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The impact of functional dysphonia on social interaction

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ABSTRACT

The aim of this study is to investigate the impact of functional dysphonia on social interaction. Functional dysphonia is a voice disorder that has a profound negative impact on communication and quality of life, and should be seen as a communication disorder that affects both the person with dysphonia and the persons he/she interacts with.

Voice therapy by a speech and language pathologist is an effective way of treating functional dysphonia, and although voice therapy does not focus on altering pragmatic behaviour in conversation, it is reasonable to assume that this behaviour is affected. The specific pragmatic components investigated in this study are pauses, which are vital in communication.

To examine the effect of voice therapy, four patients with functional dysphonia were recorded in conversation before and after a period of treatment. The recordings were analysed with emphasis on the amount and length of different types of pauses. Although the sample is small, some tendencies are visible in the results. For example, one of the participants (participant B) shows a change in his patterns of pausing, which indicates a clear improvement in the ability to plan his speech and breathing. It is also possible to discern a more confident conversational style in several participants.

In conclusion, it can be said that functional dysphonia influences the conversational style of the persons suffering from it, and that more research is needed to explore this further.

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INTRODUCTION

The voice is a mirror of the personality. With our voices we express emotions and give clues to what is happening inside of us. The voice is so interlinked with the person, that one word on the telephone will tell us who is calling. When the voice is affected by disease or injury, psychological distress is common. Furthermore

“[p]eople with dysphonia seem to experience social, lifestyle and employment difficulties as a direct consequence of their voice disorder” (Wilson et al.: 2002: p. 179).

We need our voices not only to express ourselves in social life, but also in our working environment. It is estimated that one third of people living and working in an advanced society are in professions in which voice is essential to daily functioning (Carding & Wade, 2000).

Voice disorders have been investigated acoustically, perceptually and in relation to quality of life, but in this thesis the impact of functional dysphonia will be viewed in the light of conversation analysis, which has not traditionally been used in this field.

How do the voice difficulties perceived by the patient manifest themselves in conversation? In this study I will explore how persons with functional dysphonia function in a dialogue before and after treatment by a speech and language pathology therapist. The specific elements of communication I have chosen to focus on are pauses, which are an essential part of each conversation.

Aim

The overall aim of this study is to investigate how the individual with functional dysphonia is affected in his or her social interaction. The more specific aim is to compare how the individual functions in a dialogue before and after voice treatment, with focus on the distribution and length of pauses.

While voice therapy does not focus specifically on changing pragmatic components in conversation such as pauses, there is still reason to believe that voice therapy has an influence on conversational behaviour, since the voice is intimately linked to our communicative actions. Therefore, voice therapy could result in a change in pause patterns.

Functional dysphonia: a definition

Traditionally, dysphonia with no apparent organic explanation was labelled “functional”, “psychogenic” or “hysterical” dysphonia. There is reason to believe that the inability to find organic evidence of the dysphonia may in many cases have been the result of lacking adequate investigation procedures. Therefore, the functional-organic dichotomy is dissatisfying and does not fully explain the complex causality of voice disorders (Freeman & Fawcus, 2000; Lindblad, 1992).

Carding et al. (1998) have defined non-organic dysphonia (functional dysphonia) as “disordered voice” where there is either no visible organic impairment in the laryngeal structure or function or where there is a minor laryngeal defect which could be the result of

voice hyperfunction and where surgical intervention is not considered appropriate (Carding et al., 1998: 310). There is one more important factor to consider: the patient's perception of the voice problems. The patient's description of the voice problems is a key part of the diagnostic process, and the patient can be diagnosed with functional dysphonia even if the voice does not sound disordered (Freeman & Fawcus 2000: 55).

The conventional treatment for functional dysphonia is voice therapy.

Review of literature

The following section of the thesis is a survey of relevant literature, categorised into three subgroups: risk factors for dysphonia, the impacts of dysphonia on communication and the efficacy of voice treatment.

Risk factors for dysphonia

Several risk factors for functional dysphonia have been identified: vocal hyperfunction, upper respiratory tract infection, smoking, gastro-oesophageal reflux, stress, etc (see e.g. Lindblad, 1992: 199; Carding & Wade, 2000). There is however one factor that seems to be crucial: vocal loading. Speaking loudly and for a long time will negatively affect vocal health (Vilkman 2004: 241).

Verdolini and Ramig (2001) have examined the impact of voice disorders on job function, and investigated which occupations are at risk for developing voice disorders. Their presentation of occupations at risk for voice problems is based on two previous studies: a Swedish study by Fritzell and an American study by Titze, Lemke and Montequin. The top three occupations at risk for voice disorders are singers, counselors/social workers and teachers. Out of these three, teachers are by far the largest occupational group. Yiu reports that teachers are among the most common occupational groups that seek help for voice problems, and that 16-18% of voice patients seen by a speech and language pathologist may be in the teaching profession. Vilkman (2004: p. 234) states that a majority of teachers have experienced voice problems, and that teachers are at risk for developing chronic voice problems. Verdolini & Ramig conclude that the teaching population is an important group to focus on in research, clinical work, and prevention.

