Voice symptoms, voice use and voice risk factors in day care personnel

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Abstract for master's thesis

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Abstract: Voice problems in the teaching occupation are common and the voice ergonomic risk factors well documented, but the majority of the available literature focuses on teachers. There is not as much literature found about the voice problems and voice ergonomic risk factors in day care personnel, although this group also has a high risk for developing voice problems due to their profession. Day care personnel work in a loud and often for the voice unsupportive environment, and the vocal load is high. Knowledge about preventive voice care would be beneficial for this group but is often limited. The purpose of this study was to investigate the prevalence of voice symptoms in day care personnel and detect potential environmental and individual voice ergonomic risk factors. Do day care personnel have a high vocal load? Are there any voice ergonomic risk factors in the day care personnel's environment? One preschool teacher and ten day care employees participated in the study. Data about the participants' voice use at work was collected using a voice accumulator, Vocal Holter Recorder. In addition to this, the participants answered a background questionnaire about general health and voice health, the voice questionnaire forms Screen-11 and Voice Handicap Index, and a questionnaire about percieved stress, the Percieved Stress Scale-10. Furthermore, an evaluation of the environment and voice ergonomical risk factors at the work places of the participants was conducted using ''Röstergonomisk bedömning av arbetsmiljön: handbok i röstergonomisk utredning'' by Sala et al. (2011). The results of this study showed that the prevalence of voice symptoms in the participants was 40%. Several voice ergonomic risk factors were found in the participants' work environment, of which the most prominent one was high levels of background noise. Due to technical issues a large part of the acoustical data could unfortunately not be used, but a qualitative analyse could still be conducted on seven participants' F0 values. In these analyses, a change in the participants' F0 values could be observed as a response to the high vocal load. The results of this study should be interpreted critically and qualitatively, considering the small sample size. Further research is needed on day care personnel as a considerable risk group for developing voice problems in order to decrease the prevalence of voice problems and voice ergonomic risk factors in this group and optimize the conditions for a healthy voice.
Key words: day care personnel, preschool teachers, voice ergonomic risk factors, voice problem, voice use

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Sammanfattning: Röstproblem i läraryrket är vanliga och de röstergonomiska riskfaktorerna är väl dokumenterade, men majoriteten av den tillgängliga litteraturen handlar om lärare. Det finns inte lika mycket forskning kring förekomsten av röstproblem och röstergonomiska riskfaktorer hos dagvårdspersonal, trots att denna grupp löper stor risk för att utveckla röstproblem på grund av sitt yrke. Dagvårdspersonal arbetar i en högljudd och ofta för rösten inte så ergonomisk omgivning, och belastningen på rösterna är hög. Dagvårdspersonal skulle dra stor nytta av att lära sig röstergonomi, men kunskapen kring ämnet är ofta begränsad i denna grupp. Syftet med denna avhandling var att undersöka förekomsten av röstsymptom hos dagvårdspersonal samt att undersöka förekomsten av röstergonomiska riskfaktorer. Har dagvårdspersonal en stor röstbelastning? Finns det röstergonomiska riskfaktorer i deras omgivning? En förskolelärare och tio dagvårdare deltog i denna studie. Data om deltagarnas röstanvändning samlades in med hjälp av en röstackumulator, Vocal Holter Recorder. Som tillägg till detta, fick deltagarna även svara på en bakgrundsblankett kring allmän hälsa och rösthälsa, röstformulären Screen-11 och Rösthandikappindexet samt ett frågeformulär om uppfattad stress, Uppfattad Stress Skala-10. Dessutom utfördes en evaluering av deltagarnas arbetsmiljö och förekomsten av röstergonomiska riskfaktorer med hjälp av handboken ‘'Röstergonomisk bedömning av arbetsmiljön: handbok i röstergonomisk utredning’’ av Sala m.fl. (2011). Resultaten av denna studie visade att förekomsten av röstproblem hos deltagarna var 40%. Flera röstergonomiska riskfaktorer upptäcktes i deltagarnas arbetsmiljö, av vilka den mest framträdande riskfaktorn var höga nivåer av bakgrundsbuller. På grund av tekniska problem kunde en stor del av det akustiska data inte användas, men en kvalitativ analys kunde ändå utföras på sju deltagares F0 värden. I analysen kunde en förändring i deltagarnas F0 värden observeras vid ökad röstbelastning. Resultaten i denna studie bör tolkas kritiskt och kvalitativt med tanke på sampelstorleken. Vidare forskning krävs om dagvårdspersonal som en betydlig riskgrupp för att utveckla röstproblem för att kunna minska förekomsten av röstproblem och röstergonomiska riskfaktorer i denna grupp, och optimisera förutsättningarna för en friskare röst.
Nyckelord: röstproblem, röstergonomiska riskfaktorer, röstanvändning, dagvårdspersonal, förskolelärare

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Foreword

I would like to thank those who participated in this study and made it possible. I would also like to thank my supervisors Sofia, Greta and Viveka for the guidance and support throughout the process. A big thank you to Daniel Fellman who helped me with the statistics of this study. Finally, I would like to thank my friends and family for cheering me on throughout this process.

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1 Introduction

Day care personnel and preschool teachers are in their work environment exposed to several risk factors for developing voice problems (Södersten, Granqvist, Hammarberg & Szabo, 2002). The ambient and activity sound levels are often higher than recommended, the surroundings are not favorable for voice use and the vocal demands are high (Durup, Shield, Dance, Sullivan & Gomez-Agustina, 2015; Lyberg-Åhlander, Rydell & Löfqvist, 2011; Portela, Hammarberg & Södersten, 2013; Rantala, Hakala, Holmqvist & Sala, 2015; Södersten, et.al., 2002). In addition, the knowledge about proper ergonomic voice care and usage is often limited (Munier & Kinsella, 2007; Tao, Lee, Hu & Liu, 2020). As a consequence, the prevalence of voice problems among day care personnel is high (De Alvear, Barón & Martinez-Arquero, 2011; Kaļužnaja & Lakiša, 2016; Kankare, Geneid, Laukkanen & Vilkman, 2012; Sala, Laine, Simberg, Pentti & Suonpää, 2001; Tao et.al., 2020). There is a need for further research on this group to be able to identify and reduce the potential risk factors and lower the prevalence of voice problems.

In this thesis I have chosen to use the term ’voice problems’, covering both undiagnosed subjectively experienced voice symptoms as well as diagnosed voice disorders.

1.1 Voice problems in day care personnel and the teaching profession

In a study by Lyberg-Åhlander, Rydell, Fredlund, Magnusson and Wilén (2019) an extensive research was conducted in order to investigate the prevalence of voice problems in the general population in Sweden. The prevalence of voice problems in 74 351 participants in the study was 16.9%. The profession with the highest prevalence of voice problems in the study was teachers. Voice problems are common in the teaching profession as teachers are at a high risk for developing voice problems. The prevalence of voice problems in teachers is therefore well documented (Behlau, Zambon, Guerrieri & Roy, 2012; Devadas, Bellur & Maruthy, 2017; Lyberg-Åhlander et.al., 2011; Munier & Kinsella, 2007; Roy, Merrill, Thibeault, Gray, & Smith, 2004; Smith, Gray, Dove, Kirchner, & Heras, 1997; Smith, Kirchner, Taylor, Hoffman, & Lemke, 1998; Södersten & Lindhe, 2007; Williams, 2003). The occurrence of voice problems in day care personnel is not as frequently reported, but studies have shown

that day care personnel is a risk group for developing voice problems. The prevalence of voice problems in day care personnel is presented in table 1.

Table 1. Prevalence of voice problems in day care personnel and preschool teachers.

Author(s)	Year	Participants	Methods	Prevalence of voice problems	Day care personnel with voice problems (vs. non day care personnel)	Most common voice symptoms
Tao, Lee, Hu, Liu	2020	211 kindergarten teachers, 203 elementary school teachers	Questionnaire (including Voice Handicap Index)	During the previous semester	54.0% (vs. 65.5%)	Hoarseness, dryness and tired voice
Kaļužnaja, Lakiša	2016	155 preschool teachers	Questionnaire	During career	69.7%	Hoarseness
Kankare, Geneid, Laukkanen, Vilkman	2012	119 kindergarten teachers	Questionnaire and clinical examination	Two or more symptoms weekly/currently	21%	Strained voice and hoarseness without infection
De Alvear, Barón, Martinez-Arquero	2011	282 kindergarten and elementary school teachers	Questionnaire	Currently	59%	Throat clearing, voice tiredness and hoarseness
Sala, Laine, Simberg, Pentti, Suonpää	2001	262 day care center teachers, 108 hospital nurses	Subjective, clinical and perceptual evaluation	Two or more symptoms weekly during the last year	37% (vs. 17%)	

In the study by Kankare, Geneid, Laukkanen and Vilkman (2012), the occurrence of voice problems in 119 Finnish kindergarten teachers was investigated. According to the results in the study, 21% of the participants reported that they had two or more voice symptoms occurring weekly or more often, and organic changes on the vocal folds were found in 10.9% of the participants. As much as 94% of the participants had experienced some kind of voice tiredness. Sala, Laine, Simberg, Pentti and Suonpää (2001) investigated the prevalence of voice disorders among 262 Finnish day care center teachers and compared it with that of 108 hospital nurses. The results of the study showed that the prevalence of voice symptoms in day

care personnel was generally higher than in hospital nurses. According to the study, 37% of the day care center teachers had had two or more symptoms occurring once a week or more often during the last year, compared to 17% of the nurses. In the clinical exam, visual changes on the vocal folds was found in 29% of the day care center teachers, compared to only 7% of the nurses. Thirty-eight percent of the day care center teachers experienced that their voice problems affected their work performance, while only 8% of the nurses experienced this (Sala et.al., 2001). In a study by Kaļužnaja and Lakiša (2016), 69.7% of the 155 preschool teachers participating in the study had experienced voice problems during their career. Many experienced that they often needed to take a break from speaking.

In a study by De Alvear, Barón and Martinez-Arquero (2011), the prevalence of voice problems was investigated in 282 Spanish kindergarten and elementary school teachers. According to the results of the study. 81.5% of the participants had experienced some kind of voice symptoms. The prevalence of voice problems was 59%, and some kind of voice problems were experienced by 62,7% of the participants. Tao, Lee, Hu and Liu (2020) investigated the prevalence of voice problems in 211 kindergarten teachers and 203 elementary school teachers in China. According to the results of the VHI, the total prevalence of voice problems in both groups was 59.7%. As many as 92.8% of the participants reported experiencing some kind of voice symptom. Voice diseases such as chronic laryngitis and pharyngitis also had a high prevalence in the group; 78.3% of the participants had been diagnosed with a voice disease during their career, 70% during the last semester. The results of the study showed that the kindergarten teachers had a slightly lower prevalence of voice problems than the elementary school teachers (54.0% vs. 65.5 %). Kindergarten teachers also had a slightly lower prevalence of voice symptoms and voice diseases than elementary school teachers, although the prevalence was still high in both groups (Tao et.al., 2020).

In a study by Limoeiro, Ferreira, Zambon and Behlau (2019) the findings differed slightly from previously mentioned studies as the prevalence of voice problems was investigated in 112 teachers, of which 38 were kindergarten teachers. In this study, the teachers rated their voices as good and there were no differences found between the different teaching professions. However, only the subjective evaluations of the participants' voices were obtained and there were still some voice symptoms reported by the participants. The most common voice symptom reported in the study was dry or irritated throat.

The most common voice symptom reported in all of the studies investigating the prevalence of voice problems among day care personnel and preschool teachers was hoarseness. Voice tiredness, dryness and strained voice was also commonly reported.

1.2 Risk factors for developing voice problems in the teaching profession

Teachers and day care personnel are exposed to a variety of risk factors for developing voice problems (Södersten et.al., 2002). Due to high noise levels and vocally demanding work tasks, the vocal load in day care personnel is often high (Helidoni, Murry, Chlouverakis, Okalidou & Velegrakis, 2012; Kaļužnaja & Lakiša, 2016; Lindstrom, Ohlsson, Sjöholm & Waye, 2010; Lindstrom, Waye, Södersten, McAllister & Ternström, 2011; Portela et.al., 2013; Remacle, Morsomme & Finck, 2014; Sala et.al. 2002; Simões-Zenari, Bitar & Nemr, 2012; Södersten et.al., 2002). Teachers and day care personnel are also exposed to several environmental risk factors such as poor acoustics, poor indoor air climate and stress (Vilkman, 2004). Furthermore, teachers and day care personnel are often uninformed about preventive voice care (Munier & Kinsella, 2007; Tao et.al., 2020). Preventive measures like optimizing the environment to support a healthy voice production and educating employees in the teaching profession about preventive voice care and usage would benefit this group of profession.

