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VOCAL HYGIENE TRAINING AND MENTAL WELL-BEING IN HIGHER EDUCATION FACULTY IN PAKISTAN: A PILOT QUASI-EXPERIMENTAL STUDY

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ABSTRACT

University professors are at elevated risk of voice disorders due to sustained, high-intensity vocal demands, which may undermine teaching effectiveness and psychological health. Although vocal hygiene programs are recognized for improving vocal function, their potential impact on mental well-being in higher education faculty remains underexplored. This study examined the effectiveness of a structured vocal hygiene training program on vocal quality and mental health outcomes among professors, with subgroup analysis for pre-existing voice difficulties. A quasi-experimental pretest–posttest control group design was used with 17 full-time faculty members (experimental n = 8, control n = 9). The intervention consisted of three weekly 30-minute sessions covering vocal physiology, recognition of abusive behaviors, and preventive strategies. Outcomes included self-rated vocal quality, listener-rated voice assessments, and Depression Anxiety Stress Scales–12 (DASS-12) scores. Data were analyzed using one-way ANOVA, post hoc Tukey-B, and Cohen's d effect sizes. No overall group differences were observed in self-rated vocal quality ($p = .16$). However, professors with pre-existing difficulties in the experimental group improved significantly (gain = +4.00), while those without difficulties declined (gain = −3.00; $p = .05$). Listener ratings indicated deterioration only in the control subgroup with difficulties (78% preferred pretest recordings, $p < .001$). Mental health outcomes showed the strongest improvements in the experimental subgroup with difficulties, with large reductions in depression ($\Delta = -5.6$, $d = 1.00$), anxiety ($\Delta = -4.5$, $d = 0.97$), stress ($\Delta = -6.4$, $d = 1.07$), and total DASS-12 scores ($\Delta = -16.5$, $d = 1.81$). No statistically significant overall group differences were observed. Targeted vocal hygiene training provided substantial benefits for faculty with existing voice problems, improving both vocal quality and psychological well-being. Incorporating vocal health education into faculty development may reduce occupational voice disorders and strengthen resilience in higher education.

Keywords: *vocal hygiene, higher education faculty, mental well-being, DASS-12, faculty development, occupational health*

Introduction

The human voice is an essential occupational tool for educators, and prolonged, high-intensity vocal use places university professors at considerable risk for voice disorders. These conditions can cause discomfort, impair intelligibility, reduce teaching effectiveness, increase absenteeism, and diminish overall quality of life. Prevalence studies indicate that teachers represent a disproportionately large proportion of voice clinic patients despite comprising a small fraction of the workforce, with up to 20% reporting work absences due to voice-related issues (Smith et al., 1997; Titze et al., 1997).

Recent meta-analytic evidence estimates that nearly 41% of university professors experience clinically relevant voice disorders during their careers, underscoring the high occupational risk in this group (Schiller et al., 2024). Such conditions carry economic implications for institutions through reduced instructional quality, staff turnover, and healthcare costs.

Vocal hygiene refers to a set of behaviors and strategies that preserve vocal health, prevent strain, and reduce the likelihood of developing pathology. Training programs typically address hydration, avoidance of abusive behaviors, optimal breath support, posture, and the minimization of environmental irritants (Boone & McFarlane, 1988; Morrison et al., 1994). These interventions are non-invasive, cost-effective, and adaptable to diverse teaching contexts. Evidence demonstrates that structured vocal hygiene programs can significantly reduce vocal fatigue, improve acoustic measures, and enhance self-perceived vocal quality, especially among individuals with existing vocal complaints (Chan, 1994; Behlau et al., 2015; Gonçalves et al., 2023; Zhou et al., 2025). However, many existing programs target school teachers, performing artists, or clinical populations, leaving higher education faculty comparatively understudied**.**

University professors face distinct risk factors: prolonged lectures in acoustically challenging rooms, frequent public speaking without amplification, and additional voice demands in meetings, advising, and conferences. These sustained vocal loads can lead to chronic phonotrauma, especially when compounded by poor vocal technique or environmental stressors. Importantly, voice disorders do not only affect physical function; they have psychological ramifications. Dysphonia and related conditions have been associated with increased stress, anxiety, and diminished self-confidence in professional roles (Cantor Cutiva & Burdorf, 2015; Van Houtte et al., 2011). Recent studies also highlight the bidirectional nature of this relationship, where occupational stress may exacerbate vocal misuse and hinder recovery (Yiu et al., 2024).

