

Effects of Occupation-Specific Vocal Stress on the Mental Health of Day Care Teachers

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Keywords

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Abstract

Introduction: Kindergarten teachers are exposed to numerous kinds of strains, such as noise, which can negatively affect their voices. This cross-sectional study investigates whether and to what extent the profession-specific high vocal demand is associated with the educators' mental health. **Methods:** One hundred and ninety-two kindergarten teachers from Magdeburg, Germany and its surrounding areas aged 43.4 ± 12.8 years, voluntarily participated in a survey. Vocal demand and vocal demand response, general strain factors, and mental health were assessed by using questionnaires (self-check on voice demands, Rudow checklist, General Health Questionnaire, and Maslach Burnout Inventory). The statistical analyses were carried out using SPSS. **Results:** The interviewed educators felt stressed by the excessive number of work tasks and children in each class, noisy work environment, and loud conversations. In addition, educators complained of headaches and neck pain (66%), while 28% of them experienced hoarseness and a burning throat. The mental health of 39 of the educators was impaired, and nine were at an increased risk of burnout. Self-reported voice effort correlated low with mental health ($r =$

0.287 ; $p < 0.001$) and burnout risk ($r = 0.306$; $p < 0.001$).

Conclusion: The vocal demands on educators in day care settings are very high, which is a major associated factor for the development of burnout syndrome and is also associated with headaches and neck pain. Measures for the prevention of occupational voice disorders and voice training should be a mandatory part of the educators' training and must be offered as in-service training.

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Introduction

In 2021, more than 700,000 professionals, including those working in management and administration, worked in day care centers in Germany [1]. Early childhood educators, such as kindergarten teachers, are often exposed to numerous physical and psychological strains in the course of their work. "Strain" refers to exposure to working conditions while "stress" is used to describe the consequences of strain [2]. Noise is one of the most physically stressful characteristics of the occupational activities of early childhood educators [3]. Educators are exposed to sound levels above 80 dB(A), which

can have a negative impact on their health [4–6]. Kindergarten teachers must use intense and high pitch voice (both vocally distressing) in noisy rooms with many children for extended periods without adequate breaks. Unfavorable postures, as well as lifting and carrying children, are further physical stresses that can lead to the development of musculoskeletal complaints [7]. Above all, psychological strains include stress caused by time and performance pressure, work-related conflicts with colleagues, management, and/or parents, but also stress caused by administrative tasks, such as too many regulations and increasing documentation requirements [8]. All these physical and psychological strains can result in health impairments, ranging from musculoskeletal complaints [7] to burnout and depression [9, 10].

The early childhood educator profession belongs to the group of speech-intensive professions with a moderate voice quality, but a high vocal demand [11]. Therefore, this profession is also voice-intensive (speaking and singing-intensive) because “occupational voice users” need to use their voice as a supporting role for their occupation and thus also for their ability to work. As a medium and prosodically effective means of oral communication, voice is the principal means that promotes development when working for and with children.

The larynx and vocal folds are relatively robust, can tolerate temporary overloads without permanent damage, and have a relatively good regenerative capacity. However, the vocal organ, vocal function, and vocal load capacity can be permanently impaired by long-term stress. Such nonorganic or malregulative voice disorders, especially those caused by excessive exertion, may not only impair but also render occupational performance impossible. This can be explained by the fact that increased hoarseness will reduce vocal performance and increase the manifestation of symptoms, which are subjectively perceived as stressful.

Hunter et al. [12] proposed the use of new terms, namely, “vocal demand” and “vocal demand response,” instead of the conventional “vocal load” and “vocal loading.” The effects of vocal demand in the sense of vocal load [12] on the prevalence of voice disorders in school teachers have been well-studied [13, 14]. Compared with the general population, teachers, especially female ones, have an increased prevalence of voice disorders, which are usually manifested as hoarseness, discomfort, and difficulty in using the voice, voice fatigue, or changes in voice quality. As a result, there is a considerable percentage of teachers who are forced to discontinue their work because of voice problems [13]. Behlau et al. [15] and Giannini et al. [16] also found a correlation between voice disorders

and reduced work ability, indicating the serious social and socioeconomic consequences of voice disorders.