1.2.1. Voice use, vocal loading and background noise.

The levels of background noise are often high at day cares, with noise levels often around 70–80 dB (Grebennikov, 2006; Jonsdottir, Rantala, Oskarsson & Sala, 2015; Kaļužnaja & Lakiša, 2016; Lindstrom et.al., 2011; Sala et.al., 2002; Simões-Zenari et.al., 2012; Sjödin, Kjellberg, Knutsson, Landström & Lindberg, 2012; Södersten et.al., 2002; Vilkman, 2004). The low age of the children, big groups and day care activities like free play indoors and outdoors, gatherings and reading aloud, often also combined with properties of the rooms that affect the room acoustics, result in high activity noise levels and a loud environment (Durup et.al., 2015; Kaļužnaja & Lakiša, 2016; Portela et.al., 2013; Sjödin et.al., 2012; Södersten et.al., 2002; Vilkman, 2004). In studies investigating the effect high noise levels at day cares has on the children at the day cares, it was found that also children were bothered by the

noise (McAllister, Rantala and Johnsdottir, 2019; Waye, van Kamp and Dellve, 2013). High noise levels caused irritation in the children, and some of the children reported that it was sometimes difficult to hear and be heard over the noise. The children often reacted with coping strategies like covering their ears or talking less, and sometimes the high noise levels even caused physical symptoms like sore throat or ears, headaches or stomach pains (McAllister, Rantala and Johnsdottir, 2019; Waye, van Kamp and Dellve, 2013). Ventilation and other technical equipment create a constant source of ambient noise which adds to the high noise levels (Lyberg-Åhlander et.al., 2011; Rantala et.al., 2015). In a study by Karjalainen, Brännström, Christensson, Sahlén, and Lyberg-Åhlander (2020) the effect of the acoustic properties in primary school classrooms on teachers' health was investigated. In the study, the noise levels from the ventilation system was higher than recommended and associated with a higher prevalence of voice symptoms. Increased levels of background noise often lead to an increase in vocal load, as we raise our voices unintentionally in response to high sound levels - called the Lombard effect (Lane & Tranel, 1971). This increase in vocal load is typically represented by increased or decreased values of the fundamental frequency (F0), increased values of the sound pressure level (SPL) and sometimes even an increase in the phonation time. This can result in a change in voice quality and vocal behavior, and lead to vocal symptoms (Jonsdottir et.al., 2015; Kankare et.al., 2012; Sjödin et.al., 2012; Södersten, Ternström & Bohman, 2005; Tao et.al., 2020; Vilkman, 2004).

In a study by Sala et.al. (2002) the vocal load in 51 day care center teachers in Finland was investigated and compared to the vocal load in 25 hospital nurses. The background noise levels and room acoustics in the day cares were also measured. The results of the study showed that day care center teachers used both a stronger voice and used their voices more than the nurses did. The average SPL value for the day care center teachers was 78 dB and the average phonation time was 40%. The average SPL value for the nurses was 72 dB and the average phonation time was 28%. The background noise levels at the day cares were high, with an average noise level of 67 dB (Sala et.al., 2002). In a study by Södersten, Granqvist, Hammarberg and Szabo (2002), the average background noise level at day care centers in Sweden during the day of the study was 76.1 dBA, which is 20 dB higher than what was recommended for the day cares. As a consequence, the day care personnel's average SPL was 85.4 dB, which is 9.1 dB louder than in the reference condition before the work day. In the study, the participants' average F0 was 247 Hz during work, which is higher than the average F0 value from the reference condition (202 Hz). The average phonation time

in the group was also high, 17% (Södersten et.al., 2002). In a study by Portela, Hammarberg and Södersten (2013), similar results were found as the mean F0 for the twelve preschool teachers that participated in the study was significantly higher during work (266 Hz) than after work (246 Hz), but both values were still high compared to laboratory recordings of women's F0. The phonation time was also higher during work than after (12% vs. 5.5%). These participants had few opportunities to rest their voices during work (Portela et.al., 2013). In a study by Lindström, Ohlsson, Sjöholm and Waye (2010) a raise in the F0 value could also be observed in nine preschool teachers due to high noise levels. Furthermore, Lindström, Waye, Södersten, McAllister and Ternström (2011) found that apart from raising their voices in response to higher background noise levels, some of the preschool teachers in their study maintained a higher SPL although the background noise levels decreased. The participants' SPL values ranged from 71–79 dB, and their F0 values ranged from 229–292 Hz. The noise levels at the preschools ranged from 64–72 dB (Lindström, Waye, Södersten, McAllister & Ternström, 2011).

In a study by Simões-Zenari, Bitar and Nemr (2012), the effect of noise on the voices of 28 preschool teachers was investigated in three preschools in Brazil. The results showed that 75% of the participants experienced changes in their vocal quality, and about half of the participants had a lower F0 value than expected. There were also changes in the values of HNR, jitter and shimmer for some of the participants. Alterations in the voice production like hyponasal resonance and locked jaw were found in 57% of the participants. The noise levels at the day cares were high, ranging from 58.1 up to 83.7 dB, with an average noise level of 70.4 dB (Simões-Zenari et.al., 2012). Kaļužnaja and Lakiša (2016) also investigated the effect of noise on voice and health in 155 preschool teachers or teacher assistants in 11 preschools. According to the results, almost 70% of the participants often felt the need to use a stronger voice during work due to high noise levels. Almost as many (69.7%) had experienced voice problems at work. The noise levels at the preschools were above recommendations, with an average of 70 dB. The high noise levels also caused other health complaints like headache and fatigue (Kaļužnaja & Lakiša, 2016).

Helidoni, Murry, Chlouverakis, Okalidou and Velegrakis (2012) compared the voice use of kindergarten teachers with hospital nurses, and found that 90.7% of the kindergarten teachers used a louder voice at work than nurses, perhaps due to high levels of background noise and a longer distance between the speaker and the listener. The kindergarten teachers also sung with the children, drank less water than the nurses and had a significant prevalence of upper

respiratory tract infections. Risk factors among nurses consisted more of habits and factors related to life-style, like alcohol intake, smoking and speaking much on the phone. The scores of the Voice Handicap Index were significantly higher for the kindergarten teachers than the nurses (Helidoni et.al., 2012). Remacle, Morsomme and Finck (2014) compared voice parameters between 12 kindergarten teachers and 20 elementary school teachers in Belgium, collected during a week with an Ambulatory Phonation Monitor. According to the results of the study, the vocal load was greater for kindergarten teachers than elementary school teachers. The values for F0, SPL, cycle dose and distance dose were higher in kindergarten teachers than in elementary school teachers, both during and after work. The average value for F0 was 268 Hz for kindergarten teachers and 253 Hz for elementary school teachers. The average SPL value for the kindergarten teachers was 81.7 dB, while the mean SPL value for the elementary school teachers was 79.9 dB. The participants also completed the French version of the Voice Handicap Index, which accordingly kindergarten teachers experienced more voice problems than elementary school teachers (Remacle et.al., 2014). Munier et.al. (2020), however, came to a different conclusion as the prevalence of voice symptoms were investigated in 99 kindergarten teachers and 84 primary school teachers in Finland. The prevalence of voice symptoms in this study was higher in primary school teachers than in kindergarten teachers. The results showed that primary school teachers had higher scores on almost all VAPP sum scores except for social sum, compared to the kindergarten teachers.

1.2.2. Environmental factors and health conditions.

Employees in the teaching profession are exposed to different voice ergonomic risk factors in the environment such as poor room acoustics, poor indoor air climate and factors that are associated with the culture and work tasks of the work place like working posture, the availability of voice aids and opportunity to rest the voice (Vilkman, 2004). In environments with high noise levels, the qualities and acoustics of a room play an important role in how the noise affects the voice. The size of a room and furnishings affect the acoustics in a room, and a room's property and acoustics can either support the voice or have the exact opposite effect (Lyberg-Åhlander et.al., 2011; Mealings, Buchholz, Demuth & Dillon, 2014; Pelegrin-Garcia, Lyberg-Åhlander, Rydell, Brunskog & Lofqvist, 2010; Sjödin, Kjellberg, Knutsson, Landström & Lindberg, 2014). A room’s qualities can especially affect unhealthy voices (Lyberg-Åhlander et.al., 2011; Pelegrin-Garcia et.al., 2010). Poor acoustics result in changes

especially in SPL and F0 values. A room's STv (room support) affects the auditive feedback of the voice and can cause an increase in the SPL (Astolfi et.al., 2015; Lyberg-Åhlander, García, Whitling, Rydell & Löfqvist, 2014). A long reverberation time can cause an increase in both SPL and F0 as it often increases the sound levels in the room (Astolfi et.al., 2015; Rantala & Sala, 2015). A longer reverberation time can also lead to a lower SPL value as a result of voice tiredness (Rantala & Sala, 2015).

Poor indoor air climate is caused by dusty and unclean surroundings, insufficient ventilation and low air flow, affecting the humidity and air quality in the room (Rantala & Sala, 2015). Air humidity affect the phonatory effort and cause changes in the F0 values (Vilkman, 2004). In an experimental study by Verdolini, Titze and Fennell (1994), low hydration levels of 9 – 32% increased the phonatory effort in the participants. Geneid et.al. (2009) investigated the effect of organic dust on the voice and throat in nine participants with rhinitis or asthma in an experimental arrangement, and found that exposure to dust may lead to occupational voice disorders. The participants experienced changes in their voice and reported experiencing voice symptoms from the exposure (Geneid et.al., 2009). Poor indoor climate has also been reported to increase the risk of developing laryngitis (Rantala, Hakala, Holmqvist & Sala, 2012; Rantala & Sala, 2015).

There are few studies reporting about environmental risk factors in day cares and preschools. Since preschool teachers and teachers work in a similar environment, studies about risk factors in teachers' environment are included where information about the situation in day cares or preschools is missing. In that way, an overall comprehension of the environmental risk factors in the teaching profession is provided. In a study by Sala et.al. (2002) RASTI (Rapid Speech Transmission Index) levels at 27 Finnish day cares were investigated. According to the study, the RASTI levels were below what is recommended in 12 of the rooms, indicating poor acoustics in these rooms. In a study by Sala and Rantala (2016) the acoustics of 40 classrooms in Finland were investigated. Only 14 rooms in the study had a recommended reverberation time, and only one room had the STI value within recommended guidelines (Sala & Rantala, 2016).

In a study by Ruotsalainen, Jaakkola and Jaakkola (1993), the indoor air climate in 83 rooms in 30 day care centers in Finland was investigated. Humidity, air quality, temperature, carbon oxide levels and air flow were measured. The results of the study showed that the indoor air climate at many of the day cares centers was poor. The most common reason for this was

defective ventilation and air flow, which led to higher amounts of carbon oxide which affected the quality of the air indoors. The air flow was insufficient in 70% of the rooms, and the carbon oxide levels were too high in 18% of the rooms. Three of the day care centers had too high concentrations of total volatile organic compounds that affects the air quality. Further indications of poor indoor climate found at the day cares was too high or too low temperature levels in most of the rooms, and unpleasant odors experienced by over half of the day care personnel. The average relative humidity was 31%, but cold outdoor temperatures often caused the humidity levels to decrease (Ruotsalainen, Jaakkola & Jaakkola, 1993).

Several other studies agree that poor indoor air climate at day cares seem to be caused mostly by insufficient air flow and ventilation, causing high levels of carbon oxide and low air humidity (Ferng & Lee, 2002; Kaļužnaja & Lakiša, 2016; St-Jean et.al., 2012). The sizes of the rooms also affect the indoor air quality as the levels of e.g. carbon oxide increases in too small spaces (St-Jean et.al., 2012). In a study by Tao, Lee, Hu and Liu (2020) 37.9% of the 211 kindergarten teachers in the study reported that the air humidity in their work environment affected their vocal health.

Upper respiratory tract diseases and conditions such as asthma, reflux, allergies, rhinitis, pharyngitis and laryngitis can have negative consequences on the voice and may lead to voice problems (Charn & Mok, 2012; Devadas et.al., 2017; Lee, Lao & Yu, 2010; Munier, Brockmann-Bauser, Laukkanen, Ilomäki, Kankare & Geneid, 2020; Simberg, Sala, Tuomainen & Rönnemaa, 2009). Furthermore, diseases and conditions that affect the upper airways have proven to be somewhat common in the teaching profession (Charn & Mok, 2012; Devadas et.al., 2017; Lee et.al., 2010). In the study by Helidoni, Murry, Chlouverakis, Okalidou and Velegrakis (2012) mentioned before, kindergarten teachers were more prone to develop upper respiratory tract infections than their control group of hospital nurses. In the study by Munier et.al. (2020), a connection between asthma and respiratory infection and subjective voice symptoms was found in the teachers and kindergarten teachers participating in the study.