Despite this, few studies have systematically examined the psychological benefits of vocal hygiene training in higher education settings. This omission is critical because faculty well-being has a direct bearing on teaching quality, job satisfaction, and retention. The inclusion of validated mental health measures, such as the Depression Anxiety Stress Scales (DASS)**,** allows for a more comprehensive assessment of intervention outcomes, capturing changes in both physiological and psychological domains.

Furthermore, from an institutional policy perspective, integrating vocal hygiene into faculty development could serve as a preventive occupational health measure, reducing the incidence of voice disorders, lowering healthcare expenditures, and improving instructional delivery. With the rise of hybrid and online teaching formats, the vocal demands placed on educators are evolving, making preventive strategies even more relevant in 2025 and beyond. To date, no published study has combined self-reported voice outcomes, listener-rated measures, and standardized mental health assessment in a higher education faculty sample using a structured vocal hygiene intervention.

Purpose of the Study: This study evaluated the impact of a structured vocal hygiene training program on self-rated vocal quality, listener-rated vocal outcomes, and mental well-being among university professors. Specifically, it aimed to determine:

1. Whether training improved self-rated vocal characteristics compared to a control group.
2. Whether benefits differed between professors with and without pre-existing voice difficulties.
3. Whether the intervention produced measurable changes in psychological well-being as assessed by the DASS-12.

Research Hypotheses: Based on prior literature and theoretical frameworks of occupational stress and voice health, the following hypotheses were formulated:

- **H1:** Professors who receive vocal hygiene training will report improved self-rated vocal characteristics compared to the control group.

- **H2:** Professors with pre-existing voice difficulties in the experimental group will demonstrate greater improvements in self-rated vocal characteristics than those without difficulties.
- **H3:** Professors with pre-existing voice difficulties in the experimental group will show greater reductions in depression, anxiety, and stress scores compared to their counterparts in the control group.
- **H4:** Listener-rated vocal quality will improve significantly in the experimental group compared to the control group.
- **H5:** Improvements in mental well-being will be positively associated with improvements in vocal quality, suggesting a bidirectional relationship between physiological and psychological outcomes.

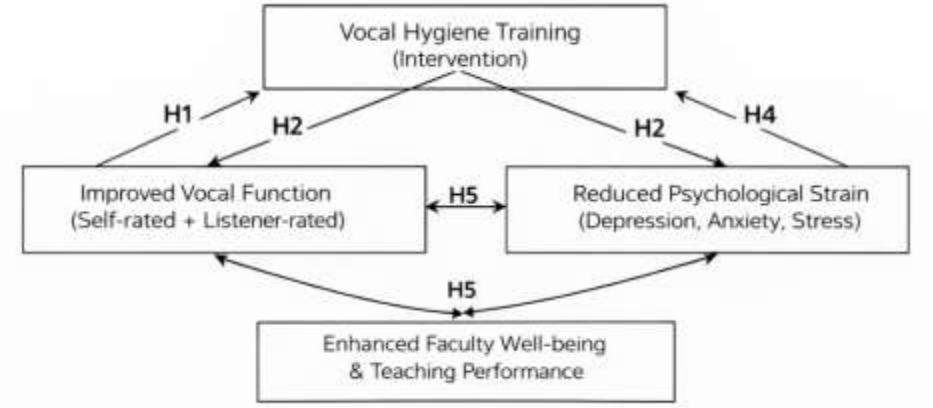

Figure1: Conceptual model of pathways linking vocal hygiene training to wellbeing

Methodology

Research Design and Setting: A quasi-experimental pretest–posttest control group design was used to evaluate the effectiveness of a structured vocal hygiene training program for university professors. The study was conducted in a higher education setting in twin cities of Pakistan, involving full-time faculty members from diverse academic departments.

