www.mednet.gr/archives
ARCHIVES OF HELLENIC MEDICINE: ISSN 11-05-3992

ORIGINAL PAPER
ΕΡΕΥΝΗΤΙΚΗ ΕΡΓΑΣΙΑ

ARCHIVES OF HELLENIC MEDICINE 2024, 41(5):626–634
ΑΡΧΕΙΑ ΕΛΛΗΝΙΚΗΣ ΙΑΤΡΙΚΗΣ 2024, 41(5):626–634

# Prevalence of self-perceived voice disorders in speech language pathology undergraduate students

**K. Kyriakou,**
**E. Theodorou,**
**K. Petinou,**
**I. Phinikettos**

*Department of Rehabilitation Sciences, Cyprus University of Technology, Limassol, Cyprus*

OBJECTIVE **To complete a further analysis of existing data to assess and analyze the prevalence of self-perceived voice disorders (VD) in speech language pathology (SLP) undergraduate students in Cyprus.** METHOD **A web questionnaire was completed by 124 SLP students enrolled in undergraduate SLP programs in two universities in Cyprus. Data from one hundred and twenty-one questionnaires were analyzed. Participants were divided into two groups: students with and without self-perceived VD. The estimated prevalence of self-reported VD along with the subjective severity were determined.** RESULTS **The estimated prevalence of self-perceived voice problems in the sample of 121 undergraduate SLP students examined is 23.14%±3.8%. 14.87% and 8.26% of the students perceived their voice to be slightly and moderately disordered, respectively. 9.09%, 3.30%, 4.95%, and 5.78% of the students with self-perceived VD were, respectively, 1st, 2nd, 3rd, and 4th year students. Also, significant differences were observed between the two groups of students in the Voice Disorder Index (VDI) total and the VDI specific statements (i.e., physical, functional, and emotional scores).** CONCLUSIONS **Voice problems may be more common in undergraduate SLP students in Cyprus than the graduate SLP students in the United States and may be as common as voice problems in future teachers. Moreover, self-perceived VD may be more common in 1st year undergraduate SLP students than 2nd, 3rd, and 4th year students.**

Ο επιπολασμός των αυτοεκτιμώμενων διαταραχών της φωνής σε προπτυχιακούς φοιτητές λογοπαθολογίας

*Περίληψη στο τέλος του άρθρου*

**Key words**

Prevalence
Speech language pathology
Students
Undergraduate
Voice disorders

*Submitted 7.8.2023*
*Accepted 2.9.2023*

The prevalence of voice disorders (VD) in the general population ranges from 16.9% to 38.5%.[1,2] Certain populations who are professional voice users, such as actors, singers, teachers, priests, politicians, and others whose occupational performance and success at their job depends on their voices may have a high prevalence of VD and higher prevalence of VD than the general population.[3] Similarly, certain university student populations that use their voice for training such as student teachers, student speech language pathologists and others may be more prone to VD than other student populations.[4,5]

There are several studies that examined the prevalence of VD in student teachers which were reported to vary from 14.1% to 42%.[4,6–9] One study investigated the prevalence of vocal symptoms among 175 student teachers (19–46 years old) when compared to 220 other university male and female students (18–50 years old) in Finland via a questionnaire that assessed vocal symptoms. Outcomes revealed that the student teachers stated a greater number of frequently occurring symptoms (42%) such as throat clearing, coughing, strained voice, etc. than other university students (24%).[4] Another study assessed the prevalence of VD among students studying to become 1st–7th grade elementary school teachers in Norway via the VHI and the Screen.[6] The results indicated that 14.1% of the student teachers experienced two or more symptoms (i.e., throat clearing, coughing, strained or tired voice, and the sensation of pain or a lump in the throat) weekly or more often.[8] One more research study determined the prevalence of voice problems in 1,494 student teachers at the beginning of their university studies in Sweden and Finland via questionnaires including the VHI-30. Results revealed that the prevalence of voice problems in the group of student teachers was 17%.[9]

Even though there are several studies reporting the prevalence of VD in student teachers, there is a limited number of investigations that explore the prevalence of voice

problems in speech language pathology (SLP) students. SLP students are similar to student teachers. For example, SLP students use their voice during therapy sessions to explain and model articulation, language, fluency, and voice targets, reinforce their clients, educate, or communicate with their clients and their families, communicate in noisy environments, such as classrooms and rehabilitation centers, model treatment techniques in a concentrated timeframe, and use a louder voice when working with hard-of-hearing people.[10] Similarly, student teachers use their voice to teach louder in noisy environments such as classrooms, teach in a concentrated timeframe, use their voice during class to explain, demonstrate and discipline students and communicate with parents. However, SLP students are also different from student teachers (e.g., SLP students may offer individual and small group therapy sessions while student teachers may teach larger groups of students). One investigation determined the voice problems of 104 1st year graduate students majoring in SLP in the state of Ohio using the Quick Screen for Voice and a questionnaire. Results indicated that 12% of the SLP graduate students reported voice problems such as persistent glottal fry, low habitual pitch and hoarse, breathy, or strained phonation.[11] Also, another investigation examined 162 graduate students in SLP at the University of Kansas and revealed that 11% of the SLP students reported a diagnosis of a voice problem by a physician or SLP.[10] Furthermore, an investigation assessed 600 Dutch speaking first year graduate SLP students using the Grade, Roughness, Breathiness, Asthenia, and Strain (GRBAS) rating scale and revealed that 27% had "slight" or "moderate" overall voice quality abnormality.[12]

