'Haeseleer, Meerschman, Wackenier and Van Lierde [36] about the experiences on SLPs in the treatment of unilateral vocal fold paralysis, supplemented by own insights. A total of 38 main questions were included, supplemented by a set of additional questions and combining multiple choice questions, closed-ended questions, open-ended questions with no bounded response space, and visual analogue scales (VAS) with a range from 0 to 100. Respondents were asked to elaborate on certain answers. The questionnaire consisted of six parts, namely: demographic characteristics, occupational characteristics, educational characteristics, therapy content, therapy delivery model, and experience of the voice therapist.

The first part of the questionnaire queried demographic characteristics, namely date of birth and gender. Age was subsequently calculated based on date of birth and date of questionnaire completion. The second part focused on occupational characteristics, in which professional experience as an SLP (in number of years, and employment rate in %), work setting, proportion of patients with voice problems, and experience with VFNs in children (in number of years, number of children with VFNs treated, and composition of patient group in terms of gender) were examined. The third part investigated educational characteristics, namely the degrees obtained and trainings attended on VFNs. The fourth part focused on therapy content. Rationale for initiating and ending therapy, type of voice therapy, used techniques,

and techniques perceived as most effective are surveyed. The fifth part investigated the therapy delivery model, namely number of sessions, therapy frequency, session duration, expectations to practice at home, involving the parents, and experience with and motivation for an intensive therapy frequency, group therapy, and online therapy. In the last part, experiences of voice therapists were investigated. Respondents were asked about difficulties they encounter and their experience with the treatment of pediatric VFNs in general, the educational program, motivation of children, workload, drop-out, and the collaboration with parents and schools.

Statistical analysis

An extensive descriptive analysis was performed using IBM SPSS version 28 (SPSS Corporation, Chicago, IL). For the multiple choice questions and closed-ended questions, percentages were calculated. For the VAS and other numerical data (e.g., number of years of experience), averages, standard deviations (SD), and ranges were calculated. The responses to the open-ended questions were analyzed separately and categorized so that percentages could be displayed as well.

Results

Demographic, educational, and occupational characteristics

By the end of the survey period, data had been collected from 46 individuals. Eleven respondents were excluded because they only completed the 'demographics' section. The remaining 35 respondents (32 women, 3 men) had a mean age of 38.14 years (SD: 9.8, range: 24.12 – 67.86), of whom 26 completed the questionnaire completely. Regarding education, 24 respondents (24/35, 68.6%) had a bachelor's degree and 11 had a master's degree (11/35, 31.4%). A postgraduate degree was obtained by 17 respondents (14/35, 40.0%): 14 postgraduates 'Voice', one postgraduate 'Learning Disabilities', one postgraduate 'Dysphagia', and one postgraduate 'Neurological Speech and Language Disorders'. In addition, 30 respondents (30/35, 85.7%) took one or more additional training courses about treating VFNs. A very wide range of one- or multiday courses and workshops was mentioned. Regarding occupation, almost all respondents (33/35, 94.3%) work in independent practices. Other settings mentioned are schools (5/35, 14.3%), residential care centers (5/35, 14.3%), hospitals (3/35, 8.6%), a multidisciplinary center (1/35, 2.9%), a patient support network (1/35, 2.9%), an educational institution (1/35, 2.9%), a recording studio (1/35, 2.9%), and a facility for adults with mental disabilities (1/35, 2.9%). Almost everyone (31/35, 88.6%) is in full-time employment, except for one respondent with employment at 50%, two at 80%, and one at 90%. On average, respondents have been working as an SLP for 15.11 years (SD: 10.0, range: 3 – 45) and had 12.00 years (SD: 8.5, range: 1 – 30) of experience with pediatric VFNs. Voice patients on average make up 26.2% (SD: 24.3, range: 1 – 90) of the total patient population. More than half of the respondents (23/35, 65.7%) have already treated more than 10 children with VFNs during their careers. Lastly, 65.7% (23/35) treated more boys than girls, 20.0% (7/35) about the same number of boys and girls, and 14.3% (5/35) more girls than boys.