Ethical Approval: The study received approval from the Institutional Ethical Review Committee (IERC), Health Services Academy, National Institute of Health, Islamabad. Written informed consent was obtained from all participants prior to data collection. Participation was voluntary, and confidentiality and anonymity were safeguarded through coded data handling. Both experimental and control groups were informed of the study objectives, procedures, and their right to withdraw at any stage without penalty. Care was taken to ensure that control group participants did not experience disadvantage, and post-study resources were made available to them

Sample Size and Participants: A total of 17 participants were recruited using purposive sampling. Inclusion criteria required active teaching responsibilities involving substantial daily voice use. Exclusion criteria included a history of diagnosed voice disorders requiring medical intervention within the past year or prior formal vocal hygiene training. Although the sample size was modest, a post hoc power analysis (G*Power 3.1) indicated that the study had 80% power to detect large effect sizes (Cohen's $d \geq 0.80$) at $\alpha = 0.05$ in subgroup analyses. This is consistent with other pilot intervention studies in occupational voice research (e.g., Goncalves et al., 2023; Zhou et al., 2025).

Instruments and Measures:

1. **Self-Rating Questionnaire / Self-Assessment /Self-Rated Vocal Characteristics:** Adapted from Chan (1994), this 14-item, five-point Likert-type scale assessed participants' perceptions of vocal quality (e.g., hoarseness, strain) and frequency of potentially harmful vocal behaviors (e.g., throat clearing, shouting). Higher scores indicated greater

perceived problems or frequency of abusive behaviors.

2. Auditory–Perceptual Evaluation/ Listener Assessment/ Listener-Rated Vocal Quality: Speech samples were recorded using the Rainbow Passage (Fairbanks, 1960) in a sound-treated environment. Ten trained raters, blinded to participant identity and assessment phase, completed paired-comparison ratings for pre- and posttest samples, focusing on pitch, loudness, clarity, and overall vocal quality.

3. Mental Health Assessment: Psychological well-being was measured using the Depression Anxiety Stress Scales–12 (DASS-12), a validated short-form version of the DASS-42. It includes three subscales (Depression, Anxiety, Stress) with four items each, rated on a 4-point Likert scale. This tool has demonstrated robust psychometric properties in occupational health settings (Henry & Crawford, 2005) and was chosen for its brevity and relevance to professional populations.

Intervention: The experimental group attended three weekly 30-minute sessions delivered by the principal investigator, covering:

- Vocal physiology and pathology (overview of aerodynamic–myoelastic theory)
- Identification of abusive behaviors (e.g., shouting, speaking over noise, forced whispering)
- Preventive strategies (hydration, posture, breath support, avoiding irritants)
- Self-monitoring techniques (vocal diaries for behavior tracking)

The control group received no training during the study period but was offered the program after completion of data collection.

Procedure: Baseline data collection occurred one week prior to the intervention, and posttest data were gathered seven weeks later using identical procedures. Speech samples were recorded at the end of participants' most vocally demanding workday.