Furthermore, the assessment of prevalence of VD by speech language pathologists may consist of subjective and objective evaluation measurements. Subjective evaluation measurements are based on the judgment of the listener or the judgment of the self-evaluator and include several rating scales, such as the GRBAS rating scale, the Voice-Related Quality of Life Scale, and the Voice Handicap Index (VHI).[13,14] In contrast, an objective voice evaluation may be completed using equipment and or software programs such as the Visipitch, Praat, and Lingwaves which measure acoustic voice parameters such as intensity, fundamental frequency, and aerodynamic measures such as the s/z ratio, maximum phonation time, etc.[15,16]

The assessment procedures of the prevalence of VD may be similar across cultures. However, the perception and impact of VD, as well as the objective characteristics of voice may vary between cultures and regions. One investigation reported lower scores on the Dysphonia Severity Index, which is a part of the software program Lingwaves, among Indian speakers compared to European speakers.[17] Furthermore, a study compared the mean VHI scores of Kuwaiti, Jordanian and Emirati teachers and indicated that the VHI mean score of Jordanian teachers was the highest in all VHI subscales followed by the Kuwaiti and then the Emirati teachers.[18]

Moreover, research also exists that shows the effectiveness of vocal hygiene education in preventing or diminishing voice problems.[19,20] A study assessed the effectiveness of a Vocal Health Program in diminishing vocal symptoms in teachers and revealed significant reductions in the teachers' voice symptoms in the experimental group when compared with the control group after three months of implementing the program.[19] Also, another study evaluated the effectiveness of a voice care program on teachers and revealed significant decreases in voice handicap scores between the experimental and control groups after eight weeks of implementing the program.[20]

Taking into consideration the following: (a) SLP students like student teachers may be prone to developing VD, (b) there is a limited number of investigations assessing the prevalence of VD in SLP students, (c) the perception and impact of self-perceived VD may vary between cultures, and (d) there is research that indicates the effectiveness of vocal hygiene education, the aim of this investigation was to complete a further analysis of the existing data[21] in order to assess and analyze the prevalence of self-perceived VD in SLP undergraduate students in Cyprus. Furthermore, the aim of this study was to specifically delineate the functional, physical, and emotional impact of VD on the daily activities of SLP undergraduate students that may give us an indication of the presence of any voice overuse, abuse, and misuse in the SLP student population and help us develop a vocal hygiene program.

## MATERIAL AND METHOD

The project obtained bioethics approval from the Cyprus National Bioethics Committee on May 6th, 2021 (reference# ΕΕΒΚ ΕΠ 2021.01.106). Respondents were informed about the survey via a letter at the beginning of the survey that described the goal and the procedures of the study and specified that by completing the survey, participants give their consent to participate in the study. Thus, a consent was assumed by virtue of the completion of the survey.

### Participants

Participants consisted of undergraduate students majoring in the field of SLP across two universities in Cyprus. Participants

received an e-mail and or a phone call invitation to participate in the study. One hundred and twenty-four questionnaires were received, creating a response rate of about 60%. Four surveys were disregarded due to missing answers. Data from one hundred and twenty-one questionnaires were analyzed. Participants were 18 to 28 years old undergraduate students and entailed 118 female and 7 male students. They consisted of 1st (n=37), 2nd (n=30), 3rd (n=27), and 4th (n=31) year students and were from different geographic rural and urban areas of Cyprus (i.e., Nicosia, n=37; Limassol, n=42; Larnaca, n=24; Famagusta, n=7; and Paphos, n=9) or Greece (n=6).

### Design of the questionnaire

A web questionnaire was placed online via the Survey Monkey website from June 1st to June 30th, 2021, which consisted of various parts including the VDI. One part is the "Voice Disorder Index" that is also labeled Voice Handicap Index-12 (VHI-12), a reliable tool that indicates the participant's perceived severity of his(her) voice problem as it relates to his(her) quality of life. It consists of twelve statements that are included in the Voice Handicap Index-30.[22,23] Four of those statements are also included in the Voice Handicap Index-10. The VDI provides good international comparability of VD with VHI. The twelve translated to Greek statements from the VHI, which are the same as the twelve statements in the VDI, were adapted and validated to the Greek language and were used for this project.[24] Statements were grouped into three content domains that are functional, emotional, and physical. The functional subscale consisted of statements that described the functional impact of a person's voice disorder on his(her) daily activities (e.g., "I feel left out of conversations because of my voice"). The emotional subscale was composed of statements representing the emotional impact of a person's voice disorders on his(her) daily activities (e.g., "I feel embarrassed when people ask me to repeat"). The physical subscale comprised statements representing a person's self-perception of laryngeal discomfort and voice output characteristics (e.g., "My voice is worse in the evening").[14] Each participant read each statement on the VDI and provided a number based on a 5-point scale (i.e., 0=Never, 1=Almost never, 2=Sometimes, 3=Almost always, and 4=Always). Participants' total score on the VDI ranged from 0 to 48. A score of 0–7 designated a normal voice, whereas a score of 8–48 showed a voice that is slightly (i.e., scores 8–14), moderately (i.e., scores 15–22) or profoundly disordered (i.e., scores 23–48) (please see Appendix A).