At work, kindergarten teachers have to talk a lot, very loudly, and for prolonged periods. What is special, however, is the use of voice that is appropriate to small children, which is characterized by a specific vocal-articulatory style of communication (so-called motherese with a typical child-directed higher pitch and exaggerated prosody), in addition to singing in a higher register and making music. This usually very loud, long, with high vocal pitch, and continuously “motherese” style of speaking in noisy surroundings leads to a particularly strong load on voice production. In addition, speaking outdoors, e.g., when walking with children or in the playground, can be exhausting, especially in cold temperatures [6].

Voice disorders occur in approximately 6% of the general population and are often phonogenic, i.e., caused by the excessive occupational use of voice. The hoarseness in the voice of educators can have an unfavorable influence on the development and performance of children, even on their voice [17–20]. Previous studies showed that many day care teachers (54%) and primary school (65%) teachers suffer from a voice disorder [21–23]. Therefore, the implementation of mandatory voice training in these occupational groups has been strongly recommended for a long time [21, 24].

A previous study on day care and primary school teachers examined the relationship between voice quality, lifestyle-related voice activities and participation, voice strength, laryngeal function, and laryngoscopic findings [21]. Condition and vibration behavior of the vocal folds and the quality of glottic closure were found to determine the sound and quality of the voice. Consequently, they are both influenced by lifestyle-related voice activities and participation, i.e., voice strength. Although these voice functions influence each other, Munier et al. [25] found no correlation of such acoustic features with the general health of the subjects.

There are only very few studies investigating the extent to which the increased vocal demand of kindergarten teachers impacts mental health. In a study of general education teachers, da Rocha et al. [26] concluded that voice disorders are also associated with mental disorders.

The aim of our study was therefore to determine the strain factors in the kindergarten setting that are associated with increased vocal demand among kindergarten teachers using a questionnaire survey. In addition, we investigated whether the vocal effort (e.g., in a noisy environment) is associated with the mental health of the employees.

Materials and Methods

Participants

After approval by the Ethics Committee, 24 larger public and private providers of day care centers in Magdeburg, Germany and its surrounding areas were contacted with the request to participate in this study. Twenty-eight facilities from 11 interested providers participated in the study comprising 206 female and eight male educators between May 2017 and April 2019. Due to the gender imbalance, the data of the eight male participants were not taken into account in the evaluation. Of the 206 female educators, two were still on internship during training and four had been in the profession for less than a year. The data of these educators were therefore not considered in the subsequent evaluation. The questionnaires of eight educators were not completely filled out. Therefore, the data of 192 educators were included in the evaluation, whose average age was 43.4 ± 12.7 years old and had been working in this profession for 24.1 ± 14.4 years.

Questionnaires

First, general sociodemographic data, such as age, gender, as well as vocational training and duration of employment, were asked. The checklist according to the Rudow [27] was used to record the strain factors. This checklist consists of 36 items that are distinguished into the following eight categories: "Children and group," "Team," "Management," "Provider," "Work tasks and organization," "Working environment," "Spatial-technical equipment," and "Physical demands." Participants were first asked regarding the occurrence of any strain factors in the institution at all ("yes"/"no") and if so, the educators were asked to indicate to what extent they felt stressed by this factor ("not," "hardly," "medium," "strong").

To register vocal efforts, the self-check voice strain, an easy-to-understand instrument from the call center sector, was used [28]. This self-check offers the possibility to assess both the demand and the vocal demand response by recording signs of voice problems and risk factors for a voice disorder. The educators responded to the respective items by either "agree" or "disagree."

"Mental health" was assessed using the short version of the General Health Questionnaire (GHQ-12) in the German version according to Linden et al. [29]. The 12 questions on the current state of health were answered on a four-point scale (0-1-2-3-scoring: total score 36 points) where high scores indicate poor mental health. Cronbach's α as a measure of internal consistency was 0.895. In addition, a dichotomous evaluation was carried out according to the 0-0-1-1 principle [30]; a sum value between 0 and 12 points was possible. If the score was <5 points, mental health was unremarkable, whereas scores ≥ 5 points indicated impaired mental health.