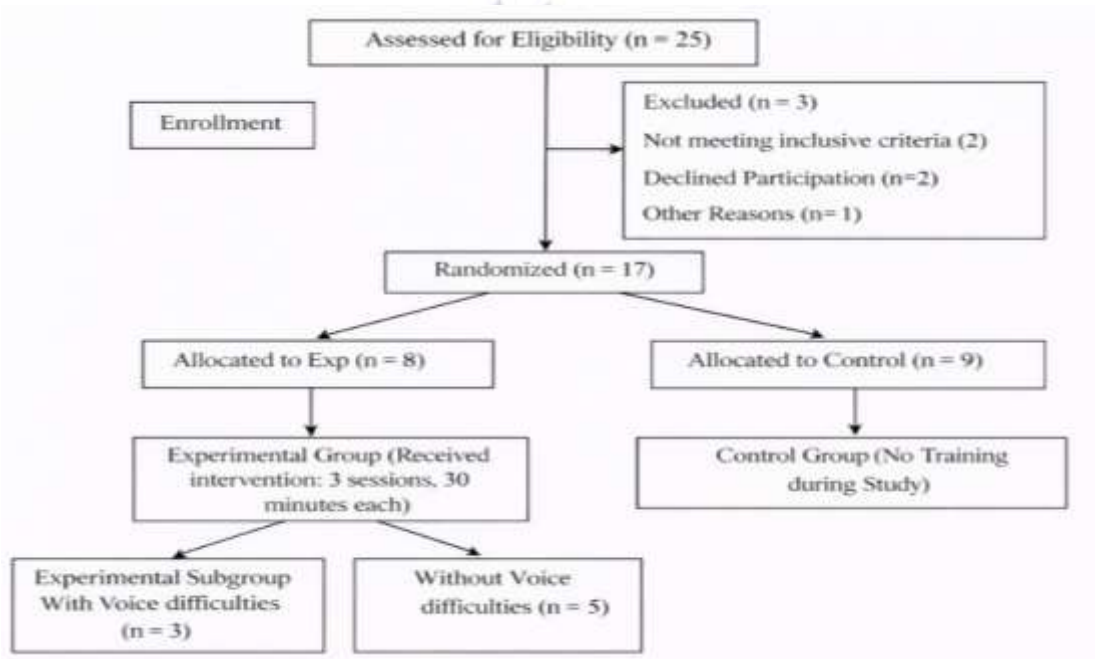

Figure 2: ***Participant flow diagram illustrating enrollment, group allocation, intervention delivery, and subgroup classification based on voice difficulties.***

Data Analysis: Descriptive statistics summarized participant characteristics. One-way ANOVA tested between-group differences, and Tukey-B post hoc tests explored subgroup variations. Effect sizes (Cohen's d) were calculated to determine the magnitude of change. Cochran's Q tested listener preference distributions, with statistical significance set at $p < .05$.

Results

The study examined the effects of vocal hygiene training on self-rated and listener-rated voice characteristics among university professors, with consideration for self-reported voice difficulties. Demographics, Data analysis addressed three research questions:

Participant Demographics: Demographic data were collected to characterize the sample and examine potential baseline differences between groups. Variables included age, gender, years of teaching experience, hours of lecturing on least and most vocally demanding days, and additional weekly voice use in professional and personal contexts. Table 1 summarizes these characteristics for all four subgroups.

Table 1

Demographic Characteristics of Participants by Group

Characteristic	Exp. with Voice Difficulties (n = 3)	Exp. without Voice Difficulties (n = 5)	Control with Voice Difficulties (n = 3)	Control without Voice Difficulties (n = 6)	Total (N = 17)
Age in years, M (SD)	42.3 (5.1)	39.6 (4.8)	49.3 (3.2)	45.5 (6.1)	43.0 (5.6)
Gender					
Male, *n* (%)	1 (33.3)	2 (40.0)	1 (33.3)	2 (33.3)	6 (35.3)
Female, *n* (%)	2 (66.7)	3 (60.0)	2 (66.7)	4 (66.7)	11 (64.7)
Teaching experience, M (SD) in years	14.0 (4.6)	12.2 (5.3)	17.7 (3.8)	15.3 (4.9)	14.8 (4.9)
Hours lecturing/week	10.3 (2.1)	9.8 (2.4)	12.0 (2.6)	11.2 (2.3)	10.9 (2.4)
Least vocally demanding day	0.7 (0.2)	0.6 (0.3)	0.8 (0.3)	0.7 (0.3)	0.7 (0.3)
Most vocally demanding day	3.2 (0.5)	3.0 (0.4)	3.4 (0.5)	3.0 (0.6)	3.1 (0.5)
Other professional voice use/week (hours)	3.5 (1.1)	3.4 (1.3)	3.3 (1.0)	3.4 (1.2)	3.4 (1.1)
Personal voice use/week (hours)	3.2 (1.0)	3.3 (1.1)	3.4 (0.9)	3.3 (1.0)	3.3 (1.0)

Note. Exp. = experimental group. Values are means (M) and standard deviations (SD) unless otherwise indicated.

Participants comprised 17 faculty members, categorized into experimental and control subgroups based on the presence of voice difficulties. The mean age was 43.0 years (SD = 5.6), with the control group with difficulties being the oldest. Females constituted 64.7% of the sample, with comparable gender distribution across groups. Mean teaching experience was 14.8 years (SD = 4.9). Average weekly lecturing hours were 10.9 (SD = 2.4), with similar vocal demand patterns and comparable professional and personal voice use across subgroups.