The impact of dysphonia on communication

There is a consensus that voice disorders have a negative impact on all aspects of life (see for example Ramig & Verdolini, 1998; Ma & Yiu, 2001;). Ramig and Verdolini state that

“Voice production plays a critical role in self-expression, well-being, and functional daily living. Disordered voice can negatively affect personal development, employment, and productivity. The effective treatment of voice disorders can positively affect quality of life in society” (Ramig & Verdolini, 1998)

The effect of voice disorders on quality of life has been investigated in several studies (see e.g. Wilson et al., 2002; Smith et al., 1996; Krischke et al., 2005). The results showed that voice disorders had a clearly negative impact on perceived health, and that the severity of the

effects on quality of life was in the same range, or worse, as impairments reported by patients with medical conditions that are generally considered more serious, e.g. rheumatoid arthritis, hemodialysis treatment and asthma (Smith et al., 1996).

It is clear that a person with a vocal disability suffers from his/hers problem, and the vocal disability also affects the person's ability to make herself/himself understood. Morton and Watson (2001) have investigated the impact of an impaired voice on children's ability to process spoken language. Their hypothesis was that when listening to a dysphonic voice, children would need more working memory resources for perceptual processing, leaving less capacity to integrate, elaborate and encode the meaning of the information. Two speakers were used in this study: a 28-year-old female with no history of voice problems, and a 26-year-old dysphonic female with a diagnosis of mild vocal fold oedema. The dysphonic voice was described as harsh, whispery and creaky in quality.

The children were asked about their opinion of the two voices, and they all expressed dislike for the dysphonic voice, and some said that they had to make a larger effort when listening to it. No one made any negative comments about the normal voice.

The recall of words from the passages read was significantly better for the normal voice than the dysphonic voice. On average, the correct conclusion was also drawn more often with normal voice than dysphonic voice. Hence, it is evident that a dysphonic voice has a negative impact on a child's understanding and processing of speech.

This study emphasises the importance of preventative vocal training for teachers, which would lead to fewer individuals being referred to speech and language therapists and the minimising of a factor affecting children's learning performance in the classroom.

The results of a study performed by Rogerson and Dodd (2005), which investigated the effect of dysphonic teachers' voices on children's processing of spoken language, support the results presented by Morton & Watson (2001). Rogerson and Dodd concluded that even mild vocal impairment has a statistically significant negative effect on children's performance on a spoken language processing task (Rogerson & Dodd, 2005: 53).

Voice quality in itself can communicate different emotions. Gobl and Ní Chasaide (2003) tested listeners' reactions to an utterance synthesised with different voice qualities. The synthetic voice quality stimulus was based on a recording of a Swedish utterance, and consequently the utterance was semantically neutral to the subjects who were native speakers of Irish English with no knowledge of Swedish. The results showed that different voice qualities were associated with different clusters of emotions. For example, tense voice was associated primarily with anger, but there was also some evidence for an association with joy.

The efficacy of voice treatment

Voice therapy is the conventional treatment for functional dysphonia, and research has shown that voice therapy is an effective way to treat functional dysphonia (Ramig & Verdolini, 1998; MacKenzie et al., 2001; Carding et al., 1998). Furthermore, Carding et al. discovered that spontaneous recovery is rare, which stresses the importance of treatment.

The study performed by MacKenzie et al. showed that voice treatment improved self rated quality of voice and expert rated quality of voice. It did not, however, have a positive effect on psychological distress, which was not reduced by voice therapy. These levels continued to be high, which might be a reflection of the greatly reduced quality of life in patients with dysphonia. It could also be interpreted as the patients with dysphonia having other problems that cause a poorer quality of life.

The conclusion that can be drawn after reviewing these articles is that voice disorders affect the individual in many ways, some which have yet to be explored. It has also been shown that listening to a dysphonic voice negatively affects linguistic processing. However, voice treatment is an effective way to treat dysphonia.

Measuring voice problems

Auditory perceptual voice analysis by the speech and language pathologist

In clinical practice, auditory perceptual voice analysis is an important tool for the speech and language pathologist. There are problems with these types of analyses: for example the intra- and inter-judge reliability may be low, and there is no international agreement upon which scales to use (Freeman & Fawcus, 2000: p. 73). Still, studies have shown that perceptual judgements sometimes have higher inter-rater reliability than acoustic measurements, and that experienced listeners as a group will make both valid and reproducible evaluations of voices (Berg & Edén, 2003: pp. 7-8).

There are several different voice evaluation scales, the most commonly used being the Buffalo III Voice Profile, the GRBAS Scale, the Vocal Profile Analysis and CAPE-V. In Sweden, the Stockholm Voice Evaluation Approach (SVEA) is the most common voice evaluation scale.

Subjective ratings by the patient

The voice handicap perceived by the patient cannot be measured through acoustic measurements or auditory-perceptual judgements. Instead, the patient's views of his/her voice and its function are essential. Jacobsen and colleagues have developed the Voice Handicap Index (VHI), which is a self-assessment questionnaire comprised of 30 items divided into 3 categories: emotional, physical, and functional aspects of voice disorders (Jacobsen et al. 1997). The VHI has been evaluated in numerous studies and has been found to be a reliable tool for assessing a patient's perceived handicap (Hogikyan & Rosen, 2002).

Although there are other voice disorder questionnaires, the VHI is the one most commonly employed to measure the subjective impact of the voice disorder on patients, and it has been translated to several languages. The Swedish version of VHI used in this study was translated by Lyberg Åhlander, Schalén & Rydell (in progress).