The Maslach Burnout Inventory was used to assess the severity of the burnout dimensions [31]. The burnout symptomatology was determined with the help of 16 items in three subscales, namely, "emotional exhaustion" ($\alpha = 0.864$), "depersonalization" ($\alpha = 0.787$), and "personal accomplishment" ($\alpha = 0.783$). High scores in the first two subscales and low scores in the "personal accomplishment" subscale indicated the presence of burnout symptoms. The individual risk of burnout was determined with the help of a formula according to Kalimo et al. [32]. The higher the score, the greater the risk of burnout.

Noise Measuring

For the assessment of the noisy environment, sound level measurements were carried out to prove that there was indeed an increased noise level in the group room. The noise level was measured with a sound level meter PCE-322A (PCE Instruments, Meschede, Germany). For this purpose, the measuring device was set up in different group rooms for approximately 45–60 min during the study. Average values (L_{eq}) were then calculated and maximum levels (L_{max}) were determined. The measurement data were then assigned to the respective kindergarten teachers who worked in these rooms.

Statistical Analyses

The statistical analyses of the data were carried out with the SPSS software program, v.28 (IBM, Armonk, NY, USA). Frequency analyses were performed to identify the presence of general stress factors as well as vocal demand and vocal demand response. The χ^2 test (or Fisher's exact test) was used to analyze group differences. The Spearman correlation coefficient was also used to analyze potential correlations between individual stress factors and mental health. A significance level of $p < 0.05$ underlies all test procedures.

Results

The present study was mostly conducted in large facilities with more than six groups and a total of >100 children. One facility was slightly smaller with 40 children in the two groups, while another facility cared for more than 60 children in the four groups.

Stress Factors according to Rudow

The most frequent strain factor mentioned by the educators was the fact that there were many tasks to be performed, immediately followed by high noise levels, both in the group room and in the institution as a whole. In addition, the coexistence of many children in the groups made it almost impossible to work with individual children and therefore represented a significant burden for the educators. Table 1 lists the stress factors rated as applicable by the majority of the educators. Exceptions are the answers to positively formulated items; here, the answer "does not apply" was evaluated. The "vocal effort caused by frequent and loud speaking" was a frequently mentioned strain factor. Other strain factors included both physical (lifting and carrying, frequent standing, unfavorable posture) and psychological (social tensions, time pressure in fulfilling work tasks, children's disciplinary problems) parameters.

Noise Measuring

Noise levels in the group rooms varied between 65.5 and 90.7 dBA, and their maximum levels were 81.8 dBA

Table 1. Overview of the strain factors most frequently mentioned by the kindergarten teachers

Strain factor	Frequency, %
There are many work tasks to be done	95.7
The noise level in the group room and in the nursery is high	95.2
There are many children in the group	90.4
Working with the individual child is hardly possible	87.0
Vocal tension due to frequent loud speaking	86.7
Unfavorable posture when playing and doing handicrafts with children	84.1
Lifting, carrying, helping, or diapering children	83.1
Frequent standing and awkward sitting	81.5
There is time pressure when performing tasks	79.9
There is tension or conflict within the team	75.7
There is time for preparation and follow-up of the pedagogical work	75.5
The children show behavioral problems	74.1
The noise protection measures for the rooms are good*	73.4
It is difficult to fulfil the pedagogical, administrative and other tasks in a quality manner	71.3
Relaxation and rest during a working day are hardly possible	68.6
There are discipline problems in the group	67.0
There is sufficient staff available*	59.5

*For this item, the answer “Does not apply” was evaluated due to the positively formulated question.

and 107.3 dBA, respectively. Noise level measurements were only taken in the group rooms provided that the corresponding educator participated in the study. The results are listed in Table 2.

Vocal Demand and Vocal Demand Response

The results of the vocal demand questionnaire are summarized in Table 3. More than three-quarters of the educators surveyed stated that they (had to) speak louder in order to drown out other noises, including environmental noises and to be heard at all. Participants also reported to suffer from headaches and neck pain and also felt exhausted and burned out after work. Almost half of the participants complained of dry mouth.