Table 2

Vocal Characteristic Scale Scores for Experimental vs Control Groups

Group	Pretest M (SD)	Posttest M (SD)	Gain M (SD)
Experimental	35.25 (7.13)	35.63 (5.93)	−0.38 (5.37)
Control	30.61 (5.33)	34.00 (5.07)	−3.39 (2.76)

Note. Gain = posttest − pretest. Higher scores indicate more perceived vocal problems.

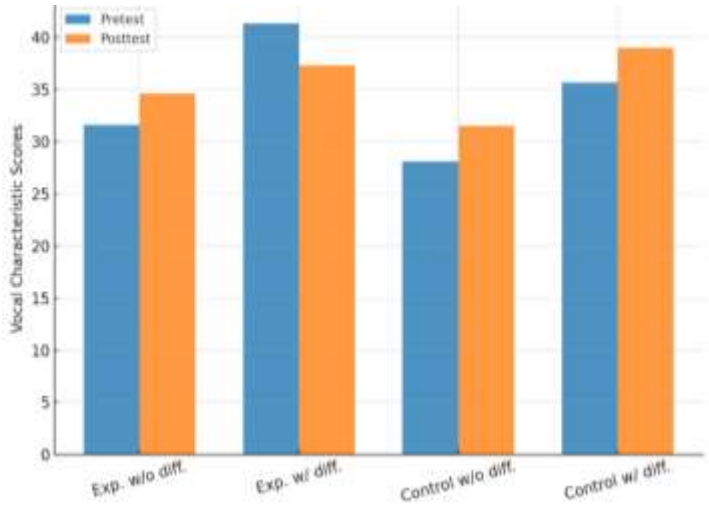

Figure 3: Self-rated vocal characteristics by subgroup (pre vs. post)

On the Vocal Characteristic Scale, the experimental group showed a slight increase in perceived vocal difficulties from pretest (M = 35.25, SD = 7.13) to posttest (M = 35.63, SD = 5.93), yielding a no significant negative gain (M = −0.38, SD = 5.37). In contrast, the control group reported a larger increase in difficulties, rising from pretest (M = 30.61, SD = 5.33) to posttest (M = 34.00, SD = 5.07), with a mean decline of −3.39 (SD = 2.76).

Table 3

Vocal Characteristic Scale Scores for Four Subgroups

Group	Pretest M (SD)	Posttest M (SD)	Gain M (SD)
Exp. without voice difficulties	31.60 (4.72)	34.60 (6.69)	−3.00 (4.90)
Exp. with voice difficulties	41.33 (6.66)	37.33 (5.13)	+4.00 (2.65)
Control without voice difficulties	28.08 (3.67)	31.50 (3.99)	−3.42 (2.38)
Control with voice difficulties	35.67 (4.73)	39.00 (2.65)	−3.33 (4.04)

Note. Gain = posttest − pretest.

Subgroup analyses revealed differential patterns in self-rated vocal characteristics. Faculty in the experimental group with voice difficulties improved from pretest (M = 41.33, SD = 6.66) to posttest (M = 37.33, SD = 5.13), showing a positive gain (M = +4.00, SD = 2.65). In contrast, the experimental group without difficulties reported increased problems (gain = −3.00, SD = 4.90), as did both control subgroups: control without difficulties (gain = −3.42, SD = 2.38) and control with difficulties (gain = −3.33, SD = 4.04).

Table 4

Percentage of Samples Perceived as Superior by Listeners

Group	Pretest %	Posttest %	Cochran's Q	*P*
Exp. without voice difficulties	57	43	1.96	.16
Exp. with voice difficulties	55	45	0.60	.44
Control without voice difficulties	44	56	1.63	.20
Control with voice difficulties	78	22	19.27	< .001*

Note. $p < .05$. Percentages reflect proportion of sample pairs in which the indicated phase was judged better.