### Data collection

The following procedures were followed. First, all undergraduate SLP students were invited to participate in the study via a phone call and or an e-mail, which included a link to an online questionnaire. Next, each participant was asked to complete various questions of the survey including the VDI. Then, individuals were divided into two groups based on their VDI score. Validated cutoffs of the VDI were used and participants who scored less than or equal to seven were grouped as students with normal voice or no self-perceived voice disorder (NVD group; n=93). Participants who scored more than 7 were grouped as students with self-perceived VD (VD group; n=28). Overall, the participants' mean and standard deviation score were 5.02 and 4.97, respectively. For the NVD group, the mean and standard deviation were 2.70 and 2.09 and for the VD group the mean and standard deviation were 12.71 and 3.83, respectively.

### Data analysis

The data was analysed using the Statistical Package of Social Sciences (SPSS statistics), version 22.0 (IBM, Armonk, NY). The estimated prevalence of self-reported VD along with the subjective severity and impact were determined. The data is presented using the form estimate±standard error. Also, the normality of physical, functional, and emotional scores was tested using the Shapiro-Wilk test. It was shown that no score was normally distributed (max $p<0.001$). Therefore, differences between the NVD and VD individuals for the physical, functional, and emotional scores were tested using the Man-Whitney U test. Finally, differences between the NVD and VD individuals for each question were tested using the Chi-squared test.

## RESULTS

The results of the present study revealed that the estimated prevalence of self-perceived voice problems in the sample of 121 undergraduate SLP students examined is 23.14%±3.8% (fig. 1). Twenty-eight out of 121 SLP students investigated received a VDI score of 8–48, which indicates a voice that is slightly, moderately, or profoundly disordered. Eighteen out of 121 (14.87%±3.2%) received a score of 8–14, which indicates a voice that is slightly disordered and 10 out of 121 (8.26%±2.5%) received a score of 15–22, which demonstrates a voice that is moderately disordered. No participants received a score of 23–48 which designates

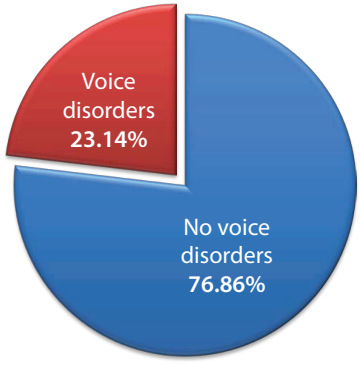


**Figure 1.** The percentage of speech language pathology (SPL) students with and without self-perceived voice disorders.

a profoundly severe VD (fig. 2). Eleven out of 28 (9.09%) students with self-perceived VD were 1st year students, 4 out of 28 (3.30%) were 2nd year students, 6 out of 28 (4.95%) were 3rd year students and 7 out of 28 (5.78%) were 4th year students (fig. 3).

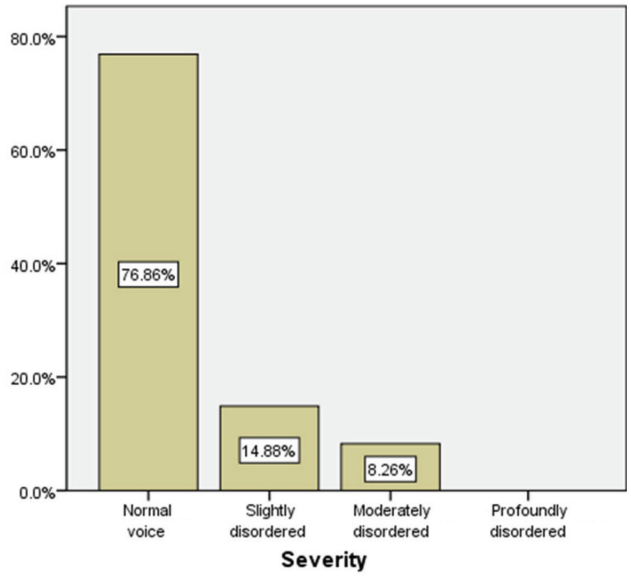


**Figure 2.** Prevalence and severity of voice disorders in speech language pathology (SLP) students.

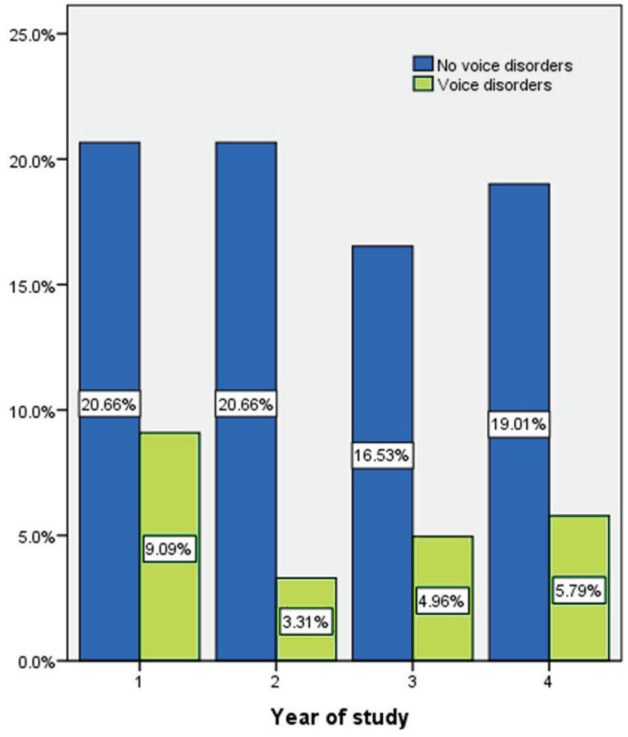


**Figure 3.** Caption: Prevalence of voice and no voice disorders and students' year of study.

The results of the current investigation also revealed that the SLP students in the VD group had a higher overall VDI median score (Mdn=11.5) compared with students in the NVD group (Mdn=2). SLP students in the VD group had a significantly higher median score for functional (VD: Mdn=4; NVD: Mdn=0; U=59.00, z=-8.17, p<0.001), physical (VD: Mdn=4; NVD: Mdn=2; U=380.50, z=-5.75, p<0.001) and emotional (VD: Mdn=5; NVD: Mdn=0; U=159.00, z=-7.96, p<0.001) subscales than students in the NVD group. Therefore, it was concluded that all three subscale scores contributed to the higher VDI score for the VD group.