In contrast, other factors affecting the voice were reported to be less frequent. For example, only 11% of the educators stated that they were active smokers or social drinkers.

Mental Health

The subjectively assessed mental health was not impaired in the majority of the educators. More specifically, it was found to be unremarkable in 153 educators with 9.9 ± 2.8 points (dichotomous GHQ total score below 5 points), while 39 educators complained of impaired mental health (21.1 ± 4.6 points; dichotomous GHQ total score ≥ 5 points).

According to the Maslach Burnout Inventory, more than half of the educators showed low levels of emotional exhaustion (Table 4). Emotional exhaustion was average

or above average in a few cases. Depersonalization was low in most of the cases. Few educators were more cynical than average. Nine educators were at risk of burnout, and 68 exhibited some symptoms. No risk of burnout was found in 115 educators.

Correlation of Relevant Items from Self-Check on Voice Stress with Stress Factors from the Rudow Checklist

“Speaking louder to drown out other noises” as a factor of vocal strain was related to the strain factor “vocal strain due to frequent, loud speaking” (according to Rudow) (Table 5). Teachers who had to speak louder felt moderately to strongly stressed compared with colleagues who did not have to speak louder ($p_{\chi^2} = 0.003$). This factor was also slightly related to the high noise level in the group room ($p_{\text{Fisher}} = 0.039$). However, the factor “speaking loudly” was not dependent on the number of children in the group room, disciplinary problems or behavioral problems on the part of the children, or noise protection measures in the facility ($p_{\chi^2} > 0.05$).

The item “I often find speaking exhausting” as a result of vocal strain was reflected in the stress caused by frequent, loud speaking ($p_{\chi^2} < 0.001$, Table 6). Furthermore, there was a correlation with both the stress due to insufficient noise protection measures ($p_{\chi^2} = 0.005$) and the stress due to the high noise level in the group room ($p_{\text{Fisher}} < 0.001$). The vocal demand was also related to the high number of children ($p_{\text{Fisher}} = 0.032$) and disciplinary problems ($p_{\chi^2} = 0.004$). When testing the association of vocal demand with

Table 2. Examples of noise levels in the group rooms of various facilities

Facility	Room 1		Room 2		Room 3		Room 4		Room 5		Room 6	
	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}	L _{eq}	L _{max}
1	82.7	101.7	75.2	98.3	79.7	102.1	81.7	95.7	69.3	89.5	76.7	88.2
2	69.0	90.9	67.0	86.6	85.2	107.3	82.3	102.5	79.3	100.7	73.3	96.8
3	76.4	97.8	75.9	97.6	80.0	96.3	90.7	105.2	75.4	92.8	84.4	103.8
4	79.9	105.4	69.6	91.5	79.0	94.7	76.5	105.6	73.1	106.5	72.6	96.5
5	77.4	88.9	78.0	100.5	77.1	103.4	76.2	92.8				
6	78.2	92.1	80.4	95.7	82.2	97.2	73.2	98.5				
7	77.8	93.6	78.4	101.4	71.07	93.6	78.3	99.9				
8	72.2	90.2	79.6	99.9	69.9	90.2	72.8	95.1				
9	79.1	94.5	74.0	81.8	79.0	91.2	78.2	95.6	76.4	98.5		
10	72.2	95.6	74.6	98.7								
11	75.0	96.4	67.3	89.2	73.6	90.9	85.7	102.9	71.9	87.3	71.8	86.8
12	76.5	87.3	71.8	86.8	75.6	91.2						
13	69.0	87.8	73.7	96.0	71.6	97.7	65.5	84.9	67.2	89.8		
14	73.3	93.7	77.5	103.0	76.7	101.0	77.7	92.8	68.4	98.9		
15	73.2	98.5	74.5	96.7	72.9	97.5	76.4	100.3				