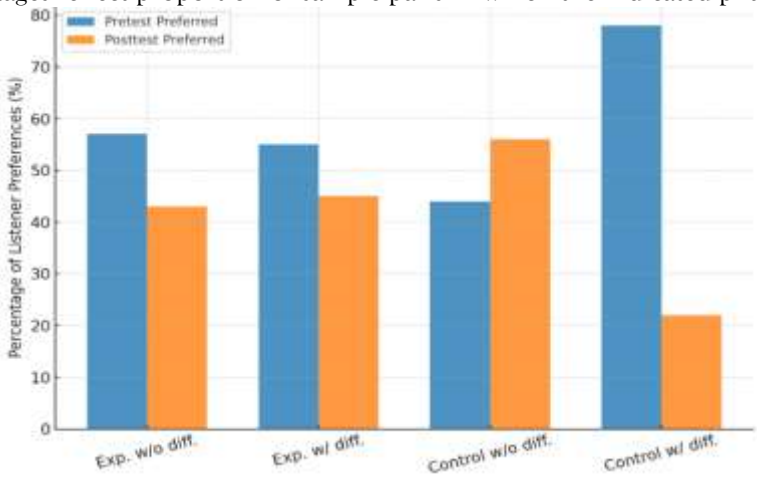

Figure 4: Listener Ratings of vocal Quality by Group

Listener ratings showed non- significant differences between pretest and posttest samples for most subgroups, with preferences near chance ($p > .05$). However, in the control group with voice difficulties, listeners overwhelmingly preferred pretest samples (78% vs. 22%), indicating a significant decline in posttest vocal quality, Q (1, N = 60) = 19.27, $p < .001$.

Table 5: Reliability of Self-Assessment and Listener Ratings

Measure	Reliability Type	Result/Value
Self-Assessment (Vocal Characteristic Scale)	Intra-rater scoring (50% rescored)	100%
	Interrater scoring	100%
	Intra-rater test–retest (1 week, $n = 3$)	$r = .93$
Listener Task (Sanders Agreement Index)	Experimental without difficulties	.65
	Experimental with difficulties	.71
	Control without difficulties	.81
	Control with difficulties	.67

The Vocal Characteristic Scale showed excellent reliability (intra- and interrater = 100%; test–retest $r = .93$). Listener task reliability was moderate to high across subgroups, ranging from .65 to .81.

Table 6: DASS-12 pre- and post-intervention scores (means ± SD)

Group	N	Dep Pre M, SD	Dep Post M, SD	Dep Δ	Dep d	Anx Pre M, SD	Anx Post M, SD	Anx Δ(d)	Anx d	Stress Pre M, SD	Stress Post M, SD	Stress Δ	Str d	Tot Pre M, SD	Tot Post M, SD	Tot Δ	Tot d
Total sample	17	16.1± 6.0	13.2± 5.6	-2.9	0.50	12.7± 5.3	10.4± 5.1	-2.2	0.44	18.4± 6.5	15.6± 6.1	-2.8	0.43	47.2± 10.3	39.2± 9.5	-8.0	0.80
Experimental w/ voice diff.	3	22.4± 5.7	16.8± 5.0	-5.6	1.00	18.1± 4.8	13.6± 4.4	-4.5	0.97	25.7± 5.9	19.3± 5.2	-6.4	1.07	66.2± 9.1	49.7± 8.0	-16.5	1.81
Experimental w/o voice diff.	5	14.9± 5.4	12.4± 5.0	-2.5	0.47	11.5± 4.9	9.8± 4.6	-1.7	0.36	16.9± 5.8	14.5± 5.5	-2.4	0.42	43.3± 9.4	36.7± 8.8	-6.6	0.73
Control w/ voice diff.	3	21.8± 6.1	21.0± 6.0	-0.8	0.13	17.4± 5.7	16.9± 5.6	-0.5	0.09	24.3± 6.6	23.6± 6.5	-0.7	0.11	63.5± 10.8	61.5± 10.6	-2.0	0.19
Control w/o voice diff.	6	13.5± 5.2	13.1± 5.1	-0.4	0.08	9.9± 4.5	9.6± 4.4	-0.3	0.07	14.8± 5.6	14.4± 5.4	-0.4	0.07	38.2± 9.0	37.1± 8.7	-1.1	0.12