1.2.3. Stress.

The relation between stress and voice problems have been investigated in several studies, and there is consensus that stress is a considerable risk factor for developing voice problems (Devadas et.al., 2017; Lyberg-Åhlander, Rydell, Löfqvist, Pelegrin-García & Brunskog,

2015; Vilkman, 2004). Kooijman et al. (2006) reported that psycho-emotional aspects, such as stress and high workload, were the most important risk factors for developing a voice disorder. Some studies have also reported the effect of voice symptoms on stress levels. Gassull, Casanova, Botey and Amador (2010) found that voice problems often led to a higher reactivity to stress, and in a study by Lee, Lao and Yu (2010), 79,3% of the participants were stressed because of their voice problems. Mendoza and Carballo (1998) found that stress caused an increase in the F0, jitter and shimmer values. Day care personnel work in a loud environment which may cause higher levels of stress, as high noise levels have been found to increase the levels of stress (Jonsdottir et.al., 2015; Sjödin et.al., 2012). Jonsdottir, Rantala, Oskarsson and Sala (2015) found that there was a connection between high stress levels and a higher prevalence of voice symptoms in preschool teachers. In a study by Holmqvist, Santtila, Lindström, Sala and Simberg (2013) where the connection between vocal symptoms and stress symptoms was investigated in 1728 participants, it was found that there was an association between the occurrence of vocal symptoms and stress symptoms. Holmqvist-Jämsén et.al.(2017) investigated the effect of raised cortisol levels and vocal symptoms in 170 participants. The results showed a positive connection between raised cortisol levels, which is a biological stress marker, and the occurrence of vocal symptoms, providing an objective view on the effect of stress on the voice. In a study by Rantala, Hakala, Holmqvist and Sala (2012), 30% of the 39 teachers participating in the voice ergonomic assessment reported that they were quite or very stressed. The results of the study showed that stress was associated with vocal symptoms. Stress also correlated most strongly out of all of the risk factors investigated in the study with the occurrence of vocal symptoms in the participants.

1.2.4. Gender.

Studies have concluded that the prevalence of voice problems is higher in women than men in the teaching profession. In a study by Holmqvist, Santtila, Lindström, Sala and Simberg (2013) women reported more vocal and stress symptoms than men. In a study conducted by Smith, Kirchner, Taylor, Hoffman and Lemke (1998), the frequency of voice disorders was higher in female teachers than in male teachers. Female teachers were also more likely to report voice symptoms, like a tired or effortful voice, than male teachers. The same results are reported in a study by Russell, Oates and Greenwood (1998), where the prevalence of voice problems was significantly higher in female teachers than in male teachers. Women

tend to use a slightly higher voice level and have a higher phonation time than men. In the study by Södersten, Ternström and Bohman (2005) women reported that they often felt like they needed to use more effort in order to make themselves heard in loud environments. The difference in voice use between women and men may be a cause for the higher prevalence of voice problems in women (De Alvear, Barón & Martínez-Arquero, 2011; Södersten et.al., 2005; Vilkman, 2004).

All participants in the studies investigating prevalence of voice problems or voice ergonomic risk factors in day care center personnel have been women, so no gender comparison regarding occurrence of voice problems is available in this population to date.

1.3 Aim of the study

Day care personnel is a risk group for developing voice problems as they are exposed to several voice ergonomic risk factors in their profession. However, the literature about voice problems and voice ergonomic risk factors in this group is limited. It is therefore important to conduct further research on the subject in order to be able to reduce the prevalence of voice problems and voice ergonomic risk factors in this profession. The aim of this study was to investigate the prevalence of voice symptoms in day care personnel and detect potential risk factors that may be the cause to eventual voice symptoms. Research questions: Do day care personnel have a high vocal load? Are there any voice ergonomic risk factors in the day care personnel's environment?

2 Method

Several different data collecting methods were used in this study in order to achieve a qualitative but comprehensive estimation of the day care personnel's voice ergonomic situation. Permission to conduct research at the day cares in Turku was obtained from Åbo Stad (26.04.2018). Ethical consent was also granted from the board of Research Ethics in Psychology and Speech-Language Pathology at Åbo Akademi University (22.01.2018).

2.1 Participants

In my thesis, both day care personnel without a pedagogical degree and preschool teachers are included as subjects of interest. ’Day care personnel’ include all personnel at day cares who work with children, regardless of their level of education. Participants in this study were ten day care employees and one preschool teacher from four different day cares and one school in Turku. The participants gave their signed consent to participate in this study before the investigations. All participants were women (mean age 45,4 years, range 23–55 years). Six of the participants were kindergarten teachers, two were social workers, one was a nurse, one was day care employee and one a child minder. Eight of the participants had worked as a day care employee for at least 10 years. All of the participants worked full time and at least 31–40 hours a week. The age of the children in the participants’ groups varied depending on the day care: in some of the day cares they had smaller groups with a wider age range, while in other day cares the groups were bigger with children of a narrower age span. Three of the participants worked with children in preschool age. Table 2 presents the demographics of the participants.

Table 2. Demographics of the participants in this study.

Participant	Age	Education	Years as a day care worker	Work time (h/week)	Age span within the group	Group sizes (number of children)
1	51	Kindergarten teacher	20–29	31–40	6–7	11–20
2	54	Kindergarten teacher	>30	31–40	5	11–20
3	23	Social worker	1–4	31–40	1–5	11–20
4	54	Nanny	>30	31–40	6–7	11–20
5	49	Day care worker	>30	31–40	6	11–20
6	55	Kindergarten teacher	20–29	31–40	3–5	21–30
7	38	Social worker	10–19	31–40	1–4	11–20
8	27	Kindergarten teacher	<1	31–40	3–6	21–30
9	48	Nurse	1–4	31–40+	3–6	21–30

10	55	Kindergarten teacher	>30	>40	3–5	21–30
11	45	Kindergarten teacher	10–19	31–40	3–6	21–30

Of the reported health conditions or diseases that may affect the airways, throat burn or reflux was the most common condition among the participants, this being reported by five of the participants. Other health conditions that also occurred in the group was long-term sinusitis or rhinitis, allergy that affects the airways and asthma. Two of the participants did not suffer from any of the mentioned health conditions. The participants that answered that they suffered from allergies or asthma also used allergy or asthma medication. Two of the participants with reflux used reflux medication. Other medications that were used by some of the participants were thyroxin medicine, migraine medicine, fibromyalgia medicine and antidepressants. Three of the participants used no medication. Three of the participants smoked, one daily and two more seldom. Health conditions and medication used by the participants are presented in table 3 and 4.

Table 3. Health conditions or diseases that may affect the airways in the participants in this study.

Health condition or disease	**N**
Prolonged rhinitis/sinusitis	2
Asthma	1
Allergy that affects the airways	3
Regular heartburn or other reflux symptom	5
None of the mentioned health conditions or diseases	2

Table 4. Medicines used by the participants in this study.

Medicines	N
Asthma medicine	1
Allergy medicine	2
Reflux medicine	2
Thyroxin	1
Migraine medicine	1
Fibromyalgic medicine	1
Antidepressants	1
No medication	3

2.2 Data collection

Acoustic data were obtained using a voice accumulator, Vocal Holter Recorder by PR.O. Voice Srl. (Astolfi et.al., 2017). The Vocal Holter Recorder consists of a contact sensor that is placed around the participant's neck. The accumulator measures and registers acoustic values that provides information about the vocal folds and the voice without recording the speech itself. The accumulator is connected to the Vocal Holter Application on a smartphone (Android). The participants wore the voice accumulator during a whole workday. Before the long-term monitoring, a short-term monitoring was performed to obtain a reference condition to compare the data from the long-term monitoring with. In the short-term monitoring, the participant was asked to talk freely about a random topic for 1–5 minutes at a comfortable voice level, and to produce a prolonged /a/ at a comfortable voice level three times. The short-term monitoring was conducted in a quiet room with low background noise and with similar conditions as during the long-term monitoring. The vocal parameters obtained from the data registered by the voice accumulator were fundamental frequency, phonation time, Cepstral Peak Prominence Smoothed, jitter, shimmer and differences in the sound pressure level and the frames duration of pause and voice to which correspond the peak of occurrence.

In addition to this, the participants answered a background questionnaire about general and voice health. In order to further investigate the prevalence of voice symptoms and stress among the participants, the questionnaire forms Screen-11, Rösthandikappindexet (the Voice Handicap Index, VHI) and Uppfattad stress-10 (the Perceived Stress Scale-10, PSS-10) were

used (PSS-10; Cohen, 1988; VHI; Jacobson et al., 1997; Screen-11; Zenger, 2019). The Screen-11 consists of 11 questions about perceived voice symptoms during the last twelve months. In Screen-11, four or more voice symptoms appearing weekly or more often may indicate voice problems. The VHI consists of 30 questions divided into three subscales: physical, psychological and emotional. According to the VHI, scores over 30 points may indicate voice problems. The PSS-10 consists of ten questions about perceived stress during the last month. In PSS-10, score of 14 o more indicates moderate to high stress. The questions of all of these three questionnaire forms are rated on a Likert scale.

An evaluation of the environment and voice ergonomical risk factors at the work places of the participants was conducted using ''Röstergonomisk bedömning av arbetsmiljön: handbok i röstergonomisk utredning'' by Sala et al. (2011). Risk factors investigated included noise levels inside and outside the rooms, air quality, the participants' posture, voice use, stress levels and the usage of aids. The evaluation consisted of observations, a short interview with the participants and measurements of background noise levels, temperature and humidity levels at the day cares. The measurements were conducted once during the day when the rooms were empty. The noise levels were measured with a decibel meter and the temperature and humidity levels were measured with a hygrometer. The range of noise levels was measured both in the middle of the participants' rooms and closer to noisy equipment like ventilation. The reverberation time was subjectively measured by listening for echo in the rooms after clapping. The air quality was investigated through interviews with the participants and subjective observations.

2.3 Statistical analyses

Statistical analyses were performed using SPSS (Statistical Package for the Social Sciences, IBM SPSS Statistics 25, Armonk, NY, USA) for Windows. Descriptive statistics was used to present general background information about the participants. Pearson's correlation analysis was used to check the correlation between the two voice questionnaires Screen-11 and VHI. A paired samples t-test was used to compare changes in the participants' F0 from the short-term monitoring and the long-term monitoring. To find out connections between potential risk factors and voice symptoms, different correlation analysis testing associations between variables were used. Due to the data not being normally distributed, the non-parametric tests

Pearson’s correlation analysis, Fisher’s exact test and Chi square test were used. Furthermore, Mann-Whitney U test were used to check connections between potential risk factors and voice symptoms in additional experimental analysis.

3 Results

The different data collecting methods gave a comprehensive overview of the prevalence of voice problems and voice ergonomic risk factors among the participants in the study. Due to some fallouts in the questionnaires and technical issues with the equipment, the sample size decreased and the results must therefore be interpreted carefully.

3.1 Voice problems

Seven participants reported that they had experienced voice problems during their career. The problems had appeared several times a week for two of the participants. Six participants experienced that their voice problems affect their work, and five had been on sick leave because of their voice problems. The most common voice symptoms reported by the participants was a sore throat and the loss of voice. Three of the participants had visited a doctor or phoniatrician because of their voice problems, and one had been diagnosed with a voice disorder (laryngitis). One of the participants had received voice therapy by a speech pathologist ten times during a few months' time, and one had received voice therapy through a group lecture. Three participants had received some sort of voice ergonomic information, one of them in the form of singing lessons. The prevalence of subjectively experienced voice problems among the participants is presented in table 5.

Table 5. Voice problems and knowledge of ergonomic voice care among the participants in the study (N = 11).

Questions	**N**	**%**
Voice problems during the career	7	64
Several times a week	2	18
Several times a month	1	9
A few times a year	4	36
Voice problems that have affected work	6	55
Have been on sick leave because of voice problems	5	46
<2 times	2	18
>2 times	3	27
Self-diagnosed voice disorder during the career	4	36
Have visited a doctor or phoniatrician	3	27
Have been diagnosed with a voice disorder by a doctor or phoniatrician	1	9
Have received voice therapy	2	18
Have received voice ergonomic information/education	3	27

Regarding the responses in Screen-11, one participant did not answer the Screen-11 questions and was excluded from further analysis. Of the remaining ten participants, four participants had four or more voice symptoms in the Screen-11 occurring weekly or more often. One had three symptoms occurring weekly or more often, and five had two symptoms or less occurring weekly or more often. The mean score in Screen-11 in the sum score variable was 13.5 (SD = 8.48),the total score range: 3–29 p. The results of Screen-11 were normally distributed according to the Shapiro-Wilk test (p = .278) and are presented in table 6.