Therapy content

The majority of respondents (31/33, 93.9%) typically provide a combination of direct and indirect therapy in children with VFNs. The respondents report that combination therapy adequately addresses the causes and the consequences of VFNs and increases the intrinsic motivation and therapy adherence. Two respondents (2/33, 6.1%) indicated that the choice of direct or indirect therapy depends on the patient's characteristics. Indirect therapy is chosen in children who are too young to participate adequately in therapy or have insufficient understanding of the pathology and its consequences. Direct therapy is chosen in older children who have a request for help themselves. During indirect therapy, all respondents choose to formulate advice to optimize the vocal environment and eliminate phonotraumatic behavior. The most frequently given advice is to avoid yelling (32/32, 100%), followed by avoiding throat clearing (30/32, 93.8%), vocal rest (28/32, 87.5%), adequate hydration (28/32, 87.5%), avoiding speaking in noisy environments (14/32, 43.8%), humidifying the air (12/32, 37.5%), diet adjustments (10/32, 31.3%), and avoiding excessive voice use during sports and games (9/32,

28.1%). Almost all respondents (31/33, 93.9%) also explain the anatomy and physiology of the larynx, vocal folds, and/or VFNs. Visual support using photos, images, videos and/or a 3D-model of the larynx is considered particularly important, but some respondents also focus on auditory support using recordings, proprioception such as feeling the vibrations of the voice, and simple analogies from the children's environment. During direct therapy, a large variety of techniques are used, which can be found in Table 1.

[Please insert Table 1 approximately here]

Table 1: Direct therapy techniques

Direct therapy technique	**%**
Breathing exercises	84.4 (27/32)
Semi-occluded vocal tract exercises	71.9 (23/32)
Resonance tube in water (LaxVox)	*100 (23/23)*
Resonant voice therapy	*82.6 (19/23)*
Lip trills	*73.9 (17/23)*
Straw phonation	*60.9 (14/23)*
Flow ball	*60.9 (14/23)*
Hand-over-mouth	*30.4 (7/23)*
Kazoo	*30.4 (7/23)*
Voiced fricatives	*21.7 (5/23)*
Lip buzz	*17.4 (4/23)*
Resonance tube in air	*13.0 (3/23)*
Tongue trills	*13.0 (3/23)*
Linguolabial trills	*8.7 (2/23)*
Cup phonation	*4.3 (1/23)*
Relaxation exercises	65.6 (21/32)
Volume training	59.4 (19/32)
Vocal Function Exercises	50.0 (16/32)
Vocal facilitation techniques	21.9 (7/32)
Change of loudness	*100 (7/7)*
Yawn-sigh	*85.7 (6/7)*
Establishing new pitch	*71.4 (5/7)*
Chewing exercises	*57.1 (4/7)*
Digital manipulation	*42.9 (3/7)*
Inhalation phonation	*14.3 (1/7)*
Accent method	21.9 (7/32)
Nasalizing method (Pahn)	3.1 (1/32)
Estill Voice Training	3.1 (1/32)
Confidential voice	3.1 (1/32)

Respondents were also asked which technique they found most effective. Semi-occluded vocal tract (SOVT) exercises are perceived as the most effective technique (13/23, 52.1%), with a clear preference for LaxVox and resonant voice therapy. Other mentioned effective aspects are insight into the pathology and its consequences, focus on relaxed phonation, and vocal hygiene recommendations.

Lastly, 34.3% of the respondents (12/35) always initiate therapy for a child with VFNs. The remaining 65.7% of the respondents (23/35) sometimes choose to take a wait-and-see approach, mainly with young children, a lack of motivation, or an unsupportive environment. Mild severity of hoarseness, limited or absent impact on the child's quality of life (QoL), lack of learnability, or presence of comorbidities may also be indications to adopt a wait-and-see approach. Some respondents highlighted the rigid regulations around reimbursement as an additional factor in carefully considering the initiation of therapy.