Table 3. Frequency [%] of statements on vocal demands and vocal demand response

Vocal demand or vocal demand response	Frequency, %
I speak louder to drown out other sounds	76.4
I often suffer from headaches or neck pain	66.8
I am exhausted and burnt out after work	57.1
My throat or mouth is often dry	47.2
I often find it tiring to speak	41.2
I usually drink very little at work and if I do, only black tea or coffee	39.7
I often have to clear my throat	38.2
I often have phlegm in my throat	32.2
The air at work is too dry	31.7
I have to talk a lot even after work	30.2
I often feel pressure in my throat	30.2
I have to repeat myself all the time to be understood	29.1
I am often hoarse	27.6
My throat often burns or itches	27.1
I talk more than the others do	27.1
I sometimes lose my voice	24.6
People often ask me if I have a cold or am hoarse	22.6
My voice gets worse during the day	21.6
I often have a lumpy feeling in my throat	18.6
I have already been to the doctor because of my voice	17.6
I cannot speak as loudly as others can	14.1
I smoke a lot	11.6

mental health and burnout risk, it was shown that the item “speak louder” was not related to burnout risk, according to Kalimo, and mental health (GHQ) ($p_{\chi^2} > 0.05$; Table 7).

A tendency was only found in the “depersonalization” MBI subscale: educators who spoke louder to drown out

other noises tended to be more cynical than those who did not have to speak louder ($p_{\chi^2} = 0.098$). The correlation of vocal demand response with mental health and burnout risk was determined using Spearman’s correlation analysis. The results are shown in Table 8. Overall, vocal demand

Table 4. Expression of burnout symptoms in the individual subscales of the Maslach Burnout Inventory among the kindergarten teachers

MBI-subscale	Level of expression [points]	Number [%]	Mean±SD Median (range)	Mean±SD Median (range) Total sample
EE	Low [≤2.00 points]	57.8	1.09±0.59 1.2 (0–2.0)	2.03±1.33 1.8 (0–5.4)
	Average [2.01–3.19 points]	1.3	2.54±0.25 2.6 (2.2–3.0)	
	High [≥3.20 points]	2.9	3.99±0.66 4.0 (3.0–5.4)	
DE	Low [≤1.00 points]	69.3	0.33±0.33 0.2 (0–1.0)	0.88±1.00 0.4 (0–4.2)
	Average [1.01–2.19 points]	18.8	1.50±0.31 1.4 (1.2–2.0)	
	High [≥2.20 points]	12.0	3.10±0.68 3.0 (2.2–4.2)	
PA	Low [≤4.00 points]	14.1	3.14±0.57 3.3 (1.7–4.0)	4.97±0.89 5.2 (1.7–6.0)
	Average [4.01–4.99 points]	17.7	4.54±0.23 4.5 (4.2–4.8)	
	High [≥5.00 points]	68.2	5.47±0.33 5.5 (5.0–6.0)	

SD, standard deviation; EE, emotional exhaustion; DE, depersonalization; PA, personal accomplishment.

Table 5. Relationship between the item “I speak louder to drown out other noises” and the stress caused by selected strain factors (according to Rudow)

I speak louder to drown out other noises	Exposure to selected strain factors [22] (number in %)				p_{χ^2}
	not	hardly	medium	strong	
Vocal tension due to frequent, loud speaking					
Applies	7.2	17.3	48.9	26.6	0.003
Does not apply	14.6	39.0	36.6	9.8	
There are many children in the group					
Applies	2.8	13.5	51.8	31.9	0.307
Does not apply	9.3	14.0	51.2	25.6	
There are discipline problems in the group					
Applies	21.6	10.1	43.9	24.5	0.203
Does not apply	23.1	20.5	43.6	12.8	
The children show behavioral problems					
Applies	18.1	11.6	42.8	27.5	0.852
Does not apply	20.5	12.8	46.2	20.5	
The noise protection measures for the rooms are good*					
Applies	13.2	14.0	34.1	38.8	0.562
Does not apply	12.5	22.5	35.0	30.0	
The noise level in the group room and in the day care center is high					
Applies	2.9	7.3	33.3	56.2	0.039^a
Does not apply	4.7	9.3	53.5	32.6	

*For this item, the answer “Does not apply” was scored. ^aFisher-test; significant differences are in bold.