With respect to VHI, two participants did not answer all of the questions and were therefore excluded. Of the remaining ones, three participants had > 31 points points in the VHI, which

indicates moderate voice problems (Jacobson et.al. 1997). Six participants had < 30 points in VHI, which indicates none or mild voice problems. None of the participants had over 60 points, which would have indicated severe voice problems. The mean score in the VHI was 19.7 (*SD* = 19.09). The highest score was 49 points, and the lowest 1 point. Of the three subscales in the VHI (functional, physical and emotional), the highest mean and median was found in the functional domain (*M* = 7.7, *SD* = 06.54). The results of VHI were not normally distributed according to the Shapiro-Wilk test ($p = .047$), nor were the results of the physical and emotional subscales in VHI (physical domain $p = .038$, emotional domain $p = .032$) due to positively skewed test results. The functional subscale, however, was normally distributed ($p = .275$). The results of the VHI is presented in table 6.

Table 6. The participants' results in the Screen-11 and VHI.

	Mean	**Min**	**Max**	**SD**
Screen-11	13.5	3	29	8.48
VHI	19.7	1	49	19.09
Functional	7.7	0	18	6.54
Physical	7.0	0	18	7.04
Emotional	5.0	0	14	5.77

The participants who scored high in Screen-11 also scored high in VHI. According to Cohen (1988; 1992) there was a strong positive correlation between the total score of Screen-11 and the total score of VHI (Pearson's $r = .884$, $p = .001$).

3.2 Voice use and vocal load

According to the background questionnaire, the participants often used a loud voice in their profession; seven of the participants reported that they used a strong voice during work daily, and four participants used a strong voice during work multiple times a week. Over half of the participants used their voice for several hours during their leisure time. When asked about

habits that may affect the voice, two of the participants answered that they sung in their leisure time, whereas two participants often used a strong voice. One participant reported frequent speech over long time on the phone, and one participant answered that she has all the aforementioned habits. Five of the participants answered that they did none of the listed voice straining habits in the questionnaire. Table 7 presents the participants' voice use and habits.

Table 7. Voice use and habits among the participants in the study.

	N
Use a strong voice at work	
Daily	7
Several times a week	4
Voice use after work	
0–2 hours	5
3–5 hours	5
6–8 hours	1
Singing	2
Speaking often and/or for a long time on the phone	2
Often using a strong voice when speaking	3
All of the above	1

Acoustic data from the monitoring of the participants was missing due to technical issues. Thus, only the mean values from seven of the participants' F0 could be qualitatively analyzed. Since several F0 values was collected from each participant during the day, an average F0 mean value was calculated from each participant in order to compare the mean F0 value from the short-term monitoring with the mean F0 value from the long-term monitoring between the groups.

A statistically significant difference in the participants' F0 mean value was calculated between the short-term monitoring and the long-term monitoring. The mean F0 value was higher during the long-term monitoring than during the short-term monitoring for all of the participants except one, who had a lower F0 value. The mean F0 in the group from the short-term monitoring was 224.6 Hz (*SD* = 31.07). The mean F0 in the group from the long-term monitoring was 268 Hz (*SD* = 46.56). The participants' average F0 values from the short- and long-term monitoring are presented in table 8.

Table 8. The participants' fundamental frequency from the short- and long-term monitoring.

F0	**Mean**	**Median**	**Min**	**Max**	**SD**
Short-term monitoring	224.6	232.4	183.9	263.0	31.1
Long term monitoring	268.0	266.2	196.0	324.8	46.6

The data of the F0 mean from the short-term monitoring was normally distributed (p = .500) as was the data of the mean F0 value of the participants from the long-term monitoring (p = .761). According to Cohen (1988; 1992), there was a strong positive correlation between the F0 mean value of the participants in the short-term monitoring and the long-term monitoring (Pearson's r = .784, p = .037). Using an independent-samples t-test, the results showed that the mean value of the participants' F0 was significantly higher during the long term monitoring compared to the short-term monitoring ($t(6)$ = -3,9, p = .008). Figure 1 present an overview over the participants' individual F0 values from the short- and long-term monitoring.

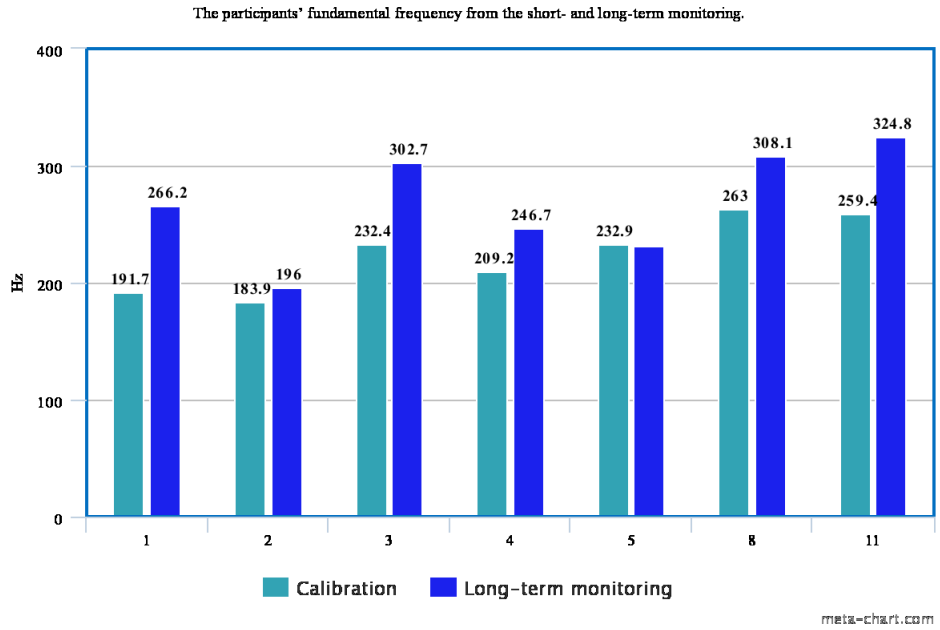

Figure 1. The participants' fundamental frequency from the short- and long-term monitoring.

3.3 Risk factors

Several voice ergonomic risk factors were found in the participants' environments. The risk factors were both individual, like posture and lack of voice rest, and environmental, like high noise levels and poor air quality.

3.3.1. Environment.

In the evaluation of the participants' working environments using ''Röstergonomisk bedömning av arbetsmiljön: handbok i röstergonomisk utredning'' by Sala et.al. (2011), voice ergonomic risk factors were found at all of the day cares. The amount of risk factors found in the participants' environments is presented in table 9.

Table 9. Amount of voice ergonomic risk factors found in the participants' environments (number of total possible risk factors in each field within parentheses).

Risk factor fields / Participant	Noise (4)	Indoor air (5)	Working posture (7)	Working culture (5)	A need to use voice amplifier (1)	Total amount of risk factors per participant (22)
1	2	3	2	2	0	9
2	3	3	3	3	0	12
3	4	3	2	0	0	9
4	3	3	3	2	0	11
5	3	3	3	4	1	14
6	3	4	4	2	0	13
7	3	3	6	3	0	15
8	3	3	3	4	0	13
9	2	4	2	2	0	10
10	3	4	2	2	0	11
11	3	3	2	1	0	9
Total amount of risk factors per field	32	36	32	25	1	126

High levels of background noise were measured at all of the day cares. The noise levels were above recommended levels and not adjustable. The source of the noises was often ventilation and noise from outside of the room (like the corridor or the next room). The noise levels ranged from 33.7 – 38.3 dBA in the middle of the room, 35.7 – 42.8 dBA from the ventilation and 34.6 – 50.7 dBA from noise outside of the room. With the added noise from outside of the room, the sound levels in the middle of the room often rose to 39 – 40 dBA in a couple of the participants' rooms. Six of the participants' rooms had a slight echo in their rooms when clapping. The spaces at the day cares were clean, but the air was often described by the participants as dry and/or drafty. The participants (N = 7) of three different day cares was experiencing that the indoor climate made them drowsy. Due to technical problems, the air humidity at the day cares could not be measured. The temperature was below what is recommended in five of the participants' rooms.

From the observations in the assessment of the participants' working environment, seven of the participants used their voice frequently during work, and four often used a strong voice. None of the participants used aids like voice amplifiers, but one of the participants said that she would like to use one. Some of the participants often worked and talked with a non-ergonomic posture, for example when they were reading story books for the children and had their head turned to the side. All of the participants had the possibility to move around during their work day, and their work tasks enabled them to change positions throughout the day. Their work tasks also often enabled the participants to take a break and stay quiet at times during the day.

3.3.2. Stress.

In the voice ergonomic evaluation, five participants answered that they were stressed at the time of the investigation. According to the answers in the PSS-10 questionnaire about perceived stress during the last month, 8 of the participants' stress levels had been moderate or high. The mean total score in the test was 17.5 points (SD = 6.09). The lowest score was 8 points and the highest 31. The results of the PSS-10 were normally distributed (p = .503). One of the participants also mentioned stress affecting her voice at work in the background questionnaire.

3.4 Connections between voice symptoms and voice ergonomic risk factors

There was a positive correlation according to Cohen (1988; 1992) between both the total scores of Screen-11 and noise levels from ventilation at the day cares (Pearson's r = .646, p = .043) and the total scores of VHI and noise levels from ventilation at the day cares (Pearson's r = .691, p = .039). To further investigate connections between voice symptoms and voice ergonomic risk factors, Chi square test and Fisher's exact test was used. There were no significant results from these analyses, but a high effect size according to Cohen (1988; 1992) was found in the analysis investigating the relationship between two or more voice symptoms occurring weekly or more often and the prevalence of upper respiratory tract infections (Cramer's V = .535, p = .091). A moderate effect size according to Cohen (1988; 1992) was also found in the analysis investigating the relationship between two or more voice symptoms

occurring weekly or more often and the amount of risk factors in the risk field ‘’Indoor air’’ (Cramer’s $V = .356$, $p = .500$).

Additional analyses

Mann-Whitney U tests were employed for examining the relationship between the environmental risk factors and voice problems on a continuous variable. Here, the Screen-11 symptom score (range 0–11 points) served as the dependent variable whereas a given risk factor (categorized into two groups using a median split) served as the independent variable. Although no statistically significant effects of neither risk factor on the symptom score was observed, we found a few considerable effect sizes for some risk factors (see table 12 and 13).

Table 12. The relationship between the participants’ total scores of Screen-11 and VHI and the total amount of voice ergonomic risk factors.

Variable	**N**	***U***	***p***	***r***
Screen-11	10	5.0	.171	.48
VHI	9	2.5	.63	.62

Table 13. The relationship between voice ergonomic risk factors and the total score of VHI for nine of the participants.

Variable	**N**	***U***	***p***	***r***
Upper respiratory tract infections	9	4.5	.262	.39
Working culture	9	2.0	.222	.49
Noise levels at the day cares	9	3.0	.167	.52

Although results from analyses with the F0 values must be carefully interpreted due to the small sample size, there were still some interesting results found that are worth mentioning. According to Cohen (1988; 1992), there were strong negative correlations between

differences in the participants' F0 mean values from the short-term monitoring and the long-term monitoring and Screen-11 results (Pearsons r = - .927, p = .008). There were also differences in the participants' F0 mean values from the short-term monitoring and the long-term monitoring and VHI results (Pearsons r = - .934, p = .006). Differences in the participants' F0 mean values from the short-term monitoring and the long-term monitoring and the total amount of voice ergonomic risk factors (Pearsons r = - .877, p = .010) and in the participants' F0 mean values from the short-term monitoring and the long-term monitoring and the risk field ''Working posture'' (Pearsons r = - .849, p = .016) were also found. In the additional experimental analyses conducted using the Mann-Whitney U test with a given risk factor as the independent variable and F0 mean as the dependent variable, moderate to high effect sizes according to Cohen (1988; 1992) were observed in some of the analyses, although the p-values were statistically non-significant. The results are presented in table 14 and 15 below.

Table 14. The relationship between the mean values of the participants' F0, collected during the long-term monitoring, and two or more voice symptoms in the participants occurring weekly or more often.

N	***U***	***p***	***r***
7	0.0	.133	.76

Table 15. The relationship between the prevalence of voice problems in the participants and the difference in the participants' F0 mean value from the short-term monitoring and the long-term monitoring.

Variable	**N**	***U***	***p***	***r***
Total score of Screen-11	7	0.5	.100	.72
Total score of VHI	7	0.0	.100	.80
Two or more voice symptoms occurring weekly or more often.	7	0.0	.133	.76

4 Discussion

The aim of this thesis was to investigate the prevalence of voice symptoms in day care personnel and detect potential voice ergonomic risk factors. Do the participants in this study have any kind of voice problems? Are they exposed to any risk factors for developing voice problems? What are the biggest risk factors in their environment? How do they use their voices and do they have a high vocal load in their work?