Therapy delivery model

Mean total number of therapy sessions is 24.80 (SD: 11.5, range: 10 – 50). All respondents provide half-hour therapy sessions, except for one respondent who provides one hour of therapy. The majority of the respondents (16/28, 57.1%) provide one therapy session a week, eight respondents (8/28, 28.6%) provide two sessions a week, three respondents (3/28, 10.7%) start with a frequency of twice a week and decrease to once a week, and one respondent (1/28, 3.6%) indicated that preschoolers visit every few weeks (not further specified) and older children visit once a week. More than half of the respondents (16/28, 57.1%) are not considering a more intensive therapy frequency. The main reason for not applying intensive frequency is the lack of practice time, especially in the home context, to achieve automation, but there are also concerns around practical arrangements, increased pressure on the child, integration in daily speech, and a lack of scientific evidence. On the contrary, respondents who are considering a more intensive therapy frequency (12/28, 42.9%), expect faster automation and higher motivation and base their expectations on scientific studies in adults showing that daily practice for a short period of time is more effective than less frequent practice for a longer period of time. To improve transfer and automation, all respondents (28/28, 100%) expect children to practice at home as well. Almost everyone (25/26, 96.2%) consider it important to practice daily at home, mainly covering the direct techniques from past therapy sessions, warming up the voice, and paying attention to vocal hygiene recommendations. Children's motivation to practice at home is rated differently by the respondents: two respondents (2/28, 7.1%) perceived that children have no motivation most of the time, 14 (14/28, 50.0%) sometimes, 11 (11/28, 39.3%) most of the time, and one (1/28, 3.6%) always. As a control of home exercises, notebooks, schedules and check-off lists with or without a reward system are mainly used (14/28, 50.0%), followed by questioning the parents (11/28, 39.3%) and/or the child (8/28, 28.6%), forwarding videos in which the child practices (3/28, 10.7%), and a fully online practice platform (1/28, 3.6%).

Other therapy aspects are discussed immediately below. Firstly, all respondents (28/28, 100%) try to involve parents in therapy. Almost everyone (26/28, 92.9%) expects a parent to be present and actively engage for at least part of the session(s). The respondents also give parents additional background information on the exercises and encourage them to practice with the child at home. On a scale of 0 (poor collaboration) to 100 (good collaboration), respondents gave a mean score of 76.68 (SD: 13.5,

range 50 – 97). In general, they felt that parents are motivated to address the problem (13/22, 59.1%). However, respondents sometimes experience that parents do not have enough time to properly supervise their children with the exercises at home, that parents have unrealistic expectations, and that parents do not perceive a slight hoarseness as abnormal, causing therapy to be terminated prematurely.

Secondly, 11 respondents (11/27, 40.7%) had experience with providing online voice therapy for pediatric VFNs. Regarding the experience of voice therapists with online therapy, respondents gave a mean score of 37.30 (SD: 28.0, range: 0 - 100) on a scale of 0 (negative experience) to 100 (positive experience). Two respondents (2/11, 18.2%) experienced no difficulties and felt that the children were alert and practiced well. Arguments for a more negative experience included: difficulty in assessing voice quality, less possibilities to give feedback, and technical limitations such as poor visibility (e.g., for assessing breathing or LaxVox) and dropping out of sound (e.g. when performing SOVT).

Thirdly, no respondents had experience with providing group therapy to children with VFNs. The majority of the respondents (12/21, 57.0%) indicated that the patient population is too small to group the children, although there are some respondents (4/21, 19.0%) who deliberately prefer a more individualized approach. If the opportunity arose, two-thirds of respondents (18/27, 66.7%) would consider offering group therapy to children with VFNs in the future. They mainly expect a positive impact on children's motivation (6/12, 50.0%), but other motives to organize group sessions are the advantages of collaborative learning (3/12, 25.0%), increased awareness about voice and voice use (2/12, 16.7%), and reduced wait times to start therapy (1/12, 8.3%).

Fourthly, 60% (15/25) of the respondents feel that children are sufficiently motivated during therapy sessions for VFNs. When motivation is lacking, respondents use psycho-education (5/10, 50%), involvement of the parents (4/10, 40%), introduction of play elements in therapy (3/10, 30%), and reward systems (1/10, 10%).

Lastly, the criteria for ending therapy vary widely among respondents: laryngoscopy showed that VFNs reduced in size or disappeared (8/24, 33.3%), normal vocal quality (5/24, 20.8%), ability to use the techniques in spontaneous speech (4/24, 16.7%), parental satisfaction (4/24, 16.7%), children's satisfaction (3/24, 12.5%), low motivation (3/24, 12.5%), sufficient knowledge of the techniques to practice on their own (3/24, 12.5%), good results on voice assessment (2/24, 8.3%), elimination of phonotraumatic behavior (1/24, 4.2%), or normal voice-related QoL (1/24, 4.2%). About one-fourth of respondents (7/26, 26.9%) experience a lot of drop-out during treatment of pediatric VFNs.