Table 6. Relationship between the item “I often find speaking exhausting” and the stress caused by selected strain factors (according to Rudow)

I often find speaking exhausting	Exposure to selected strain factors [22] (number in %)				p_{χ^2}
	not	hardly	medium	strong	
Vocal tension due to frequent, loud speaking					
Applies	2.7	8.1	52.7	36.5	<0.001
Does not apply	13.3	32.4	41.9	12.4	
There are many children in the group					
Applies	0	10.8	51.4	37.8	0.032^a
Does not apply	7.3	15.6	51.4	25.7	
There are discipline problems in the group					
Applies	13.9	9.7	41.7	34.7	0.004
Does not apply	27.6	14.3	44.8	13.3	
The children show behavioral problems					
Applies	12.3	11.0	41.1	35.6	0.064
Does not apply	23.3	11.7	45.6	19.4	
The noise protection measures for the rooms are good					
Applies	12.7	4.2	38.0	45.1	0.005
Does not apply	13.4	23.7	32.0	30.9	
The noise level in the group room and in the day care center is high					
Applies	1.4	1.4	30.1	67.1	<0.001^a
Does not apply	4.7	11.3	44.3	39.6	

^aFisher-test; significant differences are in bold.

Table 7. Relationship between vocal demand and vocal demand response and mental health, the characteristics of the burnout dimensions and the risk of burnout according to Kalimo et al.

Effect		I speak louder to drown out other noises			
		applies [%]	does not apply [%]	p_{χ^2}	
Mental health	Inconspicuous	79.1	20.9	0.102	
	Impaired	66.7	33.3		
MBI-subcales	Emotional exhaustion	Low	54.4	68.9	0.275
		Average	20.4	15.6	
		High	25.2	15.6	
Depersonalization	Low	65.3	82.2	0.098	
		Average	21.1		11.1
		High	13.6		6.7
Personal accomplishment	Low	12.9	17.8	0.544	
		Average	19.0		13.3
		High	68.0		68.9
Burnout risk (according to Kalimo)	No risk	57.9	66.7	0.559	
	Some symptoms	37.4	28.9		
	Risk of burnout	4.8	4.4		

response correlated slightly but highly significantly with mental health and burnout risk. Vocal demand response also correlated with mental health, with individual burnout dimensions, and accordingly with the overall burnout risk.

The higher the perception of vocal demand response, the greater the risk of mental health impairment and

burnout to develop. Individual relevant items of the voice questionnaire correlated very slightly to “slightly but significantly” with mental health impairment and burnout risk (Table 9). The more the educators perceived speaking as stressful, the lower their performance and the higher their emotional exhaustion and the overall risk of burnout.

Table 8. Correlation between vocal demand and vocal demand response with mental health and burnout risk

	Voice demand		Voice demand response	
	r_{Spearman}	p value	r_{Spearman}	p value
Mental health	0.287	<0.001	0.300	<0.001
MBI-subcales				
Emotional exhaustion	0.306	<0.001	0.179	0.012
Depersonalization	0.242	<0.001	0.267	<0.001
Personal accomplishment	-0.155	0.031	-0.106	0.138
Burnout risk (according to Kalimo)	0.306	<0.001	0.235	<0.001

Mental health seemed to be less affected here since a correlation could not be established.

In contrast, mental health and the risk of burnout were all strongly related to the two items “I often suffer from headaches and neck pain” and “I am exhausted and burned out after work.” The low to medium correlations were significant ($0.01 < p < 0.001$), with the exception of performance.

Discussion

The present study investigated the association between various stress factors in day care centers with the kindergarten teachers’ voices and mental health. The noise level in the group room was consistently high to very high. In our study, the noise in the group rooms was mainly caused by children playing. Nevertheless, classroom noise seems to be a common problem in kindergartens [3]. Noise in the group room, in turn, forces the educators to speak louder.

The kindergarten teachers in our study report an increased vocal demand response; they feel the often loud speaking as exhausting. The exhaustion after work manifests itself in a perceived strong vocal fatigue, and voice disorders can be the result. Other authors have detected loud speech as a risk factor for voice disorders [22].