The VHI consists of three different subscales, each consisting of ten items. The subscales measure functional, physical and emotional voice concerns respectively. The Swedish version of the VHI contains two more subscales, one concerning sensations in the mouth and throat and one concerning singing.

Conversation analysis as a clinical tool

Conversation analysis is a new tool in speech and language pathology, but the use of it is increasing, for example in the areas of language disorders and aphasia. The focus in linguistics and language studies has shifted from the traditional view of language as a unit within the individual towards a view of language as primarily a means of communication. The importance of viewing language in the context of communication has been acknowledged. Boles (1998) found that conversation analysis showed progress that could not be observed by other tests, in a woman with aphasia. This stresses the importance of conversation analysis as a clinical tool.

Yet, although we are aware of the impacts on quality of life and social functioning caused by functional dysphonia, we often fail to see that the person with functional dysphonia has a communication impairment. When the person's voice disorder is evaluated, more emphasis should be placed on how the person functions in communication with other people, because it is in the interaction with other people that the communication disability is evident.

Pause research

In early conversation research, pauses were seen as an unnecessary interruption in the spoken delivery. Now they are recognised as an important part of the conversation, and spoken communication could not function without them (see e.g. Clark, 2002). We need pauses e.g. to breathe and to allow turn-taking and pauses make the speaking easier to understand for the listener (O'Connell & Kowal, 2005).

Pauses are divided into two basic categories: pauses occurring within syntactical units, and pauses occurring at syntactical boundaries. This categorisation is supported by Kircher et al. (2004). Their study, in which they used functional Magnetic Resonance Imaging, showed that different parts of the brain are active during these different types of pauses.

It has been shown that different speakers employ different patterns of pausing, and that it might be possible to discern groups applying the same pausing strategies (van Donzel & Koopmans-van Beinum, 1996). For example, some speakers use many filled pauses while other speakers use silent pauses more often.

Pauses are essential for successful communication, and are therefore an important aspect to address when examining communication disorders, such as voice disorders. Indeed

“pauses and silence are a way of speaking (...) We may (...) say that pauses are the most important part of speaking, if we want a true conversation to arise” (Backlund, 1997; my translation).

Definition of pauses and related concepts

In conversation analysis, certain concepts are used to describe different parts of conversational interaction. Concepts relevant for this thesis are defined in short below, with emphasis on the definition of different types of pauses.

A *turn* may somewhat simplified be defined as what one speaker says from the point in the conversation where he gets or takes the conversational floor to the point where he relinquishes the floor or is interrupted. The listeners get both lexical and prosodic clues when a speaker is reaching the end of his turn: for example the speaker will use concluding phrases, falling intonation and decreasing pace (Norrby 1996).

TRP is short for “transition relevance place”, which means a place in the conversation where the turn may shift from one speaker to another. A speaker coming to a TRP will signal this in many ways, for example by ending the grammatical unit, falling or rising intonation and elongation of the last syllable. If the speaker is eager to give up his turn he may strengthen or stress the TRP by explicitly encouraging another speaker to take the conversational floor, for example by posing a question or making a demand on another speaker, e. g. “I want you to tell me what happened during your vacation” (Linell & Gustavsson, 1987). If he on the other hand wishes to prolong his turn, he may for example avoid terminal intonation, proceed directly to a new syntactic unit and avoid making eye contact with other participants in the conversation. When a speaker reaches a TRP, the other speakers may show that they do not wish to speak by giving the present speaker back-channelling. Pauses often occur at possible TRPs, either within a speaker’s turn or between the turns of two speakers.

Back-channelling is used by participants in the conversation as a means of showing the present speaker that they are listening and that they do not wish to take the conversational floor. A number of different signals are utilized, with the most common being nodding, head shaking and humming. It may also consist of short utterances, such as “yes”, “no”, “oh” etc. Back-channelling does not count as a turn in conversation analysis.

A *pause* in the conversation may be silent (unfilled) or filled by a hesitation sound such as “eeh” or “uhm”. It may also be filled by an audible inspiration. Pauses are divided into different categories, and they may occur within a speaker’s turn or between the turns of two speakers. For a schematic presentation of the different pause types, see figure 1 below.

A *planning pause* occurs within a speakers turn. The pause may be caused by the speaker having to search for a word or being distracted. Often the planning pause occurs before an important content word, such as an adjective, noun or verb (Bruce, 1998; Clark & Clark, 1977). The planning pause may be filled or unfilled.

A *pause at a possible TRP* occurs when a speaker reaches a possible TRP and falls silent, and then continues his turn. He may at the possible TRP be encouraged to keep talking by the back-channel activity of the other participants. This type of pause, like the planning pause, occurs within a speaker’s turn.

An *initiation pause* occurs at the beginning of a speaker’s turn. The speaker has been given the conversational floor by the previous speaker, but has not yet begun to speak. This type of pause occurs at a TRP.

A *reaction pause* occurs when one speaker finishes his turn, and the next, self-nominated, speaker has not yet begun his turn. The silence lasts as long as it takes for the next speaker to perceive that the previous speaker has finished his turn and to prepare his own turn. A reaction pause arises when the preceding speaker has not in any way encouraged the next speaker to answer a question or state an opinion about something.