Experience of the voice therapist

First of all, respondents were asked about their general experience with the treatment of pediatric VFNs. On a scale of 0 (negative experience) to 100 (positive experience), respondents gave a mean score of 77.28 (SD: 13.7, range: 50 – 100). Almost all respondents (25/26, 96.2%) did indicate that they

sometimes experience difficulties during treatment, namely: lack of intrinsic motivation in children (12/26, 46.2%), difficult transfer to spontaneous speech (4/26, 15.4%), persistent phonotraumatic behavior (4/26, 15.4%), insufficient understanding of the pathology (4/26, 15.4%), persistent complaints (3/26, 11.5%), unpredictable evolution (2/26, 7.7%), non-collaborative parents (2/26, 7.7%), rigid rules about reimbursement (1/26, 3.8%), and abstract nature of vocal exercises (1/26, 3.8%). On the statement "I think I successfully treat VFNs in children" (0 is disagree, 100 is agree), respondents gave a mean score of 75.04 (SD: 12.9, range: 50 – 91). On a scale of 0 (light workload) to 100 (heavy workload), respondents rated the workload related to the treatment of pediatric VFNs as 46.43 (SD: 22.5, range: 15 – 81).

Regarding education, 40% of respondents (6/15) indicated that not enough targeted training is available and not enough attention is paid to pediatric dysphonia in the basic educational program. The remaining respondents (9/15, 60%) felt that there are sufficient continuing education opportunities available. On a scale of 0 (insufficiently trained) to 100 (sufficiently trained), respondents gave a mean score of 68.68 (SD: 15.7, range: 44 – 100).

Lastly, the majority of the respondents (19/26, 73.1%) collaborate with the school during the treatment of pediatric VFNs. On a scale of 0 (poor collaboration) to 100 (good collaboration), respondents gave a mean score of 54.31 (SD: 19.4, range: 22 – 76). The main negative experiences mentioned are: insufficient teacher’s knowledge of voice, voice problems and vocal hygiene (4/15, 26.7%), teachers lack time or motivation to apply tips (4/15, 26.7%), and no feedback or communication about child's voice use in school context (4/15, 26.7%).

Discussion

The aim of this study was to identify common clinical practices and experiences regarding the treatment of pediatric VFNs of voice therapists in Flanders, Belgium.

Regarding therapy content, the combination of indirect and direct therapy is by far the most commonly used in the treatment of pediatric VFNs (93.9%). This is consistent with the results of the survey study by Signorelli, Madill and McCabe [33] in 2011, in which 89% of their respondents also preferred combination therapy. As described above, there is currently insufficient evidence for voice therapy in pediatric VFNs due to several methodological shortcomings in the existing studies. Therefore, the effective components or techniques of a successful intervention in pediatric VFNs are not yet determined.[29,30] However, in general, voice therapy does seem to have positive effects on voice or voice-related QoL in children with VFNs, with an advantage of direct therapy over indirect therapy if clinicians have sufficient expertise.[30,37] Respondents' clinical experiences support these results, as they named direct SOVT exercises as the most effective technique, but also mentioned gaining insight in the pathology and its consequences as an effective therapy component.

The most commonly used direct techniques among Flemish voice therapists are breathing exercises, SOVT exercises with a clear preference for LaxVox and resonant voice therapy, and relaxation exercises. This differs from the findings of the survey of Signorelli, Madill and McCabe [33]. In this study, 'glottal attack changes' was the most commonly used direct technique (61-67%, compared to 0% in the current study). Other techniques reported here but not currently used by Flemish voice therapists are the program Yell Well™ (46-48%), giggle technique (38-40%), open-mouth approach (30-34%), and chant talk (12-14%). Resonant voice therapy (51%, compared to 59% in the current study) and the accent method (19-27%, compared to 22% in the current study) are about equally popular in both studies. In the study of Signorelli, Madill and McCabe [33], no SOVT exercises other than resonance exercises were offered. This may be explained by the fact that the scientific background of SOVT exercises was not described until 2006 and the technique gained popularity in the last decade.[38]