Furthermore, the results revealed differences between the VD and NVD individuals for all questions in physical, functional and emotion subscales (max p<0.001). The significant questions in each subscale and the adjusted residual values for each question are reported below.

## Physical subscale

In question "Physical 1 (P1)", there were more VD individuals that reported "sometimes" (50% versus 23.7%, z=2.7) and fewer VD individuals that reported "never" (0% versus 40.9%, z=-4.1) having the clarity of their voice being unpredictable than the NVD individuals. In question P2, there were more individuals in the VD category that stated "always" (7.1% versus 0.0%, z=2.6) and "sometimes" (28.6% versus 10.8%, z=2.3) and fewer individuals (21.4% versus 58.1, z=-3.4) that stated "never" was their voice worse in the evening than the NVD category. In question P3, the VD group had significantly more individuals who reported "sometimes" (46.4% versus 2.2%, z=6.2) and fewer who reported "never" (21.4% versus 73.1%, z=-4.9) feeling as though they had to strain to produce voice than the NVD group (tab. 1).

## Emotional subscale

In question "Emotional 1 (E1)", the VD group had significantly more participants who stated "sometimes" (14.3% versus 0.0%, z=3.7) and fewer who stated "never" (60.7% versus 97.8, z=-5.6) being less outgoing because of their voice problem than the NVD group. In question E2, the number of participants in the VD category who reported that "sometimes" (17.9% versus 0.0%, z=4.2) they tend to avoid groups of people because of their voice problem was greater than the NVD group, and the number of participants who stated that they "never" tend to avoid people (57.1% versus 100%, z=-6.7) was significantly lower than the NVD group. In question E3, the number of student participants in the VD group who reported that they "almost always"

**Table 1.** Significant results for VDI questions in the physical subscale for speech language pathology (SLP) university students in the NVD (n=93) and VD (n=28) groups showing the percent of those responding to the statements.

| VDI question | NVD teachers | | VD teachers | | Adjusted residual | p value* |
|---|---|---|---|---|---|---|
| | n | % | n | % | | |
| *Physical 1 (P1)* | | | | | | |
| Never | 38 | 40.9 | 0 | 0.0 | 4.1 | |
| Almost never | 30 | 32.3 | 13 | 46.4 | -1.4 | |
| Sometimes | 22 | 23.7 | 14 | 50.0 | -2.7 | 0.001 |
| Almost always | 2 | 2.2 | 0 | 0.0 | 0.8 | |
| Always | 1 | 1.1 | 1 | 3.6 | -0.9 | |
| *Physical 2 (P2)* | | | | | | |
| Never | 54 | 58.1 | 6 | 21.4 | 3.4 | |
| Almost never | 28 | 30.1 | 10 | 35.7 | -0.6 | 0.000 |
| Sometimes | 10 | 10.8 | 8 | 28.6 | -2.3 | |
| Almost always | 1 | 1.1 | 2 | 7.1 | -1.8 | |
| Always | 0 | 0.0 | 2 | 7.1 | -2.6 | |
| *Physical 3 (P3)* | | | | | | |
| Never | 68 | 73.1 | 6 | 21.4 | 4.9 | |
| Almost never | 23 | 24.7 | 9 | 32.1 | -0.8 | 0.000 |
| Sometimes | 2 | 2.2 | 13 | 46.4 | -6.2 | |
| Almost always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| Always | 0 | 0.0 | 0 | 0.0 | 0.0 | |

* Pearson's Chi-square test

Significant differences between SLP university students in the NVD and the VD groups are indicated in the last column

VDI: Voice Disorder Index, NVD: No voice disorders, VD: Voice disorders

(7.1% versus 0.0%, z=2.6) and "sometimes" (46.4% versus 6.5%, z=5.1) feel embarrassed when people ask them to repeat was more than the NVD group and the number of student participants who reported that they are "never" (17.9% versus 82.8%, z=-6.4) embarrassed was less than the NVD group. In question E4, a higher number of individuals in the VD group stated that "sometimes" (39.3% versus 6.5%, z=4.4) they feel annoyed when people ask them to repeat and a lower number of individuals stated that they "never" (14.3% versus 86.0%, z=-7.2) feel annoyed compared to the NVD group. In question E5, the number of student participants in the VD group who declared that "sometimes" (7.1% versus 0.0%, z=2.6) they are ashamed of their voice problems was more than the NVD group and the number of participants who reported that they "never" (64.3% versus 100.0%, z=-6.0) are ashamed was less than the NVD group (tab. 2).