The participants in this study was 10 day care employees and one preschool teacher. Teachers are a known risk group for developing voice disorders, but literature about voice problems in day care personnel and preschool teachers is limited. It can still be concluded from the existing research that day care personnel and preschool teachers are a risk group for developing voice disorders (De Alvear et.al., 2011; Kaļužnaja & Lakiša, 2016; Kankare et.al., 2012; Lyberg-Åhlander, Rydell, Fredlund, Magnusson & Wilén, 2019; Sala et.al., 2001; Tao et.al., 2020). It is therefore important to conduct further research about this group.

4.1 Prevalence of voice problems, background noise, vocal load and spaces

The prevalence of four or more voice symptoms occurring weekly or more often among the participants' of this study was 40%. Three participants' scores in the VHI could be an indication of moderate voice problems (Jacobson et.al. 1997). Considering the small sample of this study, the prevalence of voice problems is prominent. A possible reason for the high prevalence could be that day care personnel who already felt that their voice was affected by the vocal load in their profession was more likely to be interested in participating in this study. Many of the participants reported that they had experienced some sort of voice problems during their career, and it was common that their voice problems affected their work performance or attendance. In the most recent study investigating the prevalence of voice problems in kindergarten teachers in Finland, the prevalence of voice problems in 119 kindergarten teachers was 21%, and as much as 94% of the participants in the study had experienced some kind of voice tiredness (Kankare et.al., 2012). In another earlier study investigating the prevalence of voice problems in 262 day care center teachers in Finland, the prevalence was 37% (Sala et.al., 2001). In a very recent study reporting the prevalence of voice problems in day care personnel in China, 54% of the 211 kindergarten teachers

participating in the study had some kind of voice problems (Tao et.al., 2020). The prevalence of voice problems in the current study should be interpreted carefully due to the small sample size, but the findings comply with the previously reported prevalence of voice problems in day care personnel, further demonstrating that this group is a risk group for developing voice problems.

The biggest risk factors for day care personnel for developing voice problems are high noise levels and high vocal load (Helidoni et.al., 2012; Kaļužnaja & Lakiša, 2016; Lindstrom et.al., 2010; Lindstrom et.al., 2011; Portela et.al., 2013; Remacle et.al., 2014; Sala et.al. 2002; Simões-Zenari et.al., 2012; Södersten et.al., 2002). As the prevalence of voice problems in the study by Kankare, Geneid, Laukkanen and Vilkman (2012) was similar to the prevalence in the current study, so were the noise levels. The background noise levels in the current study were high and not within recommended limits at any of the day cares. The lowest noise level measured was 33.7 dB, and the highest up to 50.7 dB. The recommended upper limit for noise levels at workplaces in the current study was 33 dB (Sala et.al., 2011). The high noise levels were in most cases caused by ventilation or noise from outside of the room. The statistical analysis showed a positive relation between background noise and the prevalence of voice problems in the participants. Although the results of the statistical analysis should be interpreted carefully due to the small sample size, the findings are supported by several previous studies (Jonsdottir et.al., 2015; Kaļužnaja & Lakiša, 2016; Kankare et.al., 2012; Sjödin et.al., 2012; Södersten et.al., 2005; Tao et.al., 2020; Vilkman, 2004). The high noise levels at the day cares were also the biggest risk factors in this current study for the day care personnel.

As high noise levels lead to a higher vocal load, an assumption of the thesis was that high vocal loading was a voice ergonomic risk factor for the day care personnel (Lane & Tranel, 1971). The participants' voice use in the current study was frequent, and they often used a loud voice. Several of the participants further used their voices several hours after work. These reportings suggest that the vocal load was high among the participants. Unfortunately, the acoustic data from the monitoring of the participants was missing due to technical issues, and it was therefore not possible to draw firm conclusions regarding the vocal load in the participants. However, the values of seven participants' fundamental frequency was obtained and could be qualitatively analyzed. These analyses showed that the F0 values was higher in the long-term monitoring than in the short-term monitoring for almost all of the participants. The changes in the participants' F0 values could be a reaction to the high noise levels in their

work environments, causing a higher vocal load (Lane & Tranel, 1971; Lindstrom et.al., 2010; Lindstrom et.al., 2011; Lyberg-Åhlander et.al., 2014; Portela et.al., 2013; Remacle et.al., 2014; Simões-Zenari et.al., 2012; Södersten et.al., 2002; Vilkman, 2004). However, there were some unexpected results found in the statistical analysis where a negative correlation between the F0 values and prevalence of voice symptoms was found, indicating that a higher prevalence of voice problems caused a smaller change in the F0 value. This would suggest that a change in F0 in response to higher vocal load could actually be a sign of a healthy voice behavior (Lyberg-Åhlander et.al., 2014). These results could of course also be explained by the small sample size in the analysis, leading to an uneven division of healthy and unhealthy voices. One participant's F0 values differed from the other values as they were slightly lower during the long-term monitoring compared to the short-term monitoring. This participant worked in a day care with very high noise levels. She had voice problems that occurred weekly and affected her work attendance, and a score on the VHI indicating moderate voice problems.

The acoustic properties of day cares are not very frequently investigated in previous literature. Only in a study by Sala et.al. (2002), the acoustics of 27 day cares in Finland was investigated. According to this study, only 12 of the rooms in the study had poor acoustics, indicating that the acoustics at day cares might not be that big of a problem. Poor acoustics like high reverberation time and low room support can have a negative effect on the voice however, as it can raise the noise levels even further and fail to support the voice (Astolfi et.al., 2015; Lyberg-Åhlander et.al., 2014; Lyberg-Åhlander et.al., 2011; Mealings et.al., 2014; Pelegrin-Garcia et.al., 2010; Rantala & Sala, 2015; Sjödin et.al., 2014). The day cares in the current study were very different in size and had therefore also different acoustic properties. Some of the day cares had smaller rooms with and a low roof, which caused a lower reverberation time and room support. The advantage of these day cares was that they were able to divide the groups into smaller spaces and rooms, which decreased the activity noise levels. The day cares with bigger spaces often had a higher reverberation time and higher noise levels. The day cares where the acoustics were poor posed another risk factor for the vocal health of day care personnel. One of the day cares was open planned with big spaces and a high roof. The reverberation time and noise levels were high at this day care, and the participants mentioned in conversations aside from the formal interviews that their vocal health was affected negatively by this. They experienced difficulties in being heard and

felt that their voices often failed to meet the vocal demands at work.

4.2 Environmental and individual voice ergonomic risk factors

Voice ergonomic risk factors were found in all of the participants' work environments. The average amount of risk factors in the day cares was 11.5 (*SD* = 2.12). In the current study, most risk factors were found in the risk field ''Indoor air''. The most common complaints about the indoor air climate at the day cares were that it felt dry, stuffy or drafty. Seven of the participants felt that the indoor air made them drowsy. According to Vilkman (2004), employees in the teaching profession such as day care personnel are exposed to different environmental voice ergonomic risk factors, of which poor indoor air climate is a prominent risk factor in the environment of day cares (Ferng & Lee, 2002; Kaļužnaja & Lakiša, 2016; Ruotsalainen et.al., 1993; St-Jean et.al., 2012; Tao et.al., 2020). Poor indoor air climate is most commonly caused by unclean surroundings, insufficient ventilation or too small spaces which affect the air quality and humidity (Rantala & Sala, 2015; Ruotsalainen et.al., 1993; St-Jean et.al., 2012). The rooms in the current study had a working ventilation and the spaces were clean, but the groups were often big, with many children in the same room which may increase e.g. the levels of carbon oxide, worsening the air quality. The temperature in some of the day cares was below recommendations and might be related to the drafty feeling some of the participants experienced.

There was a moderate effect size between the prevalence of voice ergonomic risk factors and voice problems found in the current study, indicating that the environment had an effect on the vocal health of the participants. According to previous literature, the prevalence of voice ergonomic risk factors causes a higher vocal load. The results of the current study also showed that an increasing amount of voice ergonomic risk factors caused a smaller change in the participants' F0 value. As mentioned previously, a static F0 value in response to a high vocal load could also be a sign of an unhealthy vocal behavior, further implying that the prevalence of voice ergonomic risk factors does indeed have a negative effect on the vocal health. There was also a moderate effect size between the occurrence of voice symptoms and the environmental risk field ''Indoor air'' in the current study, indicating that there was a connection between indoor air climate and the prevalence of voice problems. Poor indoor air climate has previously been reported to cause changes in the voice and affect the vocal health

negatively (Geneid et.al., 2009; Rantala et.al., 2012; Rantala & Sala, 2015; Verdolini, Titze & Fennell, 1994).

In the current study, nine of the participants suffered from some kind of upper respiratory tract infection or condition that may affect the voice, of which the most common condition was heartburn. Eight of the participants used some kind of medication. Studies have shown that the prevalence of upper respiratory infections is a risk factor for developing voice problems (Charn & Mok, 2012; Devadas et.al., 2017; Lee et.al., 2010; Munier et.al., 2020; Simberg et.al., 2009). In the current study, moderate effect sizes were found between the prevalence of voice symptoms and the prevalence of upper respiratory tract infections. These results are in line with previous studies stating that upper respiratory tract infections are a risk factor for the vocal health in teachers and day care personnel (Munier et.al., 2020).

Stress affected several of the participants in the current study. Eight of the participants had been highly or moderately stressed during the last month, and five were stressed at the time of the investigation. The average total score in the PSS-10 for the group was 17.5 points (*SD* = 6.09). One of the participants reported in the background questionnaire that stress affected her voice. Stress is reported in previous studies to be a voice ergonomic risk factor, although the literature about the impact of stress in day care personnel is limited. However, a negative impact of stress on the voice was not detected in the current study as there were no connections found between stress and voice problems in the statistical analysis. An explanation for this might again be the small sample size, but it is also probable that stress is not the most prominent voice ergonomic risk factor. Since there is a lack of research about the effect of stress in day care personnel, assumptions about how stress affects, or does not affect, the voice in day care personnel cannot be made.

In this study, the impact of several other possible voice ergonomic risk factors was investigated but turned out not to have a considerable impact in this study or it was not possible or beneficial to check for relationships. These potential risk factors were size of the groups of children, age of the children and gender (Durup et.al., 2015; Kaļužnaja & Lakiša, 2016; Portela et.al., 2013; Russell, Oates & Greenwood, 1998; Sjödin et.al., 2012; Smith et.al., 1998; Södersten et.al., 2002; Vilkman, 2004). The age range of the children varied within the groups and was therefore not possible to use in the analysis. There were no connections found in the analysis including the size of the groups. Since all participants in this study were women, a gender comparison was not possible.

4.3 Preventive voice care in the teaching profession.

Several of the participants in the current study reported that they would be interested in learning about preventive voice care. Only three participants had previously received some sort of voice training. The knowledge about preventive voice care is often limited among day care personnel and teachers. In a study by Tao, Lee, Hu and Liu (2020), 91.5% of the 414 kindergarten and elementary school teachers participating in the study had never received any kind of voice training. In a study by Munier and Kinsella (2007), 93% of the 304 teachers participating in the study had never received any kind of voice education. A study by Kankare, Geneid, Laukkanen and Vilkman (2012) reported slightly better results, as 62% of the preschool teachers reported that they had received some kind of voice training. Improper use of the voice is a risk factor for developing voice problems as well as other factors like unergonomic posture and lack of voice rest may affect the voice negatively (Arboleda & Frederick, 2008; Hammarberg, Södersten & Lindestad, 2007; Tao et.al., 2020).

Preventive voice care consisting of ergonomic voice use, the use of aids like voice amplifiers and the optimization of the environment for the voice is essential in order to sustain a healthy voice, especially during conditions with high vocal load (Vilkman, 2004). In a study by Sjödin, Kjellberg, Knutsson, Landström and Lindberg (2014), preventive measures like noise isolation, smaller groups, voice education and the use of recovery rooms for voice rest had a positive effect on the voice health of the preschool teachers. Karjalainen, Sahlén, Falck, Brännström and Lyberg-Åhlander (2020) found that teachers who had received voice ergonomic education improved their ability at evaluating their voices and well-being. They also had a lower prevalence of burn-out symptoms. The use of voice amplifiers has proven to be beneficial for teachers as it resulted in a significant decrease in the F0 and SPL values (Sapienza, Crandell & Curtis, 1999; Jonsdottir, 2003). In a study by Jonsdottir (2003) the use of a voice amplifier also reduced the prevalence of voice symptoms in the five teachers participating in the study. In order to improve the indoor air quality, it would be important to have a working mechanical ventilation as it improves the air quality (St-Jean et.al., 2012). Since the vocal load in day care employees is high and they are a risk group for developing voice problems, preventive measures and education in preventive voice care would be important for this group.