A pause may also be filled by an audible inspiration. Inspiration may occur both within a syntactical unit and at a possible TRP, but when inspiration occurs within a syntactical unit the inspiration may be faster and deeper than when it occurs at syntactical boundaries (Hird & Kirsner, 2002).

The figure below presents a schematic overview of the different types of pauses, exemplified in an exchange between speaker 1 and speaker 2. Planning pauses, TRP pauses and initiation pauses occur within a speaker's turn. The reaction pauses are the only pause type that occur outside the speakers' turns. Planning pauses (filled and unfilled) occur within a syntactical unit, i.e. not at syntactical boundaries. TRP pauses occur between two syntactical units within a speaker's turn. Initiation pauses occur at the beginning of a speaker's turn and not within a syntactical unit.

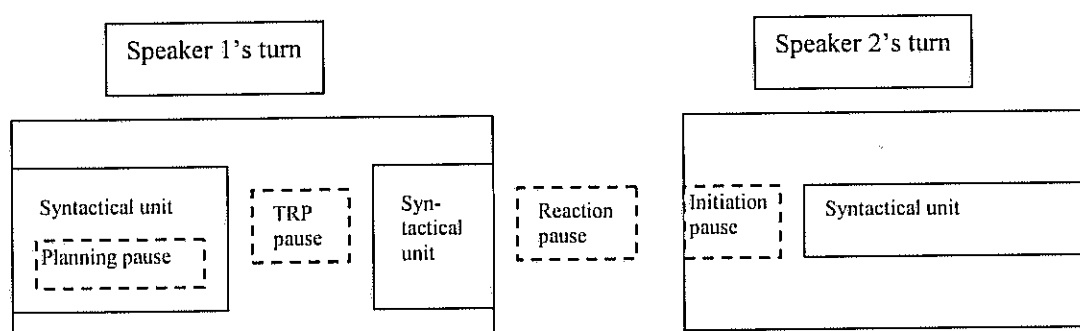


Figure 1. Schematic presentation of the different pause types.

METHOD

Participants

A first attempt to recruit participants was made at a large university hospital. Information about the study, including a feedback form for the patients to fill in if they were interested in taking part in the study, was handed out by two speech and language pathologists working at the clinic. The information was given to approximately 10 patients, but only one patient was interested in participating in the study. It was therefore not possible to move forward with the study in this city.

A second attempt to recruit participants for the study was made at the Speech and Language Pathology Department at the hospital in a medium sized Swedish city. All patients with functional dysphonia who were seeing a speech and language pathologist for the first time during a period of 3 weeks were approached and asked if they would participate in the study. All the patients were referred from ENT specialists. Five patients were referred during these weeks and all of them accepted participating in the study. One patient was excluded, since this patient began receiving voice therapy before the initial recording. The patients consisted of two male and two female patients. In all, 4 patients completed the study. Participant A is a 48-year-old female pre-school teacher who does not smoke or use any medication. She was

diagnosed with functional dysphonia and underwent five voice therapy sessions. Participant B is a 41-year-old engineer who does not smoke or use any medication. He was diagnosed with dysphonia and underwent 6 voice therapy sessions. Participant C is a 50-year-old engine man who does not smoke. He medicates with Amilorid and Hydroklortiazid, which are diuretic and blood pressure-lowering drugs. He was diagnosed with dysphonia and phonastenia and underwent 9 voice therapy sessions. Patient D is a 52-year-old female who is unemployed. She does not smoke or use any medication. She was diagnosed with functional dysphonia and underwent 5 voice therapy sessions. The patients are also presented in the table 1 below.

Table 1. Information about the participants in the study

Patient	Sex	Age (years)	Occupation	Smoking	Present medication	Diagnosis (ICD-10)	Number of voice therapy sessions
A	Female	48	Pre-school teacher	No	None	R49.0B	5
B	Male	41	Engineer	No	None	R49.0	6
C	Male	50	Engine man	No	Amilorid+ Hydro-klortiazid	R49.0, R49.8A	9
D	Female	52	Un-employed	No	None	R49.0B	5

The diagnoses presented in the table are those that were noted by the speech and language pathologists. R49.0B is specified as functional dysphonia, R49.8A as phonastenia and R49.0 as dysphonia.

Procedure

Subjective assessments of voice disorders

Both the patient and the conversation partner were asked to fill out a form evaluating their voice disorder prior to and following the voice treatment. The speech pathologist was asked to fill out the form in order to make clear that no significant changes occurred in their perception of their voices, which could influence the patient, and no changes were noted. The form used was a Swedish version of the Voice Handicap Index (Lyberg Åhlander, Schalén & Rydell: in progress). (See also p 6 above.)

The Swedish version of the VHI contains five subscales, measuring functional, physical and emotional voice concerns, sensations in the mouth and throat and singing voice problems. Examples of statements that the patients are asked to respond to:

- My voice makes it difficult for people to hear me (functional voice concern)
- I run out of air when I talk (physical voice concern)
- I am tense when talking to others because of my voice (emotional voice concern)
- My throat feels dry (sensation in mouth and throat)
- I get hoarse when I sing (singing voice problem)

The patients rate how often each statement applies to their situation: never, almost never, sometimes, almost always or always. Responses are scored from 0 to 4, where never equals 0 and always equals 4. This means that the higher the score, the greater the impact of the voice problem on the patients.