The results regarding therapy dosage should be interpreted within the legal framework in which Flemish voice therapists work. The Belgian legal system provides reimbursement for 80 sessions of 30-minute voice therapy for children, spread over a period of up to two years. One-hour therapy sessions are not reimbursed in children.[39] In this study, mean number of voice therapy sessions was 24.80. The study of Fujiki and Thibeault [40] (Wisconsin, US) found that children with benign vocal fold lesions or oedema received an average of 7.54 sessions of 50-minute voice therapy, which is almost half of the total therapy duration in minutes compared with Flemish voice therapists. In the systematic review of Adriaansen, Meerschman, Van Lierde and D'Haeseleer [29] regarding the effectiveness of voice therapy in children with VFNs, the mean number of provided sessions was 14.67. However, comparison with this result should be made with caution, as these therapies were performed in the context of research and the

dosage may differ from the usual dosage in clinical practice. According to a narrative and a systematic literature review in the adult population, total number of voice therapy sessions varies between 5 and 16 sessions[41] with an average of 10.87 sessions.[42] Therefore, it seems safe to state that Flemish voice therapists offer a large number of sessions to children with VFNs compared to international colleagues.

Interestingly, more than half of the respondents (57.1%) do not want to consider a more intensive therapy frequency in the future. However, research in adults has shown that intensive voice therapy is at least equally effective than traditional long-term therapy.[43-45] In addition, the study of Fujiki and Thibeault [40] in children with benign vocal fold lesions showed that therapy frequency did not affect the number of voice therapy sessions to meet treatment goals. This may suggest that intensive therapy could lead to positive results in children as well. Several arguments are described in favor of intensive voice therapy: enhanced learning and consolidation of vocal behaviors due to massed practice, more time-efficiency, higher voice therapy attendance rates and patient compliance, easier to simultaneously treat multiple components involved in voice production, and opportunities for specificity and individuality.[44-46] Possible disadvantages are the practicality and complexity of scheduling intensive voice therapy sessions and the potential risk of overdosing the laryngeal system.[43]

All respondents try to involve parents in treatment and parental collaboration and motivation are perceived as quite good. It can be assumed that parents with very low motivation will not initiate therapy so voice therapists will generally work with more motivated parents. Existing literature clearly states that parents play a fundamental role in pediatric voice therapy, because they should monitor the children's vocal behavior in daily life and substitute for the therapist when practicing vocal techniques at home.[47,48] There is evidence that involving parents, especially the mother, of children with VFN leads to higher voice-related QoL.[49] The qualitative research of Braden, Van Leer, McConville and Blakeslee [50] showed that parental motivation for attending voice therapy were worrying about bullying and social isolation, reduced intelligibility, and the desire for their child to be healthy and successful. Not being bothered or unaware of the voice problem, unclear or low expectations of voice therapy, and fear of changing the child's voice were mentioned by parents as barriers to seeking therapy for their dysphonic child.

Forty percent of the respondents had experience with providing online therapy for children with VFNs. In general, telepractice was perceived rather negatively in this patient population. However, literature shows that telepractice can be effective for voice problems. A pilot study in adult women with VFNs found that an intensive online voice therapy program could produce significant improvements in perceptual and objective vocal quality, nodule size and vocal fold closure, and voice-related QoL. Moreover, these patients were highly positive about their experience with online voice therapy.[51] Two case studies further showed that online voice therapy in children with voice problems could improve vocal quality.[52] An additional benefit of telepractice in speech and language pathology appears to be

the high attendance rate and low cancellation of appointments compared to in-person therapy.[53] Furthermore, the qualitative research of Hines, Lincoln, Ramsden, Martinovich and Fairweather [54] showed that speech and language therapists were able to build a good therapeutic relationship with children during online sessions. According to the literature, the main pitfalls of telepractice are managing motivation and attention, and technical difficulties such as poor audio or video quality, delay between audio and visual images, loss of internet connection, and insufficient technological literacy.[51,52,55] Technical difficulties were also mentioned by the respondents in the current study, in addition to concerns about correctly evaluating vocal quality and providing clear and concrete feedback.