**Table 2.** Significant results for VDI questions in the emotional subscale for speech language pathology (SLP) university students in the NVD (n=93) and VD (n=28) groups showing the percent of those responding to the statements.

| VDI question | NVD teachers | | VD teachers | | Adjusted residual | p value* |
|---|---|---|---|---|---|---|
| | n | % | n | % | | |
| *Emotional 1 (E1)* | | | | | | |
| Never | 91 | 97.8 | 17 | 60.7 | 5.6 | |
| Almost never | 2 | 2.2 | 7 | 25.0 | -4.0 | |
| Sometimes | 0 | 0.0 | 4 | 14.3 | -3.7 | 0.000 |
| Almost always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| Always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| *Emotional 2 (E2)* | | | | | | |
| Never | 93 | 100.0 | 16 | 57.1 | 6.7 | |
| Almost never | 0 | 0.0 | 7 | 25.0 | -5.0 | 0.000 |
| Sometimes | 0 | 0.0 | 5 | 17.9 | -4.2 | |
| Almost always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| Always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| *Emotional 3 (E3)* | | | | | | |
| Never | 77 | 82.8 | 5 | 17.9 | 6.4 | |
| Almost never | 10 | 10.8 | 8 | 28.6 | -2.3 | 0.000 |
| Sometimes | 6 | 6.5 | 13 | 46.4 | -5.1 | |
| Almost always | 0 | 0.0 | 2 | 7.1 | -2.6 | |
| Always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| *Emotional 4 (E4)* | | | | | | |
| Never | 80 | 86.0 | 4 | 14.3 | 7.2 | |
| Almost never | 7 | 7.5 | 13 | 46.4 | -4.9 | 0.000 |
| Sometimes | 6 | 6.5 | 11 | 39.3 | -4.4 | |
| Almost always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| Always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| *Emotional 5 (E5)* | | | | | | |
| Never | 93 | 100.0 | 18 | 64.3 | 6.0 | |
| Almost never | 0 | 0.0 | 8 | 28.6 | -5.3 | 0.000 |
| Sometimes | 0 | 0.0 | 2 | 7.1 | -2.6 | |
| Almost always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| Always | 0 | 0.0 | 0 | 0.0 | 0.0 | |

* Pearson's Chi-square test

Significant differences between SLP university students in the NVD and the VD groups are indicated in the last column

VDI: Voice Disorder Index, NVD: No voice disorders, VD: Voice disorders

## Functional subscale

In question "Functional 1 (F1)", the VD students' group had a lower percentage of individuals who proclaimed

that they "never" feel left out of conversations because of their voice than the NVD group (64.3% versus 98.9%, z=-5.6). In question F2, the percentage of participants in the VD student's group who stated that "sometimes" (42.9% versus 5.4%, z=5.0) and "almost always" (7.1% versus 0.0%, z=2.6) people have difficulty understanding them in a noisy room was greater than the NVD group and the number of participants who declared that "never" (7.1% versus 71.0%, z=-6.0) do people have difficulty understanding them was lower than the NVD group. In question F3, the students within the VD class had more individuals who reported that "sometimes" (28.6% versus 2.2%, z=4.5) and fewer individuals who reported that "never" (25.0% versus 96.8%, z=-8.4) did their family have difficulty hearing them when calling them through the house than the students within the NVD class. In question F4, the number of individuals in the students' VD category who reported that "sometimes" (35.7% versus 1.1%, z=5.6) their voice makes it difficult for people to hear them is more than the NVD category and the number of individuals in the VD category who reported to "never" (21.4% versus 92.5%, z=-7.7) encounter this difficulty is less than the NVD category (tab. 3).

**Table 3.** Significant results for VDI questions in the functional subscale for speech language pathology (SLP) university students in the NVD (n=93) and VD (n=28) groups showing the percent of those responding to the statements.

| VDI question | NVD teachers | | VD teachers | | Adjusted residual | p value* |
|---|---|---|---|---|---|---|
| | n | % | n | % | | |
| *Functional 1 (F1)* | | | | | | |
| Never | 92 | 98.9 | 18 | 64.3 | 5.6 | |
| Almost never | 1 | 1.1 | 9 | 32.1 | -5.2 | |
| Sometimes | 0 | 0.0 | 1 | 3.6 | -1.8 | 0.000 |
| Almost always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| Always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| *Functional 2 (F2)* | | | | | | |
| Never | 66 | 71.0 | 2 | 7.1 | 6.0 | |
| Almost never | 22 | 23.7 | 11 | 39.3 | -1.6 | 0.000 |
| Sometimes | 5 | 5.4 | 12 | 42.9 | -5.0 | |
| Almost always | 0 | 0.0 | 2 | 7.1 | -2.6 | |
| Always | 0 | 0.0 | 1 | 3.6 | -1.8 | |
| *Functional 3 (F3)* | | | | | | |
| Never | 90 | 96.8 | 7 | 25.0 | 8.4 | |
| Almost never | 1 | 1.1 | 13 | 46.4 | -6.6 | 0.000 |
| Sometimes | 2 | 2.2 | 8 | 28.6 | -4.5 | |
| Almost always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| Always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| *Functional 4 (F4)* | | | | | | |
| Never | 86 | 92.5 | 6 | 21.4 | 7.7 | |
| Almost never | 6 | 6.5 | 12 | 42.9 | -4.7 | 0.000 |
| Sometimes | 1 | 1.1 | 10 | 35.7 | -5.6 | |
| Almost always | 0 | 0.0 | 0 | 0.0 | 0.0 | |
| Always | 0 | 0.0 | 0 | 0.0 | 0.0 | |