Recordings

The first recording of the participants took place after their first meeting with a speech and language pathologist, but before the commencement of voice therapy. The second recording was made after the final session of voice therapy. The number of voice therapy sessions varied between 5 and 9 sessions per patient.

The conversations were recorded on a MiniDisc recorder (Sony Minidisc Deck MDS-JE640) with a microphone (AKG D190E). The conversation partner was a speech and language pathologist working at the clinic, but who was not in charge of the treatment of the specific patient. The patient and the conversation partner were each given the same description of a situation which would be the starting point of the discussion. They were informed that they would be recorded during their discussion, and that it was not a problem if they occasionally became silent. The instructions about silence were given in the attempt to create a conversation as natural as possible. A normal conversation contains many pauses, and if the participants had not been informed that silence was not a problem, they might have become more stilted in trying to avoid falling silent.

When the conversation tapered out the recording was stopped. In the table below the lengths of the conversations are presented (in seconds).

Table 2. Lengths of conversations.

	Length of pre-treatment conversation (s)	Length of conversation after treatment (s)
Participant A	123.9	152.62
Participant B	293.99	222.22
Participant C	81.98	99.32
Participant D	211.4	130.31

Transcribing and pause analyses

The dialogues were transferred into a computer and transcribed orthographically using the software Praat 4.4.04 (<http://www.praat.org>). All pauses were marked and the length of each was calculated (in seconds). The pauses were then categorised into different pause types, according to the definitions of different pauses, see pp 6-7 and table below.

Table 3. Overview of the different pause types.

	Occurs within syntactical unit	Occurs within turn	Occurs at the beginning of turn
Planning pause (filled and unfilled)	Yes	Yes	No
Pause at possible TRP	No	Yes	No
Reaction pause	No	No	No
Initiation pause	No	Yes	Yes
Pause filled with audible inspiration	May occur at any place		

Pertaining auditory perceptual voice analysis

After the voice treatment of the participants, the auditory perceptual voice analyses made by the treating speech pathologist were pertained from the participants' patient records.

RESULTS

Voice Handicap Index

A higher score in the Voice Handicap Index indicates more distress. The maximum sum of each subscale is 40 points, and the maximum total is 200 points.

The results show a clear improvement for two participants, participant A and B. Participant C shows a slight improvement, while participant D's voice disorder seems to have worsened.

Table 4. Voice Handicap Index results before and after treatment.

Participant	A		B	
	Before voice therapy	After voice therapy	Before voice therapy	After voice therapy
Part 1 - Functional	8	4	11	10
Part 2 - Physical	9	3	12	11
Part 3 - Emotional	1	0	9	5
Part 4 – Sensations in mouth and throat	6	3	2	7
Part 5 - Singing	7	4	14	6
Total	31	14	48	39
Participant	C		D	
	Before voice therapy	After voice therapy	Before voice therapy	After voice therapy
Part 1 - Functional	6	6	20	25
Part 2 - Physical	12	12	22	24
Part 3 - Emotional	12	7	12	17
Part 4 – Sensations in mouth and throat	26	30	19	19
Part 5 - Singing	14	13	37	37
Total	70	68	110	129

The speech and language pathologists' assessments

The speech and language pathologist treating each participant assessed the participant's voice before and after treatment. This assessment was based on an auditory perceptual voice analysis of a recording of the participant reading a short fable, "The north wind and the sun".

The speech and language pathologist treating participant A noticed some improvement, although there were still problems with register breaks. The absence of roughness after treatment is a positive sign.

Participant B's voice was perceived as significantly improved by the speech and language therapist. Still, the speech and language therapist pointed out a few things after treatment that still needed improving.

After treatment, participant C's voice was assessed by the speech and language pathologist as improved, but with some remaining problems.

The speech and language pathologist treating participant D did not find that there was much improvement in the participant's voice after treatment.

Table 5. The speech and language pathologists' assessments of the participants' voices before and after treatment.

Participant	Before treatment	After treatment
A	Some abdominal breathing. Normal intensity. High pitch. Marked unstable register. A lot of roughness. Reduced sonority.	When compared to the first recording the register is somewhat stabilised. Constant glottal fry. In the exercises the patient still does not manage to produce voiced fricatives and has a lot of difficulties with vowel sounds. In both cases register breaks occur easily.
B	Predominantly costal breathing pattern. Read very fast. Incoordination between breathing and phonation. Intensity: somewhat low. Pitch: somewhat elevated. Quality: glottal fry. Hypertension. Breathiness and glottal fry at end of phrases. Reduced sonority.	Improvement in all parameters. The breathing pattern has been slightly lowered. Also the speech rate has been reduced, but could be furthermore reduced. The before mentioned quality parameters remain, although diminished.
C	Slightly elevated breathing pattern. Some incoordination between breathing and phonation. Low intensity. Lowered pitch. Quality: constant glottal fry.	Today the patient presents a perfectly satisfactory intensity. The pitch is still somewhat low. The glottal fry is not as pervasive as before. Sonorous elements occur.
D	The voice is characterised by reduced sonority and strain with quite a bit of hard glottal attacks. Fairly constant roughness and intermittent aphonia.	No dramatic difference between the recordings quality wise. Still a lot of roughness. Perhaps somewhat less restrained.