No respondents had experience with group therapy for children with VFNs, although two-thirds would like to consider it in the future. Research on group therapy sessions in children is currently lacking. However, research in adults is promising. The randomized controlled trial of Ohlsson, Dotevall, Gustavsson, Hofling, Wahle and Österlind [56] showed that group sessions in adults with functional voice disorders provide better voice-related QoL over the longer term compared to individual sessions. For voice range profile and self-perceived degree of hoarseness and vocal fatigue, no significant differences were observed between individual and group sessions. In the study of Abrahamsson, Millgård, Havstam and Tuomi [57], no significant difference was found in voice-related QoL between individual and group sessions in adults with dysphonia. Both therapy modalities led to statistically significant improvements in voice-related QoL. Moreover, it has also been shown that group therapy in adults with dysphonia can provide significant improvements in vocal symptoms and anxiety levels.[58] Traditionally, more individual therapy is given because there is more time for focused practice. Recently, however, the potential benefits of group therapy have become more emphasized: optimized time management and health care resource allocation, more psychological support from peers, more opportunities for spontaneous conversation and associated improved generalization of techniques, more peer modeling, and more motor learning opportunities by observing the learning process of others.[56,59,60] In adults, group voice therapy seems to be a useful alternative, but additional research in children is needed.

This is the first study that investigates voice therapist's experiences in the rehabilitation of pediatric VFNs. Overall, voice therapists are quite positive about treating pediatric VFNs: they feel comfortable during therapy sessions, find their therapy quite effective, and experience an average workload compared to other pathologies. Despite these positive experiences, there is a significant proportion of voice therapists who find the basic educational program inadequate and still desire additional specific training about this pathology. Institutions of higher education should be stimulated to provide adequate attention and practical tools to treat pediatric VFNs during the basic educational program. Moreover, the majority of respondents have already taken additional courses, citing a wide range of different courses and workshops on varying topics. In Flanders, there is already a postgraduate degree on voice problems, which is a part-time educational track over a period of two years. This is an intensive course that also requires the necessary time investment, which may not always be possible for a voice therapist

working in practice. Thus, Flemish voice therapists seem to be in need of a shorter, easily accessible specialized course on pediatric VFNs.

This study has some limitations. Firstly, the sample size is not very large. This may be explained by the inclusion criteria, in which only voice therapists with experience in pediatric VFNs were included. The length of the survey may also have had a negative impact on sample size. About one-fourth of the respondents did not entirely complete the questionnaire and possibly other potential respondents were discouraged by the length of the survey. Secondly, this was a quantitative study in which it was not possible to analyse the results in depth. For example, multiple choice questions have a limited number of response options where nuances may be missed. Therefore, it would also be interesting to conduct a qualitative study of voice therapists' experiences in treating pediatric VFNs using semi-structured interviews or focus groups. Additionally, the answers to the open-ended questions in this study were processed and categorized by the principal investigator. It is not impossible that this involved a subjective interpretation of the answers. Lastly, some forms of survey bias could not be completely avoided. There is a possible social desirability bias and selection bias based on distributing the survey only digitally and not providing the survey in languages other than Dutch.

Conclusion

In this study, common clinical practices and experiences of Flemish voice therapists when treating pediatric VFNs are described. In certain cases, a wait-and-see approach is adopted instead of initiating therapy. When voice therapy is preferred, voice therapists usually provide a combination of indirect and direct techniques in this population. During indirect therapy, voice therapists offer a broad range of advices and explain relevant anatomy and physiology. The most commonly used direct techniques are breathing exercises, SOVT exercises, relaxation exercises, volume training, and vocal function exercises. On average, 24.80 half-hour sessions are offered per child with VFNs. Implementing a more intensive therapy frequency or group therapy is not common in Flanders. Telepractice is among the possibilities, but is more likely to be considered a negative experience. Flemish voice therapists generally feel confident and successful treating VFNs in children. However, they also experience various difficulties related to the treatment of this pathology, like a lack of intrinsic motivation in children. The workload of therapy for this particular population is perceived to be similar to other patient populations. There is still some need to organize short, easily accessible specialized courses on pediatric VFNs in Flanders.