* Pearson's Chi-square test

VDI: Voice Disorder Index, NVD: No voice disorders, VD: Voice disorders

Significant differences between SLP university students in the NVD and the VD groups are indicated in the last column

## DISCUSSION

The present study, which represents one of the few studies to explore the prevalence of self-perceived VD in SLP students worldwide,[11,12] revealed that the assessed prevalence of self-reported voice problems in the sample of undergraduate SLP students examined is 23.14%. The prevalence of VD in SLP undergraduate students revealed by the present investigation differs from previously reported research on the prevalence of VD in graduate SLP students which was found to be 11–12% and 27% in the United States (US) and the Netherlands, respectively.[11,12]

The variation among the prevalence outcomes between graduate and undergraduate SLP students may be attributed to differences in voice use among students in different programs, universities, cultures, or geographical regions.[11] Particularly, previous studies involved participants from the US (Ohio and Kansas) and Belgium, while the present investigation included participants from Cyprus.[10,11] Also, past studies included participants from the University of Cincinnati, the Miami University of Ohio, the University of Kansas, and Ghent University while the current investigation contained participants from the Cyprus University of Technology and the European University.[10,11] Thus, voice use between different countries (e.g., US, Belgium, and Cyprus) and university settings (i.e., University of Ohio, University of Kansas, Ghent University, and universities in Cyprus) may vary.

Furthermore, the difference in the prevalence between graduate and undergraduate SLP students may be attributed to differences in the perception of VD and the impact of VD on an individual between different cultures.[18,25] Studies provided evidence that the self-perception of VD may differ from culture to culture. For example, dysphonic patients from Hong Kong presented higher scores on the Voice Activity and Participation Profile than patients from the US.[25] Also, Jordanian teachers scored higher in the

VHI compared to the Kuwaiti and the Emirati teachers.[18] Similarly, American and Belgian SLP students may have a different self-perception of VD than Cypriot SLP students.

Additionally, prevalence differences between undergraduate and graduate SLP students may be attributed to graduate students' awareness of VD and vocal hygiene education. For instance, the graduate SLP students in the US may have received more education regarding VD and vocal hygiene in their undergraduate and graduate programs compared to undergraduate students in Cyprus. Consequently, graduate SLP students may be more aware about VD, as well as voice hygiene and may be implementing vocal hygiene habits more than undergraduate SLP students.

Moreover, the prevalence of VD in SLP undergraduate students revealed by the present study approximates the findings of some previously reported studies on student teachers showing that the prevalence of voice symptoms or complaints on student teachers was 17% in Finland[9] and Sweden.[7] On the other hand, the undergraduate SLP students' prevalence reported by the current investigation differs from earlier findings on student teachers which reported that the prevalence of voice symptoms or complaints on student teachers was 42.0% in Finland[8] and 39.6% in the Netherlands.[6]

Furthermore, the current investigation demonstrated that the prevalence of VD increased in the 1st year students (9.09%), decreased dramatically in the 2nd year students, (3.30%) and then increased gradually in the 3rd (4.95%) and 4th (5.78%) year students. The variation in the prevalence of VD between 1st–4th year students may be attributed to the students' level of awareness of VD and voice hygiene. Specifically, 1st year students may have a low awareness of VD and habits conducive to vocal health. Second year students may have an increased awareness of voice habits that encourage vocal health because they enroll in the VD class in their 2nd and 3rd year. Third and 4th year students may then gradually forget to practice habits that are conducive to voice health. No other study in the literature examined the correlation between SLP students' prevalence of VD and their year of study.

Moreover, significant differences were observed between the VD and NVD student groups in the VDI total and specific VDI statements (i.e., functional, physical, and emotional scores). This outcome is in agreement with other studies which reported differences in the VHI between VD and NVD groups. Investigators translated, adapted, and validated a new version of VHI in Quebec French and revealed that both the total and subscale scores exhibited adequate ability to discriminate between the voice disordered and control groups.[26] Investigators also verified psychometric properties of VHI in Slovak language and reported that the mean score of the control group was significantly lower than the mean score of the dysphonic group.[27] Moreover, researchers examined the possibility of the adaptation of the VHI to the Croatian language and compared the results of its administration between the dysphonic and control groups. Outcomes revealed that individuals with VD had a significantly higher average total VHI score and significantly higher scores in each of the three VHI domains compared to individuals in the control group.[28]

Furthermore, the results indicated differences between VD and NVD individuals for all questions in the physical, functional, and emotion subscales. No other investigation has examined significant differences between the VD and NVD individuals for each question in the VHI or VDI.

Identifying the prevalence of self-perceived VD in SLP students is a crucial piece of information, which was minimally investigated by previous investigations. It indicates the need to develop a preventative vocal hygiene program for the SLP student population. Taking into consideration the effectiveness of vocal hygiene education in preventing or diminishing voice problems in other populations indicated by various investigations, the vocal hygiene program should be directed to promote optimal voice production, reduce abusive voice behaviors, and lessen the functional, physical, and emotional impact of VD on students' daily activities.[19,20]

In summary, the existing research is one of the few investigations that explored the prevalence of VD in undergraduate SLP students. The results of the study overall concluded that voice problems may be more common in undergraduate SLP students in Cyprus than the graduate SLP students in the US and it may be as common as the voice problems in future teachers. Furthermore, voice problems may be less common in undergraduate SLP students in Cyprus than the graduate Dutch students. The outcomes of the investigation also concluded that VD may be more common in 1st year undergraduate students than 2nd, 3rd, and 4th year undergraduate students. These outcomes suggest that undergraduate SLP students may have a low awareness of the voice demands in their future profession and they may be at risk of developing a VD during their career. It is recommended that they receive vocal hygiene education during their training and during their career as SLPs to develop and continue to implement habits conducive to vocal health.