Pause analyses results

The results of the pause analyses of the recordings are presented for each participant in turn. It contains information about the pauses before and after treatment, with the pre-treatment results in parenthesis. The results shown are the following:

- the number of pauses of each type
- the percentage of a certain type of pauses out of the total amount of pauses in each pause category

- the average length of each pause type
- the median length of each pause type. Median length is given as a complement to the average length, which can be misleading if there for example one very long pause
- the minimum length in each pause category
- the maximum length in each pause category

Results for participant A

The length of the pre-treatment conversation with participant A was 123.90 seconds (2 minutes and 3.90 seconds) and the length of the conversation after treatment was 152.62 seconds (2 minutes 32.62 seconds).

Participant A has a larger proportion of unfilled planning pauses after treatment, whereas there are no filled planning pauses after treatment, compared to 10% before treatment. The average length of the unfilled planning pauses has decreased from 1,07 s to 0,53 s, and the median length has decreased from 0,69 s to 0,45 s.

The amount of pauses at possible TRP has decreased from 45% to 26%. Both the proportion of reaction pauses and audible inspirations have increased, from 3% to 9% and from 5% to 13% respectively.

Table 6. Results for participant A. Pre-treatment results within parentheses.

	Unfilled planning pause	Filled planning pause	Pause at possible TRP	Initiation pause	Reaction pause	Audible inspiration
Number of pauses	12 (23)	0 (6)	6 (28)	0 (0)	2 (2)	3 (3)
Percentage (%)	52% (37%)	0% (10%)	26% (45%)	0% (0%)	9% (3%)	13% (5%)
Average length (s)	0,53 (1,07)	- (0,63)	1,81 (1,33)	- (-)	0,77 (0,56)	1,02 (1,10)
Median length (s)	0,45 (0,69)	- (0,56)	1,33 (1,32)	- (-)	0,77 (0,56)	0,97 (0,58)
Minimum length (s)	0,17 (0,13)	- (0,3)	0,39 (0,14)	- (-)	0,17 (0,33)	0,72 (0,46)
Maximum length (s)	2,21 (4,84)	- (1,13)	4,63 (2,84)	- (-)	1,37 (0,78)	1,37 (2,25)

Results for participant B

The length of the pre-treatment conversation with participant B was 293.99 seconds (4 minutes 53.99 seconds) and the conversation after treatment was 222.22 seconds (3 minutes 42.22 seconds).

The percentage and length of planning pauses, both filled and unfilled, are approximately the same before and after treatment for participant B. The pauses at possible TRP have increased from 11% to 27% of the total amount of pauses. There is a tendency for the pauses at possible TRP to become shorter.

The proportion of audible inspiration has decreased from 28% to 10%, and they have become longer: the average length has gone from 0,37 s to 0,42 s, and the median length has gone from 0,28 s to 0,43 s.

The proportion of reaction pauses are essentially the same before and after treatment. After treatment the reaction pauses are shorter, but the number of pauses of this type is small and the difference could be due to random variation.

Table 7. Results for participant B. Pre-treatment results within parentheses.

	Unfilled planning pause	Filled planning pause	Pause at possible TRP	Initiation pause	Reaction pause	Audible inspiration
Number of pauses	32 (20)	8 (6)	19 (5)	0 (0)	4 (2)	7 (13)
Percentage (%)	46% (43%)	11% (13%)	27% (11%)	0% (0%)	6% (4%)	10% (28%)
Average length (s)	0,66 (0,68)	0,48 (0,48)	1,05 (1,37)	- (-)	1,17 (1,45)	0,42 (0,37)
Median length (s)	0,44 (0,39)	0,48 (0,51)	0,72 (1,53)	- (-)	0,58 (1,45)	0,43 (0,28)
Minimum length (s)	0,13 (0,11)	0,17 (0,18)	0,27 (0,22)	- (-)	0,10 (0,90)	0,30 (0,11)
Maximum length (s)	2,60 (2,21)	0,86 (0,75)	3,33 (2,84)	- (-)	3,40 (2,00)	0,52 (0,69)

Results for participant C

The length of the pre-treatment conversation with participant C was 81.98 seconds (1 minute 21.98 seconds) and the conversation after treatment was 99.32 seconds (1 minute 39.32 seconds). This is a very limited sample of dialogue.

Participant C has approximately the same percentage of filled and unfilled planning pauses before and after treatment (53% vs 55%), but there is a tendency towards more filled planning pauses. There is quite a large span between the shortest and the longest planning pause both before and after treatment, which makes the statistics ambiguous: the average length has increased from 0,79 s to 1,18 s, but the median length has decreased from 0,71 s to 0,46 s.

The pauses at possible TRP show a tendency to become longer. The proportion of reaction pauses is larger after treatment, and they have become shorter. After treatment the proportion of audible inspiration is 15%, compared to 8% before treatment.

Table 8. Results for participant C. Pre-treatment results within parentheses.