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Appendices

Appendix A

Demographic characteristics

1. Sex
    a. Male
    b. Female
    c. Other
2. Date of birth:

Occupational characteristics

3. Have you been employed as a speech and language therapist?
    a. Yes
    b. No (if 'no', the survey will be terminated)
4. How long have you been working as a speech and language therapist? (in years)
5. What percentage (%) have you been active as a speech and language therapist?
6. Which setting are you working in?
    a. Private practice
    b. School
    c. Hospital
    d. Rehabilitation center
    e. Residential care center
    f. Other
        i. What other setting are you working in?
7. What is the proportion of patients (adults and children) with voice problems of the total population of patients you treat? (in percent)
8. Do you have experience with treating vocal fold nodules in children?
    a. Yes

   b. No (if ‘no’, the survey will be terminated)

9. How many years of experience do you have treating VFNs in children?
10. How many children with VFNs do you think you have already treated?
    a. < 5
    b. 5-10
    c. 10-20
    d. >20
11. Which is the composition of your patient group (children with VFNs) in terms of gender?
    a. More boys
    b. More girls
    c. Equal numbers of boys and girls

Educational characteristics

12. Which degree did you obtain?
    a. Bachelor
    b. Master
    c. Post-graduate
        i. What post-graduate degree did you obtain?
    d. Doctorate
    e. Other
        i. Which other degree did you obtain?
13. Have you attended any additional trainings about the treatment of VFNs in children?
    a. Yes
        i. What continuing education did you take?
    b. No

Therapy content

14. Do you sometimes choose to not initiate therapy?
    a. Yes
        i. In which situation do you prefer to not initiate therapy?
        ii. Why do you make this choice?
    b. No
15. Does your treatment consist of an indirect approach, direct approach or a combination of both?
    a. Indirect therapy (eliminating voice abuse and applying voice hygiene)
        i. Why do you choose this?
        ii. In which child do you choose indirect therapy?
    b. Direct therapy (teaching techniques that provide a more relaxed voice and train the laryngeal muscles)
        i. Why do you choose this?
        ii. In which patient do you choose direct therapy?
    c. Combination of direct and indirect therapy
        i. Why do you choose this?
        ii. In which patient do you choose a combination of direct and indirect therapy?
16. Which techniques do you regularly apply while giving indirect therapy?
    a. Providing information on the voice problem and good voice use
        i. How do you explain the voice problem and good voice use to the child?
    b. Vocal hygiene recommendations
        i. Which vocal hygiene recommendations do you regularly give to the child (and parents)?
            1. Increase hydration (e.g. drinking more than 1 litre water a day)
            2. Avoid yelling (e.g. staying closer to the interlocutor)
            3. Humidifying the air
            4. Diet adjustments (e.g. drinking less acid beverages, eating healthy)

5. Avoid talking in noisy environments
6. Avoid talking during play and sport activities
7. Avoid throat clearing and coughing
8. Other
    a. What other recommendations do you give?

c. Other
    i. What other indirect techniques do you apply for VFNs?

17. Which techniques do you regularly apply while giving direct therapy?

a. Breathing exercises
b. Relaxation exercises
c. Vocal facilitation techniques
    i. Chewing
    ii. Yawn-sigh
    iii. Half-swallow-boom
    iv. Chant talk
    v. Inhalation phonation
    vi. Confidential voice therapy
    vii. Digital manipulation
    viii. Establishing new pitch
    ix. Change of loudness
    x. Glottal fry
    xi. Other
        1. Which other vocal facilitation techniques do you apply?
d. Vocal function exercises
e. Volume training
f. Semi-occluded tract exercises

i. What semi-occluded vocal tract exercise do you use the most?

1. Resonance exercises (e.g. resonant voice therapy)
2. LaxVox / water resistance therapy / resonance tube in water
3. Lip trills
4. Tongue trills
5. Linguolabial trills
6. Straw phonation
7. Resonance tube in air
8. Humming
9. Voiced fricatives
10. Lip buzz
11. Hand-over-mouth exercises
12. Kazoo
13. Flow ball
14. Other

a. Which other SOVT exercises do you use?

g. Accent method

h. Other

i. What other direct techniques do you use?