ACKNOWLEDGEMENTS

*We are very thankful to the 121 undergraduate SLP student volunteers that agreed to participate in this survey.*

Funding sources

*The research was funded by the TEPAK post-doctoral program.*

## ΠΕΡΙΛΗΨΗ

**Ο επιπολασμός των αυτοεκτιμώμενων διαταραχών της φωνής σε προπτυχιακούς φοιτητές λογοπαθολογίας**

Κ. ΚΥΡΙΑΚΟΥ, Ε. ΘΕΟΔΩΡΟΥ, Κ. ΠΕΤΕΙΝΟΥ, Ι. ΦΟΙΝΙΚΕΤΤΟΣ

*Τμήμα Επιστημών Αποκατάστασης, Τεχνολογικό Πανεπιστήμιο Κύπρου, Λεμεσός, Κύπρος*

*Αρχεία Ελληνικής Ιατρικής 2024, 41(5):626–634*

**ΣΚΟΠΟΣ** Ολοκλήρωση μιας περαιτέρω ανάλυσης των υφιστάμενων δεδομένων προκειμένου να εκτιμηθεί και να αναλυθεί ο επιπολασμός των αυτοαντιλαμβανόμενων διαταραχών της φωνής σε προπτυχιακούς φοιτητές λογοπαθολογίας στην Κύπρο. **ΥΛΙΚΟ-ΜΕΘΟΔΟΣ** Ένα διαδικτυακό ερωτηματολόγιο συμπληρώθηκε από 124 προπτυχιακούς φοιτητές λογοπαθολογίας, οι οποίοι φοιτούσαν σε δύο πανεπιστήμια της Κύπρου. Αναλύθηκαν τα δεδομένα από τα 121 ερωτηματολόγια. Οι συμμετέχοντες χωρίστηκαν σε δύο ομάδες: φοιτητές με και χωρίς αυτοαντιλαμβανόμενες διαταραχές φωνής. Προσδιορίστηκε ο εκτιμώμενος επιπολασμός και η υποκειμενική σοβαρότητα των αυτοαντιλαμβανόμενων διαταραχών της φωνής. **ΑΠΟΤΕΛΕΣΜΑΤΑ** Ο εκτιμώμενος επιπολασμός των αυτοαντιλαμβανόμενων προβλημάτων φωνής στο δείγμα των 121 προπτυχιακών φοιτητών λογοπαθολογίας που εξετάστηκαν ήταν 23,14%±3,8%. Το 14,87% και το 8,26% των φοιτητών αυτοεκτίμησαν τη φωνή τους ως ελαφρώς και μετρίως διαταραγμένη, αντίστοιχα. Ποσοστό 9,09%, 3,30%, 4,95% και 5,78% των φοιτητών ήταν φοιτητές του 1ου, 2ου, 3ου και 4ου έτους, αντίστοιχα. Επίσης, παρατηρήθηκαν σημαντικές διαφορές μεταξύ των δύο ομάδων φοιτητών στον συνολικό δείκτη διαταραχής φωνής και στις ειδικές δηλώσεις του δείκτη διαταραχής φωνής (δηλαδή, στις βαθμολογίες των σωματικών, λειτουργικών και συναισθηματικών κατηγοριών). **ΣΥΜΠΕΡΑΣΜΑΤΑ** Τα προβλήματα φωνής μπορεί να είναι πιο συχνά στους προπτυχιακούς φοιτητές λογοθεραπείας στην Κύπρο απ' ό,τι στους μεταπτυχιακούς φοιτητές λογοθεραπείας στις Ηνωμένες Πολιτείες της Αμερικής και ενδέχεται να είναι εξ ίσου συχνά με τα προβλήματα φωνής στους μελλοντικούς εκπαιδευτικούς. Επί πλέον, οι αυτοαντιλαμβανόμενες διαταραχές φωνής μπορεί να είναι συχνότερες στους προπτυχιακούς φοιτητές λογοθεραπείας του 1ου έτους απ' ό,τι στους φοιτητές του 2ου, 3ου και 4ου έτους.