Uneconomical and nonphysiological use of the voice, psychological problems, stress, crises, anatomical conditions, and/or severe underlying diseases can favor the development of a voice disorder. Other influencing factors are poor spatial acoustics, low humidity, poor air quality, and lack of voice training during education.

Kindergarten teachers have a higher risk of burnout [33], which was confirmed in our study: a risk of burnout was found in nine educators (4.6%). Mental health was also impaired in 20.3% of the educators surveyed. Among teachers in general, almost 30% were reported to be affected [34]. However, a comparison with other studies is difficult due to the different cut-off criteria used.

Kindergarten teachers report mental, physical, and psychological exhaustion after work. The degree of exhaustion was related, among other things, to the size of the group, plethora of work tasks, excessive bureaucracy, and/or lack of adequate staff.

The majority of kindergarten teachers reported symptoms of headaches and neck pain. These symptoms may be directly and indirectly related to vocal strain or vocal function. For example, blockage or muscular immobility of the cervical spine is a result of working as a kindergarten teacher and may lead to cervicogenic or vertebrogenic dysphonia. Headaches may be associated with this condition or attributed to the fact that the group room or the facility as a whole is (too) noisy. Neck pain can also be caused by non-ergonomic kindergarten furniture. A good working posture and ergonomic furniture for kindergarteners are important prerequisites for the prevention of work-related musculoskeletal disorders [7].

Preventing Voice Disorders in Educators

Voice aptitude tests, raising educators’ awareness of voice hygiene, and training and in-service measures, such as attending voice training seminars, are part of the inventory of methods to prevent voice disorders in the educator’s profession [35]. When designing prevention measures, behavioral prevention (internal factors) and situational prevention (external factors) can be combined as they integrate individual health-related actions into material, social and cultural living, and environmental conditions. At the level of behavioral prevention, communicative behavior, teaching behavior, and anticipating noise/stress management are significantly involved. The level of relationship prevention (e.g., structural measures for room acoustics, collective handling of noise, and pedagogical measures in the teaching curriculum) has a reciprocal effect. Resource activation in the form of promoting individual (coping) strategies and strengthening motivation can complement the measures for

Table 9. Correlation of individual items of the voice questionnaire with mental health and burnout risk

	I speak louder to drown out other noises		I often find speaking exhausting		I often suffer from headaches and neck pains		I am exhausted and burnt out after work	
	r _{Spearman}	p value	r _{Spearman}	p value	r _{Spearman}	p value	r _{Spearman}	p value
Mental health	-0.045	0.530	0.109	0.126	0.215	0.002	0.412	<0.001
MBI-subcales								
Emotional exhaustion	0.116	0.104	0.295	<0.001	0.201	0.005	0.629	<0.001
Depersonalization	0.206	0.004	0.136	0.057	0.166	0.021	0.315	<0.001
Personal accomplishment	-0.046	0.518	-0.166	0.020	-0.091	0.203	-0.066	0.360
Burnout risk (according to Kalimo)	0.126	0.080	0.290	<0.001	0.232	0.001	0.501	<0.001

situational prevention. Seminars on the prevention of voice disorders take into account health models (biopsychosocial, salutogenesis), particularly the International Classification of Functioning, Disability and Health (ICF), through the components of voice function, activity, participation, and leisure.

Statement of Ethics

The study complies with the guidelines for human studies and the research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. This study protocol was reviewed and approved by the Ethics Committee of the Otto von Guericke University Magdeburg at the Faculty of Medicine, approval number [40/17]. Written informed consent was obtained from all participants to participate in the study.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

S.D. contributed to the conception, design of the work, acquisition of data, analyses and interpretation of the data, drafting the manuscript and approving the final version of the manuscript, and is accountable for aspects of the work in the event that questions are raised. S.V.-Z. contributed to the interpretation of the data, revising the manuscript, and approving the final version of the manuscript. I.B. contributed to the conception, design of the work, and interpretation of the data, revising the manuscript, and approving the final version of the manuscript.

Data Availability Statement

All relevant data generated or analyzed during this study are included in this article. Further inquiries can be directed to the corresponding author.

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