	Unfilled planning pause	Filled planning pause	Pause at possible TRP	Initiation pause	Reaction pause	Audible inspiration
Number of pauses	6 (6)	5 (2)	3 (2)	1 (1)	2 (3)	3 (1)
Percentage (%)	30% (40%)	25% (13%)	15% (13%)	5% (8%)	10% (23%)	15% (8%)
Average length (s)	1,18 (0,79)	0,49 (0,64)	2,29 (0,29)	- (-)	0,98 (1,31)	0,46 (-)
Median length (s)	0,46 (0,71)	0,47 (0,64)	2,28 (0,29)	- (-)	0,98 (1,35)	0,45 (-)
Minimum length (s)	0,31 (0,21)	0,39 (0,49)	0,93 (0,19)	2,00 (4,29)	0,76 (1,07)	0,40 (0,59)
Maximum length (s)	3,88 (1,49)	0,61 (0,78)	3,66 (0,39)	2,00 (4,29)	1,19 (1,52)	0,52 (0,59)

Results for participant D

The length of the pre-treatment conversation with participant D was 211.4 seconds (3 minutes and 31.4 seconds) and the conversation after treatment was 130.31 seconds (2 minutes 10.31 seconds).

Participant D has no filled planning pauses before treatment, but after treatment they amount to 5% of the total number of pauses. The proportion of unfilled planning pauses is similar, but they have gotten longer: the average length has increased from 0,53 s to 0,70 s, and the median length has increased from 0,42 s to 0,51 s.

The pauses at possible TRP are somewhat shorter after treatment. The proportion of reaction pauses has decreased from 17% to 8%, and they have become shorter. After treatment the proportion of audible inspiration has increased from 6% before treatment to 14% after treatment.

Table 9. Results for participant D. Pre-treatment results within parentheses.

	Unfilled planning pause	Filled planning pause	Pause at possible TRP	Initiation pause	Reaction pause	Audible inspiration
Number of pauses	17 (8)	2 (0)	10 (6)	0 (0)	3 (3)	5 (1)
Percentage (%)	46% (44%)	5% (0%)	27% (33%)	0% (0%)	8% (17%)	14% (6%)
Average length (s)	0,70 (0,53)	0,48 (-)	1,10 (2,11)	- (-)	0,62 (1,34)	0,46 (-)
Median length (s)	0,51 (0,42)	0,48 (-)	0,98 (2,31)	- (-)	0,55 (1,76)	0,36 (-)
Minimum length (s)	0,18 (0,22)	0,33 (-)	0,48 (0,5)	- (-)	0,32 (0,16)	0,35 (0,55)
Maximum length (s)	1,92 (1,42)	0,62 (-)	1,76 (3,24)	- (-)	0,98 (2,10)	0,79 (0,55)

DISCUSSION

Discussion of results

Voice therapy does not focus on pragmatic issues, such as turn taking and holding the conversational floor. Pauses are discussed in voice therapy, but not primarily in their pragmatic context. Rather, they are seen as an important way of keeping a relaxed pace and preventing voice strain. Still, a change in vocal behaviour should influence the pragmatic part of communication as well.

How is pause duration affected by voice therapy? One possible outcome would be that patients will have shorter pauses after voice therapy, since their need to rest their voices has decreased. On the other hand, the importance of pauses is often stressed in voice therapy, as mentioned above, and therefore one might see a lengthening of the pauses. Perhaps this will lead to a change in the location of the pause, rather than a change in the duration, and more pauses will be located at syntactic borders. (Pause categories are defined for example in Table 3 at p 12.)

Before treatment participant A scored 31 (out of maximum 200) on the Voice Handicap Index, and after treatment she scored 14, which signals an improvement in voice related distress. The speech pathologist treating participant A notes that her register is somewhat stabilised after treatment, but that she still has register breaks when producing voiced fricatives and vowel sounds in vocal exercises. After treatment, participant A does not use any filled planning pauses, which could be interpreted as her having learned to economise her voice. It is also possible to speculate that since participant A has become aware of her register breaks and when they occur, she avoids using filled planning pauses and thereby avoids some register breaks. There are no discernable differences in pause lengths other than that the unfilled pauses have become shorter after voice therapy; the average length of the unfilled pauses was 1.07 seconds before treatment and 0.53 after treatment.

Participant B scored 48 on the Voice Handicap Index before treatment, and 39 after, which is a significant decrease in voice related distress. The treating speech pathologist has noted that participant B shows an over-all improvement after treatment, and that the speech rate has been reduced. Hence, the participant and the speech pathologist's assessment agree that the participant's voice has improved. The pause analyses results show a shift in the location of pauses. The percentage of audible inspirations has decreased, and the percentage of pauses at syntactic borders (pauses at possible TRP) has increased. This could be interpreted as participant B having learned to plan his speech and breathing more proficiently. Since there is no direct change in the length of planning pauses and the pauses at possible TRP and the reaction pauses show a tendency of getting shorter, one may consider why the speech pathologist perceives participant B's speech rate as slower. The pauses filled with audible inspiration have increased somewhat in average length, and perhaps this contributes to the perception of a slower pace.

Participant C scored 70 before and 68 after treatment on the Voice Handicap Index, which means that participant C's perceived voice distress is approximately the same. The treating speech pathologist's auditory perceptual analysis suggests that some improvement has occurred: the intensity is satisfactory and the glottal fry not as pervasive. Still, the speech

pathologist notes that the pitch is still low and that “sonorous elements occur”, which could be interpreted as reduced sonority. The recordings of participant C in conversation are the shortest; the duration is roughly a minute and a half per recording. It is therefore not realistic to draw any conclusions from the pause analyses of participant C’s conversations.