4.4 Limitations of the study

There were several limitations of this study which affected the results. One limitation was technical issues that arose during the investigation. Technical problems with the voice accumulator Vocal Holter Recorder, which was the main data collecting method for this study, resulted in data completely missing from the analysis, decreasing the amount of the acoustic data obtained. During the investigation, there were also different instructions given as to how to use the Vocal Holter Recorder, which resulted in a non-consistency throughout the measurements. Due to technical problems with the hygrometer, the humidity at the day cares could not be measured either.

Another limitation of the study was the small sample. It was decided to include only a few participants in the study in order to conduct a qualitative and narrow evaluation of each participants' situation, but this quickly becomes a limitation when data is missing due to technical issues, as mentioned, or mistakes or misunderstandings. generalization of the results of a small sample are also not possible, and the results should always be interpreted carefully.

Improvements could also have been made to the background questionnaire, as some of the questions were misinterpreted or misunderstood.

4.5 Conclusions and future research

The aim of this thesis was to investigate the prevalence of voice problems in day care personnel and detect potential risk factors that may be the cause to eventual voice symptoms. The findings of this study support previous literature, stating that day care personnel are a risk group for developing voice problems. The vocal load in this profession is high due to high noise levels, and day care personnel are exposed to several individual and environmental voice ergonomic risk factors. Furthermore, there is a lack of knowledge about preventive voice care in this profession. In the current study, the prevalence of voice problems was 40%. There where environmental risk factors in all of the day cares, the biggest risk factor being high background noise levels. Although a large part of the acoustic data obtained with the Vocal Holter recorder was missing due to technical issues, the F0 values of seven of the participants was obtained. The analysis of the data showed a change in the F0 value from the

short-term monitoring to the long-term monitoring in all of the seven participants. An interesting find was the changes in the participants' F0 in response to high vocal load, indicating that a fluctuant F0 could be a sign of a healthy voice behavior. Although the results of the statistical analysis must be carefully interpreted due to the small sample size, a few connections and relevant effect sizes that are in line with previous literature could be observed. The most important finding was a positive correlation and a moderate effect size between the prevalence of voice problems and noise levels at the day cares. Preventive measures and education in preventive voice care would be important for day care personnel, as it would decrease the vocal load and the risk of developing voice problems.

Since the research about this group is limited, further research is recommended in order to achieve a more comprehensive understanding of especially the voice ergonomic risk factors in day care personnel. A larger sample size would be beneficial in order to be able to generalize the results. Since day care personnel clearly is a risk group for developing voice problems, it would be important to conduct further research on this subject in order to lessen the prevalence of voice problems and risk factors in this group.

Swedish summary/Svensk sammanfattning

Röstsymptom, röstanvändning och röstergonomiska riskfaktorer hos dagvårdspersonal.

Introduktion

Dagvårdspersonal och förskolelärare är utsatta för flera olika röstergonomiska riskfaktorer i sitt yrke (Södersten m.fl., 2002). Bullernivåerna är ofta för höga och röstbelastningen är stor för dagvårdspersonal (Durup m.fl., 2015; Lyberg-Åhlander m.fl., 2011; Portela m.fl., 2013; Rantala m.fl., 2015; Södersten m.fl., 2002). Utöver detta är dagvårdspersonal utsatt för flera röstergonomiska riskfaktorer i arbetsmiljön (Vilkman, 2004). Dagvårdspersonal skulle dra

nytta av att lära sig om röstergonomi, men kunskapen kring ämnet är ofta begränsad i denna grupp (Munier & Kinsella, 2007; Tao m.fl., 2020).

Förekomsten av röstproblem hos 119 finska barnträdgårdslärare i en studie av Kankare, Geneid, Laukkanen och Vilkman (2012) var 21%. Hela 94% av deltagarna hade upplevt någon form av rösttrötthet. I en studie av Sala, Laine, Simberg, Pentti och Suonpää (2001) var prevalensen för röstproblem hos 262 finska barnträdgårdslärare 37%. En av de största röstergonomiska riskfaktorerna för dagvårdspersonal är de höga ljudnivåerna på daghemmen, som kan uppgå till så mycket som 70–80 dB (Grebennikov, 2006; Jonsdottir m.fl., 2015; Kaļužnaja & Lakiša, 2016; Lindstrom m.fl., 2011; Sala m.fl., 2002; Simões-Zenari m.fl., 2012; Sjödin m.fl., 2012; Södersten m.fl., 2002; Vilkman, 2004). Barnens unga ålder samt olika aktiviteter som fri lek bidrar till de höga ljudnivåerna, men bakgrundsbuller från till exempel ventilation bidrar till en stor del av bullret (Durup m.fl., 2015; Kaļužnaja & Lakiša, 2016; Lyberg-Åhlander m.fl., 2011; Portela m.fl., 2013; Rantala m.fl., 2015; Sjödin m.fl., 2012; Södersten m.fl., 2002; Vilkman, 2004). I en studie av Sala m.fl. (2002) var bullernivåerna på de finska daghemmen i höga, med en medelnivå på 67 dB. Eftersom man ofta automatiskt höjer röststyrkan vid höga ljudnivåer (Lane & Tranel, 1971), ledde detta till i en ökad röstbelastning hos deltagarna i studien. Barnträdgårdslärarna använde en röststyrka på 78 dB i medeltal, och fonationstiden var 40%. Både röststyrkan och fonationstiden var mer hos barnträdgårdslärarna än hos deras kontrollgrupp av sjuksköterskor. Liknande resultat rapporterades från daghem i Sverige, där höga bullernivåer ledde till en ökning i deltagarnas röststyrka och F0 värden (Södersten m.fl., 2002).

Personer i läraryrken är även utsatta för andra både individuella och i arbetsmiljön röstergonomiska riskfaktorer, som dålig akustik i rummen, dålig inomhusluft, stress och luftvägssjukdomar eller andra tillstånd som påverkar rösten negativt. Det finns dock inte många studier kring hur dessa riskfaktorer påverkar dagvårdspersonal. Ruotsalainen, Jaakkola och Jaakkola (1993) undersökte inomhusluftens kvalitet på 30 daghem i Finland och rapporterade att inomhusluften på de flesta daghemmen i studien var dålig på grund av bland annat ineffektiv ventilation och luftutbyte. Stress och luftvägssjukdomar har även rapporterats ha en negativ påverkan på rösten hos dagvårdspersonal (Jonsdottir m.fl., 2015; Munier m.fl., 2020). Det skulle dock behövas mer forskning kring ämnet för att kunna noggrannare kartlägga röstergonomiska riskfaktorers påverkan på dagvårdspersonals rösthälsa.

Syfte

Syftet med avhandlingen var att undersöka förekomsten av röstsymptom hos dagvårdspersonal samt att undersöka förekomsten av röstergonomiska riskfaktorer. Eftersom litteraturen kring ämnet är begränsad och det finns ett behov av att utöka forskningen kring ämnet, är denna avhandling relevant.

Metod

I studien deltog en förskolelärare och tio dagvårdare från fyra svenskspråkiga daghem och en förskola i Åbo. Data kring deltagarnas röstanvändning samlades in med hjälp av en röstackumulator, Vocal Holter Recorder, som registrerade akustiskt data från stämbandens vibrationer. Utöver detta fick deltagarna även fylla i ett bakgrundsformulär om allmän hälsa och rösthälsa, röstformulären Screen-11 och Rösthandikappindexet samt ett formulär om upplevd stress, Upplevd Stress Skala-10. En utvärdering av deltagarnas arbetsmiljö och röstergonomiska riskfaktorer utfördes även. Utvärderingen inkluderade instrumentella mätningar av bland annat bullernivåer på deltagarnas arbetsplatser, intervjuer och observationer.

Resultat och slutsatser

Förekomsten av röstsymptom hos deltagarna i avhandlingen var 40%. Tre av deltagarna hade ett resultat i Rösthandikappindexet som skulle kunna indikera på en måttlig röststörning. Höga bullernivåer var den största röstergonomiska riskfaktorn i studien, vilket även rapporterats tidigare (Helidoni m.fl., 2012; Kaļužnaja & Lakiša, 2016; Lindstrom m.fl., 2010; Lindstrom m.fl., 2011; Portela m.fl., 2013; Remacle m.fl., 2014; Sala m.fl., 2002; Simões-Zenari m.fl., 2012; Södersten m.fl., 2002). Bullernivåerna var högre än rekommendationerna på alla daghem i nuvarande studie, och deltagarna ansåg att rösten belastades av detta. På grund av tekniska problem fattades data från de akustiska mätningarna med röstackumulatorn, men sju deltagares F0 värden kunde ändå analyseras. I analysen framkom det att nästan alla deltagares F0 värden höjdes under dagen, vilket kan vara en reaktion på de höga ljudnivåerna och orsaka en stor röstbelastning (Lane & Tranel, 1971; Lindstrom m.fl., 2010; Lindstrom m.fl., 2011; Lyberg-Åhlander m.fl., 2014; Portela m.fl., 2013; Remacle

m.fl., 2014; Simões-Zenari m.fl., 2012; Södersten m.fl., 2002; Vilkman, 2004). Daghemmens utrymmen varierade i storlek och egenskap, men flera daghems utrymmen hade brister i akustiken och i kvaliteten på inomhusluften. På grund av det begränsade samplet kunde samband mellan olika variabler endast tolkas kvalitativt i den statistiska analysen, men några intressanta riktningar som överensstämmer med litteraturen observerades ändå. Det fanns ett starkt samband mellan buller och förekomsten av röstproblem, vilket har observerats i flera studier tidigare (Jonsdottir m.fl., 2015; Kaļužnaja & Lakiša, 2016; Kankare m.fl., 2012; Sjödin m.fl., 2012; Södersten m.fl., 2005; Tao m.fl., 2020; Vilkman, 2004). Det fanns även ett negativt samband mellan deltagarnas F0 värden och röstproblem, vilket är ett intressant fynd eftersom det skulle indikera att ett fluktuerande F0 värde är ett tecken på ett friskt röstbeteende (Lyberg-Åhlander m.fl., 2014). Det fanns ett samband mellan förekomsten av röstergonomiska riskfaktorer och röstsymptom, vilket tyder på att arbetsmiljön har en påverkan på rösthälsan (Ferng & Lee, 2002; Kaļužnaja & Lakiša, 2016; Ruotsalainen m.fl., 1993; St-Jean m.fl., 2012; Tao m.fl., 2020). Detta syntes även i analyser med F0 värden och förekomsten av röstergonomiska riskfaktorer. Vidare fanns det ett samband mellan luftvägssjukdomar och förekomsten av röstproblem (Munier m.fl., 2020).

Resultaten i nuvarande studie visar att dagvårdspersonal är en riskgrupp för att utveckla röstproblem, även om resultaten bör tolkas kritiskt på grund av det begränsade samplet. Dagvårdspersonal har en stor röstbelastning på grund av höga ljudnivåer i sitt yrke, vilket kan leda till röstproblem. Dagvårdspersonal är dessutom även utsatt för andra röstergonomiska riskfaktorer i arbetsmiljön. Det finns ett behov att utöka forskningen kring ämnet, eftersom litteraturen gällande röstproblem hos dagvårdspersonal är begränsad. Därför behövs det vidare forskning för att kunna minska förekomsten av röstproblem och röstergonomiska riskfaktorer i denna yrkesgrupp.

References

Arboleda, B. M. W., & Frederick, A. L. (2008). Considerations for maintenance of postural alignment for voice production. *Journal of Voice*, *22*(1), 90–99.

Astolfi, A., Carullo, A., Corbellini, S., Spadola, M., Accornero, A., Puglisi, G. E., ... & Marcuzzo, G. (2017). Long-term voice monitoring with smartphone applications and contact microphone. *The Journal of the Acoustical Society of America*, *141*(5), 3541–3541.

Astolfi, A., Puglisi, G. E., Cutiva, L. C., Pavese, L., Carullo, A., & Burdorf, A. (2015). Associations between objectively-measured acoustic parameters and occupational voice use among primary school teachers. *Energy Procedia*, *78*, 3422–3427.

Behlau, M., Zambon, F., Guerrieri, A. C., & Roy, N. (2012). Epidemiology of voice disorders in teachers and nonteachers in Brazil: prevalence and adverse effects. *Journal of voice*, *26*(5), 665–e9.

Charn, T. C., & Mok, P. K. H. (2012). Voice problems amongst primary school teachers in Singapore. *Journal of Voice*, *26*(4), e141–e147.

Cohen, J. (1988). Statistical power analysis for the behavioral sciences (2nd ed.). Hillsdale, NJ: Erlbaum.

Cohen, J. (1992). A power primer. *Psychological bulletin*, *112*(1), 155.

Cohen, S. (1988). Perceived stress in a probability sample of the United States.