**Λέξεις ευρετηρίου:** Διαταραχές φωνής, Επιπολασμός, Λογοθεραπεία, Προπτυχιακοί φοιτητές

## References

1. LYBERG-ÅHLANDER V, RYDELL R, FREDLUND P, MAGNUSSON C, WILÉN S. Prevalence of voice disorders in the general population, based on the Stockholm public health cohort. *J Voice* 2019, 33:900–905
2. SPANTIDEAS N, DROSOU E, KARATSIS A, ASSIMAKOPOULOS D. Voice disorders in the general Greek population and in patients with laryngopharyngeal reflux. Prevalence and risk factors. *J Voice* 2015, 29:389.e27–e32
3. KYRIAKOU K, THEODOROU E, PETINOU K, PHINIKETTOS I. Risk factors for voice disorders in public school teachers in Cyprus. *J Prev Med Hyg* 2020, 61:E221–E240
4. SIMBERG S, SALA E, RÖNNEMAA AM. A comparison of the prevalence of vocal symptoms among teacher students and other university students. *J Voice* 2004, 18:363–368
5. SEARL J, BAILEY E. Vocal behaviors of student actors and student speech-language pathologists. *Voice and Speech Review (VSR)* 2014, 8:5–26
6. THOMAS G, DE JONG FICRS, KOOIJMAN PGC, DONDERS ART, CREMERS CWRJ. Voice complaints, risk factors for voice problems and history of voice problems in relation to puberty in female student teachers. *Folia Phoniatr Logop* 2006, 58:305–322
7. OHLSSON AC, ANDERSSON EM, SÖDERSTEN M, SIMBERG S, BARREGÅRD L. Prevalence of voice symptoms and risk factors in teacher students. *J Voice* 2012, 26:629–634
8. GREVE K, BRYN EK, SIMBERG S. Voice disorders and impact of voice handicap in Norwegian student teachers. *J Voice* 2019, 33:445–452
9. OHLSSON AC, DEMITZ-HELIN G, FURU AC, HÄLLGREN I, KARJALAINEN S. Potential risk factors and prevalence of voice symptoms in students starting their teacher education. *J Voice* 2021, 35:323.e1–323.e8
10. SEARL J, DARGIN T. Voice and lifestyle behaviors of speech-lan-

guage pathology students: Impact of history gathering method on self-reported data. *J Voice* 2021, 35:158.e9–158.e20
11. GOTTLIEBSON RO, LEE L, WEINRICH B, SANDERS J. Voice problems of future speech-language pathologists. *J Voice* 2007, 21:699–704
12. D'HAESELEER E, DE LEY S, COSYNS M, DESOMER E, DE MESEL J, VAN MAELE G ET AL. Speech characteristics in female students training to be speech-language pathologists. *Folia Phoniatr Logop* 2016, 68:167–174
13. SAPIENZA CM, RUDDY BF. *Voice disorders*. Plural Publishing Inc, San Diego, CA, 2009
14. JACOBSON BH, JOHNSON A, GRYWALSKI C, SILBERGLEIT A, JACOBSON G, BENNINGER MS ET AL. The Voice Handicap Index (VHI): Development and validation. *Am J Speech Lang Pathol* 1997, 6:66–70
15. SOUMYA M, NARASIMHAN SV. Correlation between subjective and objective parameters of voice in elderly male speakers. *J Voice* 2022, 36:823–831
16. COLTON RH, CASPER JK. *Understanding voice problems. A physiological perspective for diagnosis and treatment*. Williams & Wilkins, Baltimore, 1996
17. JAYAKUMAR T, SAVITHRI SR. Effect of geographical and ethnic variation on Dysphonia Severity Index: A study of Indian population. *J Voice* 2012, 26:e11–e16
18. ALBUSTAN SA, MARIE BS, NATOUR YS, DARAWSHEH WB. Kuwaiti teachers' perceptions of voice handicap. *J Voice* 2018, 32:319–324
19. BASTOS PRHO, HERMES EC. Effectiveness of the Teacher's Vocal Health Program (TVHP) in the municipal education network of Campo Grande, MS. *J Voice* 2018, 32:681–688
20. SUNDRAM ER, NORSA'ADAH B, MOHAMAD H, MOY FM, HUSAIN NRN, SHAFEI MN. The effectiveness of a voice care program among primary school teachers in Northeastern Malaysia. *Oman Med J* 2019, 34:49–55
21. KYRIAKOU K, THEODOROU E, PETINOU K, PHINIKETTOS I. Risk factors for voice disorders in undergraduate speech language pathology students. *J Voice* 2022, S0892–1997(21)00411–2
22. WEVOSYS. lingWAVES 3: Global handbook for SLP and voice clinic suites. WEVOSYS, Bamberg, 2014
23. WEVOSYS. lingWAVES Voice Disorder Index/Voice Handicap Index-12. WEVOSYS, Bamberg, 2022. Available at: https://www.wevosys.de/produkte/ lingwaves/lingwaves_voice_disorder_index.html
24. GUGATSCHKA M, RECHENMACHER J, CHIBIDZIURA J, FRIEDRICH G. Comparability and conversion of Stimmstörungsindex (SSI) and Voice Handicap Index (VHI). *Laryngorhinootologie* 2007, 86:785–788
25. YIU EML, HO EM, MA EPM, ABBOTT KV, BRANSKI R, RICHARDSON K ET AL. Possible cross-cultural differences in the perception of impact of voice disorders. *J Voice* 2011, 25:348–353
26. BOURQUE JM, DEFOY L, BATCHO CS, TREMBLAY P, GAGNON S, MARTEL-SAUVAGEAU V. Cross-cultural adaptation and validation of the Voice Handicap Index in the Québec French population (VHI-QF). *J Voice* 2020, 34:811.e1–811.e6
27. FRAJKOVA Z, KRIZEKOVA A, MISSIKOVA V, TEDLA M. Translation, cross-cultural validation of the Voice Handicap Index (VHI-30) in Slovak language. *J Voice* 2022, 36:145.e1–145.e6
28. BONETTI A, BONETTI L. Cross-cultural adaptation and validation of the Voice Handicap Index into Croatian. *J Voice* 2013, 27:130.e7–130.e14

*Corresponding author:*

K. Kyriakou, Cyprus University of Technology, Department of Rehabilitation Sciences, 15 Vragadinou street, 3036 Limassol, Cyprus
e-mail: kyriaki.kyriakou@cut.ac.cy