After treatment participant D scored 129 on the Voice Handicap Index, which is higher than the pre-treatment score 110. The speech pathologist treating participant D notes that there are no obvious differences between the pre- and after treatment recordings. This means that participant D and her treating speech pathologist are in agreement that at this point there has not been any improvement as a result of the voice therapy. Before voice therapy participant D does not use any filled planning pauses, whereas they occur after treatment. This could possibly be the beginning of a strategy to soften participant B’s hard glottal attacks.

In three out of four participants, the unfilled planning pauses are slightly or markedly longer after treatment. This might be a sign of a more confident conversational style, where the participants feel more comfortable producing longer pauses and still holding the floor. It may also be an effect of the focus on pausing in voice therapy.

Another tendency showing is that approximately 50% of all pauses are planning pauses (unfilled and filled). The division of pauses into filled and unfilled planning pauses differ between the participants, from 25% of the total amount of participant C’s pauses after treatment to 0% of participant A’s pauses after treatment. This could be a sign of different pause strategies as described by van Donzel and Koopmans-van Beinum (1996).

When discussing voice therapy, it is important to clarify the goal of the therapy. There has been a shift from the goal being to alter the patient’s voice to instead focusing on supplying the patient with the necessary tools to handle vocally demanding situations. This shift has at least partly been forced by the lack of resources and the economy: it is not possible to provide the patients with extensive periods of therapy. Instead, short time therapy is the norm. In this context, it is interesting to see that two out of the four participants experienced an improvement according to the VHI results, while two participants did not experience any improvement after voice therapy. Is it possible that short time voice therapy is effective for some patients with functional dysphonia, while other patients may need longer periods of voice therapy to implement the tools learned? One may speculate that although two of the patients did not rate any improvement on the VHI, they may still have learned to use the tools presented in voice therapy, and therefore the treatment was finished.

As has been shown in the background, a voice disorder does not merely affect the individual suffering from it but also the persons interacting with him/her. Children find it more difficult to process and decode the speech of a person with dysphonia, and this may very well be true for adults as well (Morton & Watson, 2001; Rogerson & Dodd, 2005). It is also known that when we listen to a person with a voice disorder, we imitate their vocal behaviour and larynx tension with our own and this may cause discomfort for the listener. What effect will this have on how the person with dysphonia is treated in a dialogue? Perhaps the person will be interrupted more often, since the listener will have some trouble processing his/her speech and will need clarification. The person listening might also limit the time the person with dysphonia is allowed in the conversation, because of the discomfort experienced when listening to him/her. This may in turn cause insecurities in the patient with dysphonia, contributing to the already lowered quality of life.

Methodological discussion

Initially, an attempt was made to recruit participants for the study at a large university hospital. The information was given to approximately 10 patients, but only one patient expressed an interest in taking part in the study, and it was therefore not possible to move forward with the study in that form. The speech and language pathologists distributing the information were asked what they believed to be the cause of the lack of positive feedback, and they suggested there might be too much time and effort required from the patients.

After this first effort to recruit participants, the planning of the recording and the information directed towards the patients were modified.

An important question is why the patients did not feel that it was important to participate in the study, despite the impact voice disorders have on different aspects of life. Perhaps the patients themselves underestimate the impact of their voice disorder on their life, seeing that it is not life threatening or immobilising.

Another methodological issue was to provide the participants with something to discuss, in order to create a conversation. Two short descriptions of a situation were written, and these were used as a starting point for the conversation. Still, although the conversation partners had a topic to discuss, the dialogue was at some points slightly stilted and did not last very long. Participant C was the participant producing the least amount of conversation, and this made it unrealistic to draw any conclusions from the pause analyses of his conversations. Conversations with the other participants were also short, and for it to be possible to draw any definitive conclusions the amount of data needs to be greater.

If a larger study were to be made, there are other factors to consider. The group of participants in this study is not homogenous; they are of different sex, they have different occupations and they did not receive the same number of voice therapy sessions. It would be desirable to investigate a more homogenous group where one might also exclude participants who medicate (as participant C in this study). It would also be informative to find a way to measure speech rate (perhaps in words per ten seconds), since a pause may be perceived as longer when occurring in a person who has a rapid speech pace. Still, speech pace may not be as important when the participants are mainly compared to themselves before and after treatment, as in this study.

Conclusion

Functional dysphonia has a major impact on life, especially on quality of life and communication. Although voice therapy does not focus on pragmatic aspects of communication, conversational behaviour shows a tendency to become altered by the therapy. The effect is positive: patients learn to plan their speech better and perhaps to feel more confident in conversational interaction with other people.

Future studies should examine whether the tendencies toward longer unfilled planning pauses seen in this small study would be present in a larger number of patients with functional dysphonia, and whether the effects last for a longer period of time. It would also be interesting

to follow up on the difference in distribution of pauses seen in patient B: is this specific to him or would this be seen in more patients after receiving voice therapy? To further investigate the conversational behaviour of persons with functional dysphonia it would be relevant to analyse the dialogues using Initiative Response Analysis or Conversation Analysis, which was not possible in this study since the dialogue samples were too short. It would then be possible to conclude whether persons with functional dysphonia are treated differently by their conversational partner before and after treatment.

Conversation analysis of patients with voice disorders could be used as a complement to other evaluation instruments. It provides a means of pinpointing the conversational behaviour that may contribute to voice disorders, and may constitute a useful approach to emotional voice concerns.

The impact of voice disorders on communication and social interaction is an area which requires much more research.

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