De Alvear, R. M. B., Barón, F. J., & Martínez-Arquero, A. G. (2011). School teachers' vocal use, risk factors, and voice disorder prevalence: guidelines to detect teachers with current voice problems. *Folia phoniatrica et logopaedica*, *63*(4), 209–215.

Devadas, U., Bellur, R., & Maruthy, S. (2017). Prevalence and risk factors of voice problems among primary school teachers in India. *Journal of voice*, *31*(1), 117–e1.

Durup, N., Shield, B., Dance, S., Sullivan, R., & Gomez-Agustina, L. (2015). How classroom acoustics affect the vocal load of teachers. *Energy Procedia*, *78*, 3084–3089.

Ferng, S. F., & Lee, L. W. (2002). Indoor air quality assessment of daycare facilities with carbon dioxide, temperature, and humidity as indicators. *Journal of Environmental Health*, *65*(4).

Gassull, C., Casanova, C., Botey, Q., & Amador, M. (2010). The impact of the reactivity to stress in teachers with voice problems. *Folia Phoniatrica et Logopaedica*, *62*(1–2), 35–39.

Geneid, A., Rönkkö, M., Airaksinen, L., Voutilainen, R., Toskala, E., Alku, P., & Vilkman, E. (2009). Pilot study on acute voice and throat symptoms related to exposure to organic dust: preliminary findings from a provocation test. *Logopedics Phoniatrics Vocology*, *34*(2), 67–72.

Grebennikov, L. (2006). Preschool teachers' exposure to classroom noise. *International Journal of Early Years Education*, *14*(1), 35–44.

Hammarberg, B., Södersten, M., & Lindestad, P. Å. (2008). Röststörningar-allmän del. I L. *Hartelius, U. Nettelbladt & B. Hammarberg (Red.), Logopedi*, 245–263.

Helidoni, M., Murry, T., Chlouverakis, G., Okalidou, A., & Velegrakis, G. (2012). Voice risk factors in kindergarten teachers in Greece. *Folia Phoniatrica et Logopaedica*, *64*(5), 211–216.

Holmqvist-Jämsén, S., Johansson, A., Santtila, P., Westberg, L., von der Pahlen, B., & Simberg, S. (2017). Investigating the role of salivary cortisol on vocal symptoms. *Journal of Speech, Language, and Hearing Research*, *60*(10), 2781–2791.

Holmqvist-Jämsén, S., Santtila, P., Lindström, E., Sala, E., & Simberg, S. (2013). The association between possible stress markers and vocal symptoms. *Journal of Voice*, *27*(6), 787–e1.

Jacobson, B. H., Johnson, A., Grywalski, C., Silbergleit, A., Jacobson, G., Benninger, M. S., & Newman, C. W. (1997). The voice handicap index (VHI) development and validation. *American Journal of Speech-Language Pathology*, *6*(3), 66–70.

Jónsdóttir, V., Laukkanen, A. M., & Siikki, I. (2003). Changes in teachers' voice quality during a working day with and without electric sound amplification. *Folia phoniatrica et logopaedica*, *55*(5), 267–280.

Jonsdottir, V., Rantala, L. M., Oskarsson, G. K., & Sala, E. (2015). Effects of pedagogical ideology on the perceived loudness and noise levels in preschools. *Noise & health*, *17*(78), 282.

Kaļužnaja, D., & Lakiša, S. (2016). Preschool personnel exposure to occupational noise. In *Proceedings of the Latvian Academy of Sciences. Section B. Natural, Exact, and Applied Sciences.* (Vol. 70, No. 5, pp. 300–307). Sciendo.

Kankare, E., Geneid, A., Laukkanen, A. M., & Vilkman, E. (2012). Subjective evaluation of voice and working conditions and phoniatric examination in kindergarten teachers. *Folia Phoniatrica et Logopaedica*, *64*(1), 12–19.

Karjalainen, S., Brännström, J. K., Christensson, J., Sahlén, B., & Lyberg-Åhlander, V. (2020). A Pilot Study on the Relationship between Primary-School Teachers' Well-Being and the Acoustics of their Classrooms. *International Journal of Environmental Research and Public Health*, *17*(6), 2083.

Karjalainen, S., Sahlén, B., Falck, A., Brännström, J., & Lyberg-Åhlander, V. (2020). Implementation and evaluation of a teacher intervention program on classroom communication. *Logopedics Phoniatrics Vocology*, *45*(3), 110–122.

Kooijman, P. G. C., De Jong, F. I. C. R. S., Thomas, G., Huinck, W., Donders, R., Graamans, K., & Schutte, H. K. (2006). Risk factors for voice problems in teachers. *Folia Phoniatrica et Logopaedica*, *58*(3), 159–174.

Lane, H., & Tranel, B. (1971). The Lombard sign and the role of hearing in speech. *Journal of Speech and Hearing Research*, *14*(4), 677–709.

Lee, S. Y., Lao, X. Q. & Yu, I. T. (2010). A Cross-sectional Survey of Voice Disorders among Primary School Teachers in Hong Kong. *Journal of occupational health, 52*(6), pp. 344–352. doi:10.1539/joh.L10015

Limoeiro, F. M. H., Ferreira, A. E. M., Zambon, F., & Behlau, M. (2019). Comparison of the occurrence of signs and symptoms of vocal and change discomfort in the vocal tract in teachers from different levels of education. In *CoDAS* (Vol. 31, No. 2, pp. 0–0). Sociedade Brasileira de Fonoaudiologia.

Lindstrom, F., Ohlsson, A. C., Sjöholm, J., & Waye, K. P. (2010). Mean F0 values obtained through standard phrase pronunciation compared with values obtained from the normal work environment: a study on teacher and child voices performed in a preschool environment. *Journal of Voice*, *24*(3), 319–323.

Lindstrom, F., Waye, K. P., Södersten, M., McAllister, A., & Ternström, S. (2011). Observations of the relationship between noise exposure and preschool teacher voice usage in day-care center environments. *Journal of Voice*, *25*(2), 166–172.

Lyberg-Åhlander, V. L., García, D. P., Whitling, S., Rydell, R., & Löfqvist, A. (2014). Teachers' voice use in teaching environments: a field study using ambulatory phonation monitor. *Journal of Voice*, *28*(6), 841–e5.

Lyberg-Åhlander, V., Rydell, R., Fredlund, P., Magnusson, C., & Wilén, S. (2019). Prevalence of voice disorders in the general population, based on the Stockholm Public Health Cohort. *Journal of Voice*, *33*(6), 900–905.

Lyberg-Åhlander, V. L., Rydell, R., & Löfqvist, A. (2011). Speaker's comfort in teaching environments: voice problems in Swedish teaching staff. *Journal of Voice*, *25*(4), 430–440.

Lyberg-Åhlander, V., Rydell, R., Löfqvist, A., Pelegrin-García, D., & Brunskog, J. (2015). Teachers' voice use in teaching environment. Aspects on speakers' comfort. *Energy Procedia*, *78*, 3090–3095.

McAllister, A. M., Rantala, L., & Johnsdottir, V. I. (2019). The others are too loud! Children's experiences and thoughts related to voice, noise and communication in Nordic preschools. *Frontiers in psychology*, *10*, 1954.

Mealings, K. T., Buchholz, J. M., Demuth, K., & Dillon, H. (2014). An investigation inot the acoustics of an open plan compared to enclosed kindergarten classroom. In *INTER-NOISE and NOISE-CON Congress and Conference Proceedings* (Vol. 249, No. 2, pp. 5348–5357). Institute of Noise Control Engineering.

Mendoza, E., & Carballo, G. (1998). Acoustic analysis of induced vocal stressby means of cognitive workload tasks. *Journal of Voice*, *12*(3), 263–273.

Munier, C., Brockmann-Bauser, M., Laukkanen, A. M., Ilomäki, I., Kankare, E., & Geneid, A. (2020). Relationship between laryngeal signs and symptoms, acoustic measures, and quality of life in Finnish primary and kindergarten school teachers. *Journal of Voice*, *34*(2), 259–271.

Munier, C., & Kinsella, R. (2007). The prevalence and impact of voice problems in primary school teachers. *Occupational Medicine*, *58*(1), 74–76.

Pelegrin-Garcia, D., Lyberg-Åhlander, V., Rydell, R., Brunskog, J., & Lofqvist, A. (2010). Influence of classroom acoustics on the voice levels of teachers with and without voice problems: A field study. In *Proceedings of Meetings on Acoustics 160ASA* (Vol. 11, No. 1, p. 060001). Acoustical Society of America.

Portela, A. S., Hammarberg, B., & Södersten, M. (2013). Speaking fundamental frequency and phonation time during work and leisure time in vocally healthy preschool teachers measured with a voice accumulator. *Folia Phoniatrica et Logopaedica*, *65*(2), 84–90.

Rantala, L. M., Hakala, S. J., Holmqvist, S., & Sala, E. (2012). Connections between voice ergonomic risk factors and voice symptoms, voice handicap, and respiratory tract diseases. *Journal of Voice*, *26*(6), 819–e13.

Rantala, L. M., Hakala, S., Holmqvist, S., & Sala, E. (2015). Classroom noise and teachers' voice production. *Journal of Speech, Language, and Hearing Research*, *58*(5), 1397–1406.

Rantala, L., & Sala, E. (2015). Associations between Classroom Conditions and Teacher's Voice Production. *Energy Procedia*, *78*, 3120–3125.

Remacle, A., Morsomme, D., & Finck, C. (2014). Comparison of vocal loading parameters in kindergarten and elementary school teachers. *Journal of Speech, Language, and Hearing Research*, *57*(2), 406–415.

Roy, N., Merrill, R. M., Thibeault, S., Gray, S. D., & Smith, E. M. (2004). Voice disorders in teachers and the general population: effects on work performance, attendance, and future career choices. *Journal of Speech, Language, and Hearing Research*, *47*(3), 542–551.

Ruotsalainen, R., Jaakkola, N., & Jaakkola, J. J. K. (1993). Ventilation and indoor air quality in Finnish daycare centers. *Environment International*, *19*(2), 109–119.

Russell, A., Oates, J., & Greenwood, K. M. (1998). Prevalence of voice problems in teachers. *Journal of voice*, *12*(4), 467–479.

Sala, E., Airo, E., Olkinuora, P., Simberg, S., Ström, U., Laine, A., ... & Suonpää, J. (2002). Vocal loading among day care center teachers. *Logopedics Phoniatrics Vocology*, *27*(1), 21–28.

Sala, E., Hellgren, U., Ketola, R., Laine, A., Olkinuora, P., Rantala, L., . . . Arbetshälsoinstitutet. (2011). *Röstergonomisk bedömning av arbetsmiljön: Handbok i röstergonomisk utredning*. Helsingfors: Arbetshälsoinstitutet.

Sala, E., Laine, A., Simberg, S., Pentti, J., & Suonpää, J. (2001). The prevalence of voice disorders among day care center teachers compared with nurses: a questionnaire and clinical study. *Journal of Voice*, *15*(3), 413–423.

Sala, E., & Rantala, L. (2016). Acoustics and activity noise in school classrooms in Finland. *Applied acoustics*, *114*, 252–259.

Sapienza, C. M., Crandell, C. C., & Curtis, B. (1999). Effects of sound–field frequency modulation amplification on reducing teachers' sound pressure level in the classroom. *Journal of Voice*, *13*(3), 375–381.

Simberg, S., Sala, E., Tuomainen, J., & Rönnemaa, A. M. (2009). Vocal symptoms and allergy–a pilot study. *Journal of Voice*, *23*(1), 136-139.

Simões-Zenari, M., Bitar, M. L., & Nemr, N. K. (2012). The effect of noise on the voice of preschool institution educators. *Revista de saude publica*, *46*, 657–664.

Sjödin, F., Kjellberg, A., Knutsson, A., Landström, U., & Lindberg, L. (2012). Noise exposure and auditory effects on preschool personnel. *Noise & health*, *14*(57), 72–82.

Sjödin, F., Kjellberg, A., Knutsson, A., Landström, U., & Lindberg, L. (2014). Measures against preschool noise and its adverse effects on the personnel: an intervention study. *International archives of occupational and environmental health*, *87*(1), 95–110.

Smith, E., Gray, S. D., Dove, H., Kirchner, L., & Heras, H. (1997). Frequency and effects of teachers' voice problems. *Journal of voice*, *11*(1), 81–87.

Smith, E., Kirchner, H. L., Taylor, M., Hoffman, H., & Lemke, J. H. (1998). Voice problems among teachers: differences by gender and teaching characteristics. *Journal of Voice*, *12*(3), 328–334.

St-Jean, M., St-Amand, A., Gilbert, N. L., Soto, J. C., Guay, M., Davis, K., & Gyorkos, T. W. (2012). Indoor air quality in Montréal area day-care centres, Canada. *Environmental Research*, *118*, 1–7.