18. Which treatment method do you experience as the most effective?

a. Indirect therapy

i. Why do you find this the most effective treatment method?

ii. Which techniques do you consider most effective?

b. Direct therapy

i. Why do you find this the most effective treatment method?

ii. Which techniques do you consider most effective?

c. Combination of direct and indirect therapy

i. Why do you find this the most effective treatment method?

ii. Which techniques do you consider most effective?

Therapy delivery model

19. On average, how many sessions do you provide to a child with VFNs?
20. How many sessions a week do you provide for a child with VFNs?
    a. 1 session a week
    b. 2 sessions a week
    c. Other
        i. How many sessions a week do you provide for a child with VFNs?
21. How long is a therapy session for treating VFNs in children?
    a. Half an hour
    b. About one hour
    c. More than one hour
22. Would you be willing to provide a more intensive voice therapy (shorter therapy duration, higher frequency) for treating children with VFNs?
    a. Yes
        i. Why would you opt for a more intensive therapy?
    b. No
        i. Why would you not opt for a more intensive frequency?
23. Did you already provide intensive therapy for children with VFNs ?
    a. Yes
    b. No
24. Do you ask the child to practice at home?
    a. Yes

i. Specifically, what do you expect from the child when you ask to practice at home?

ii. Why do you think this adds value?

iii. On average, does the child have sufficient motivation to continue practicing at home?

1. Yes
2. Usually yes
3. Sometimes yes
4. Usually no
5. No

iv. How often do you ask the child to practice at home?

1. Daily
2. Every two days
3. Every three days
4. Other

a. How often do you ask the child to practice at home?

v. How do you control whether the child practiced at home?

b. No

i. Why do you not ask the child to practice at home?

25. Do you involve the parents in therapy?

a. Yes

i. How do you involve the parents?

b. No

i. Why do you not involve parents in therapy?

26. Did you already provide online therapy for treating VFNs in children?

a. Yes

i. Did you think this was more of a negative experience or more of a positive experience? (VAS: anchors “negative experience”, left side, score 0; and “positive experience”, right side, score 100)

ii. Why did you experience it this way?

b. No

i. Why do you choose to not provide online therapy?

c. Not applicable / I did not treat children with VFNs during lockdown

27. Did you already provide group therapy for treating children with VFNs?

a. Yes

i. Did you think this was more of a negative experience or more of a positive experience? (VAS: anchors “negative experience”, left side, score 0; and “positive experience”, right side, score 100)

ii. Can you list some advantages to providing group therapy?

iii. Can you list some disadvantages to providing group therapy?

b. No

i. Why do you choose to not provide group therapy?

ii. Would you ever consider to do this?

1. Yes

a. Why would you opt to do this?

2. No

a. Why would you not opt to do this?

28. When do you choose to end therapy?

Experience of the voice therapist

29. How do you experience treating VFNs in children? (VAS: anchors “negative experience”, left side, score 0; and “positive experience”, right side, score 100)

30. Do you experience difficulties in treating VFNs in children?

a. Yes

    i. What difficulties do you experience?

b. Sometimes

    i. What difficulties do you experience?

c. No

31. How did you experience the educational program / training regarding the treatment of VFNs in children? (VAS: anchors “insufficiently trained”, left side, score 0; and “sufficiently trained”, right side, score 100)

    a. Why do you find this?

32. Do you think children are sufficiently motivated during the treatment of VFNs?

    a. Yes

    b. No

        i. How do you cope?

33. Do you agree with the following statement: “I think I successfully treat VFNs in children”? (VAS: anchors “disagree”, left side, score 0; and “agree”, right side, score 100)

34. How do you experience the workload regarding the treatment of VFNs in children? (VAS: anchors “light workload”, left side, score 0; and “heavy workload”, right side, score 100)

    a. Why do you experience it this way?

35. Do you experience a lot of therapy drop-out during the treatment of VFNs in children?

    a. Yes

    b. No

36. How do you experience the collaboration with parents? (VAS: anchors “poor collaboration”, left side, score 0; and “good collaboration”, right side, score 100)

    a. Why do you experience it this way?

37. Do you collaborate with the school of the child?

    a. Yes

        i. How do you experience this collaboration? (VAS: anchors “poor collaboration”, left side, score 0; and “good collaboration”, right side, score 100)

b. No

38. Do you have any comments on this survey?