Södersten, M., Granqvist, S., Hammarberg, B., & Szabo, A. (2002). Vocal behavior and vocal loading factors for preschool teachers at work studied with binaural DAT recordings. *Journal of Voice*, *16*(3), 356–371.

Södersten, M., & Lindhe, C. (2007). Voice ergonomics-an overview of recent research. In *39th Nordic Ergonomics Society Conference*. Lysekil.

Södersten, M., Ternström, S., & Bohman, M. (2005). Loud speech in realistic environmental noise: phonetogram data, perceptual voice quality, subjective ratings, and gender differences in healthy speakers. *Journal of Voice*, *19*(1), 29–46.

Tao, Y., Lee, C. T. C., Hu, Y. J., & Liu, Q. (2020). Relevant Work Factors Associated with Voice Disorders in Early Childhood Teachers: A Comparison between Kindergarten and Elementary School Teachers in Yancheng, China. *International Journal of Environmental Research and Public Health*, *17*(9), 3081.

Verdolini, K., Titze, I. R., & Fennell, A. (1994). Dependence of phonatory effort on hydration level. *Journal of Speech, Language, and Hearing Research*, *37*(5), 1001–1007.

Vilkman, E. (2004). Occupational safety and health aspects of voice and speech professions. *Folia Phoniatrica et Logopaedica*, *56*(4), 220–253.

Waye, K. P., van Kamp, I., & Dellve, L. (2013). Validation of a questionnaire measuring preschool children's reactions to and coping with noise in a repeated measurement design. *BMJ open*, *3*(5).

Williams, N. R. (2003). Occupational groups at risk of voice disorders: a review of the literature. *Occupational medicine*, *53*(7), 456–460.

Zenger, A. (2019). Validation of a fast and easy screening method for voice disorders.

Appendix A

Voice symptoms, voice use and voice risk factors in day care personnel
Pro Gradu avhandling

Bakgrundsblankett

Kod: _____

Personuppgifter

1. Ålder: _____

2. Kön:
   - ☐ Kvinna
   - ☐ Man
   - ☐ Annat

3. Utbildning:
   - ☐ Närvårdare
   - ☐ Barnträdgårdslärare
   - ☐ Annan,
     vad?_____
     ___

Arbete

4. Jag arbetar:
   - ☐ Heltid
   - ☐ Deltid

5. Hur många timmar i veckan arbetar du i genomsnitt?
   - ☐ <5 h
   - □ 5–10 h

☐ 11–20 h
☐ 21–30 h
☐ 31–40 h
☐ >40 h

6. Hur många år har du arbetat inom dagvården?
   ☐ <1 år
   ☐ 1–4 år
   ☐ 5–9 år
   ☐ 10–19 år
   ☐ 20–29 år
   ☐ >30 år

7. Vilken/vilka åldersgrupper arbetar du med?
   ☐ 1–2 år
   ☐ 3–4 år
   ☐ 5–6 år
   ☐ Andra:
   _____

8. Antal barn i din undervisningsgrupp:
   ☐ 1–5 st
   ☐ 6–10 st
   ☐ 11–20 st
   ☐ 21–30 st
   ☐ Annat:
   _____

9. Tycker du att du använder en stark röst på arbetet?
   ☐ Ja, dagligen
   ☐ Ja, flera gånger i veckan
   ☐ Mer sällan
   ☐ Nej, aldrig

Hälsa och allmäntillstånd

10. Lider du av något av följande tillstånd:
    ☐ Långvarig snuva/bihåleinflammation
    ☐ Astma
    ☐ Allergi som påverkar luftvägarna (t.ex. pollenallergi)

☐ Regelbunden halsbränna eller andra refluxsymtom

☐ Annat tillstånd som du tror kan påverka rösten:

_____

11. Använder du någon slags medicinering regelbundet?

☐ Astmamedicin

☐ Allergimedicin

☐ Annan, vad?

_____

☐ Nej

12. Röker du?

☐ Dagligen

☐ Flera gånger i veckan

☐ Mer sällan

☐ Aldrig

13. Hur många timmar om dagen använder du rösten på fritiden?

☐ 0–2 timmar

☐ 3–5 timmar

☐ 6–10 timmar

☐ 10+ timmar

14. Gör du något av följande:

☐ Sjunger, exempelvis körsång eller karaoke regelbundet

☐ Talar mycket i telefon

☐ Använder ofta en stark röst när jag talar

☐ Annan vana/intresse som jag tror kan påverka rösten, vad?

_____

___

_____

___

☐ Jag har inga röstkrävande intressen/vanor

Rösthälsa

15. Har du haft problem med rösten under arbetslivet? (Om du svarade nej, fortsätt till fråga 24)

☐ Ja

☐ Nej

16. Om du haft problem med rösten under arbetslivet, hur ofta har de uppstått?

☐ Flera gånger i veckan

☐ Flera gånger i månaden

☐ Några gånger per år

☐ Mer sällan

17. Har röstproblemen påverkat ditt arbete?

☐ Ja,
hur?_____

☐ Nej

18. Har du varit sjukskriven från arbetet på grund av problem med rösten?

☐ Ja, flera gånger (> 2 gånger)

☐ Ja, någon enstaka gång (< 2 gånger)

☐ Nej, aldrig

19. Har du eller har du haft en röststörning* under arbetslivet?

☐ Laryngit (stämbandsinflammation)

☐ Stämbandsknutor

☐ Annan röststörning,
vad?_____
_____

☐ Nej, jag har inte haft en röststörning under arbetslivet

(*En röststörning är en nedsatt förmåga att använda rösten som kan ha en anatomisk, funktionell eller neurologisk orsak.)

20. Har du uppsökt en läkare eller foniater på grund av att du haft problem med rösten?

☐ Ja

☐ Nej

21. Har du blivit diagnosticerad med en röststörning av en läkare eller foniater?

☐ Laryngit (stämbandsinflammation)

☐ Stämbandsknutor

☐ Annat, vad?

_____

☐ Nej, jag har inte blivit diagnosticerad med en röststörning av en läkare eller foniater

22. Har du fått röstterapi av en legitimerad talterapeut?

☐ Ja, på grund av ovannämnda problem

☐ Ja, på grund av annan orsak, specificera:

_____

☐ Nej

23. Om du har fått röstterapi, hur många gånger/ under en hur lång period?

_____

24. Har du fått någon form av röstergonomisk* utbildning/information?

☐ Ja, ungefär hur många timmar? _____

☐ Nej

(*Med röstergonomi menas förebyggande åtgärder som främjar en hållbar röstanvändning.)

SCREEN-11

Hur ofta har du haft följande röstsymtom under de 12 senaste månaderna? Ringa in den siffra som stämmer överens med påståendet enligt följande skala:

0=aldrig 1=sällan 2=varje vecka 3=dagligen

Rösten blir ansträngd	0 1 2 3
Rösten blir trött	0 1 2 3
Rösten blir hes	0 1 2 3
Rösten sjunker medan du talar	0 1 2 3
Rösten brister medan du talar	0 1 2 3
Problem med att få rösten att höras	0 1 2 3

Rösten blir ansträngd	0 1 2 3
Rösten blir trött	0 1 2 3
Rösten blir hes	0 1 2 3
Rösten sjunker medan du talar	0 1 2 3
Rösten brister medan du talar	0 1 2 3
Behov av att harkla dig medan du talar	0 1 2 3
Behov av att hosta medan du talar	0 1 2 3
Känsla av spändhet kring halsen/struphuvudet	0 1 2 3
Känsla av att ha en klump i halsen	0 1 2 3
Känsla av smärta kring halsen/struphuvudet	0 1 2 3

Appendix B

Skriftligt samtycke

Voice symptoms, voice use and voice risk factors in day care personnel

Hej, och välkommen att delta i min Pro gradu avhandling!

Jag studerar femte året talterapi vid Åbo Akademi och gör just nu min Pro gradu avhandling om förekomsten av röstsymtom hos dagvårdspersonal och röstergonomiska riskfaktorer i deras arbetsmiljö. Resultat av tidigare studier har visat att personer som använder rösten i sitt arbete har många röstergonomiska riskfaktorer i sin arbetsmiljö. Resultaten tyder också på att dagvårdspersonal kunde vara en speciellt utsatt grupp. Därför är det viktigt att noggrannare kartlägga arbetssituationen, röstanvändningen och arbetsmiljön.

Undersökningen går ut på att du får bära en röstackumulator (Vocal Holter recorder) under en hel arbetsdag. Röstackumulatorn är en apparat som bärs runt halsen och mäter och registrerar akustiska värden som ger information om stämbanden och rösten. Apparaten spelar inte in det du säger. Ackumulatorn är ansluten till en applikation (app) som laddas ner på telefonen. Appen kan tyvärr dock endast laddas ner på Android-telefoner, så för att kunna delta i studien bör du ha tillgång till en Android-telefon. Röstackumulatorn är diskret och stör inte arbetet. Som tillägg till detta får du även fylla i ett frågeformulär och delta i en intervju (ca 30 min). Resultaten i studien anonymiseras och behandlas konfidentiellt. Avhandlingen har blivit godkänd av den forskningsetiska nämnden i psykologi och logopedi vid Åbo Akademi, och beviljats forskningslov av Åbo stad.

Information som samlas in till studien är namn, ålder, allmänna uppgifter om daghemmet och din daghemsgrupp och svar på en frågeblankett om bland annat din hälsa, allmäntillstånd, stress, röstergonomi och röst. Dessa uppgifter jämförs med det akustiska data som samlats in med hjälp av röstackumulatorn för att kunna kartlägga förekomsten av röstsymtom hos dagvårdspersonal och identifiera eventuella riskfaktorer för att utveckla röstsymtom.

All information som samlas in är endast till för min studie och all data kommer att behandlas konfidentiellt. Det insamlade materialet och datamatrisen för de statistiska analyserna kommer att anonymiseras. Avhandlingen kommer att rapportera endast värden och resultat för insamlat och analyserat data och enskilda deltagare kan inte identifieras utifrån det. Insamlade uppgifter kommer att förvaras säkert bakom två lås i utrymmen vid ämnet logopedi, Arken. Uppgifterna bevaras i 5 år efter att datat publicerats i en tidskrift, eller ifall publicering inte sker, 5 år efter avslutat projekt. En dataskyddsbeskrivning finns till påseende vid ämnet logopedi vid Åbo Akademi.

På denna blankett ger du ditt skriftliga samtycke till att delta i studien genom att kryssa i nedanstående rutor och ge din underskrift. Ditt deltagande är frivilligt och du har rätt att avbryta ditt deltagande när som helst utan att ange orsak.

☐ Ja, jag är myndig.

☐ Ja, jag har förstått ovanstående och godkänner att mina uppgifter används i studien, samt att de förvaras vid ämnet logopedi, Arken.

☐ Ja, jag samtycker till att delta i studien.

☐ Ja, jag samtycker till att ge mina kontaktuppgifter för att kunna bli kontaktad gällande eventuella praktiska arrangemang gällande tidpunkt för datainsamling och intervju.

_____

Deltagarens e-post och/ eller telefonnummer

_____

Deltagarens underskrift och namnförtydligande

Pro Gradu skribent: Sara Alopaeus, talterapistuderande vid Åbo Akademi

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PRESSMEDDELANDE

Voice symptoms, voice use and voice risk factors in day care personnel

Pro gradu-avhandling i logopedic
Fakulteten för humaniora, psykologi och teologi, Åbo Akademi

Resultaten från en pro gradu-avhandling vid Åbo Akademi visar att dagvårdspersonal är en riskgrupp för att utveckla röstproblem. Sara Alopaeus har undersökt förekomsten av röstproblem och röstergonomiska riskfaktorer hos dagvårdspersonal i Åbo. Förekomsten av röstproblem hos deltagarna var hög, och flera röstergonomiska riskfaktorer hittades i deltagarnas arbetsmiljö. Även deltagarnas röstbelastning var hög.

Tio dagvårdare och en förskolelärare deltog i avhandlingen. Materialet samlades in med hjälp av en röstackumulator, Vocal Holter Recorder. Ett bakgrundsformulär om rösthälsa och allmänhälsa, röstformulären Screen-11 och Rösthandikappindexet samt ett formulär om upplevd stress, PSS-10, kompletterade det insamlade datat. Utöver detta utfördes även en evaluering av deltagarnas arbetsmiljö och förekomsten av röstergonomiska riskfaktorer.

Trots att dagvårdspersonal är en riskgrupp för att utveckla röstproblem, är den tillgängliga litteraturen kring ämnet begränsad. Det skulle därför vara viktigt att forskningen kring ämnet utökas för att minska på förekomsten av röstproblem och röstergonomiska riskfaktorer i denna yrkesgrupp.

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