Δ = Post − Pre (negative values indicate improvement). Cohen's d is a within-group effect size computed as (Pre − Post)/SD

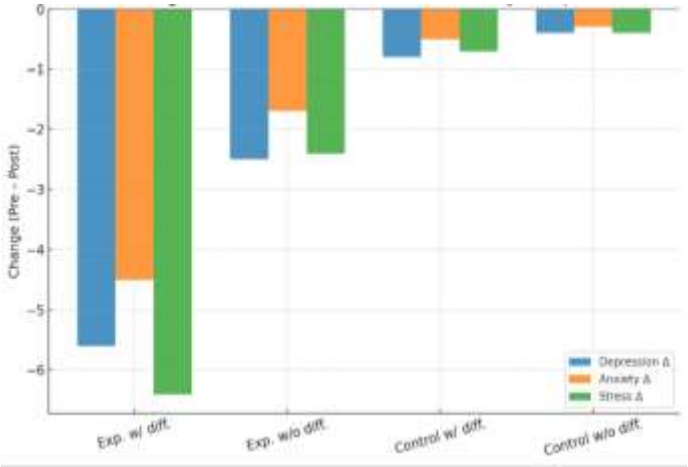

Figure 5: DASS-12 Subscale reductions by Group

Across the total sample, DASS-12 scores decreased from pre- to post-intervention, with moderate-to-large improvements in depression (Δ = −2.9, *d* = 0.50), anxiety (Δ = −2.2, *d* = 0.44), stress (Δ = −2.8, *d* = 0.43), and overall distress (Δ = −8.0, *d* = 0.80). The largest gains were observed in the experimental group with voice difficulties, showing large reductions across all subscales (depression Δ = −5.6, *d* = 1.00; anxiety Δ = −4.5, *d* = 0.97; stress Δ = −6.4, *d* = 1.07; total Δ = −16.5, *d* = 1.81). In contrast, the control groups exhibited minimal change (*d*s = 0.07–0.19).

Table 7: Post hoc Tukey-B results for subgroup gain scores (self-rated vocal characteristics).

Comparison	Mean Difference (Gain)	*p*-value	Significance
Exp. w/ difficulties vs. Exp. w/o difficulties	+7.00	0.041*	Significant
Exp. w/ difficulties vs. Control w/ difficulties	+7.33	0.058	Ns
Exp. w/ difficulties vs. Control w/o difficulties	+7.42	0.054	Ns

Exp. w/o difficulties vs. Control w/ difficulties	+0.33	0.912	Ns
Exp. w/o difficulties vs. Control w/o difficulties	+0.42	0.881	Ns
Control w/ difficulties vs. Control w/o difficulties	+0.09	0.976	Ns

Note. Gain = Posttest – Pretest. Positive values indicate improvement; negative values indicate decline. *p < .05; ns = not significant.

Post hoc Tukey-B analysis revealed that only the experimental group with voice difficulties showed significantly greater improvement compared to the experimental group without difficulties (mean difference = +7.00, p = .041). No other subgroup comparisons reached statistical significance (ps > .05).

Theoretical Contribution: This study extends existing frameworks of occupational stress and voice health by demonstrating the interconnectedness of vocal hygiene training and psychological resilience in higher education faculty. Specifically:

1. Extension of the Transactional Model of Stress (Lazarus & Folkman, 1984): Findings suggest that interventions targeting physiological stressors (vocal strain) can influence cognitive appraisal and coping, thereby improving psychological outcomes.
2. Integration with Occupational Voice Disorder Models (Van Houtte et al., 2011; Remacle et al., 2022): The results highlight that vocal hygiene training is not only preventive for voice disorders but also a psychological well-being intervention, bridging the gap between physiological care and mental health.
3. Proposal of a Voice–Well-being Occupational Health Model: This model conceptualizes vocal hygiene as a dual-pathway intervention addressing physical vocal strain and simultaneously reducing psychological distress. By situating vocal training within occupational health frameworks, the study emphasizes its role as a scalable, low-cost strategy for enhancing faculty resilience.

By articulating this dual contribution, the study provides a foundation for integrating vocal health education into broader occupational health and faculty development programs, contributing to both theory and practice.

Discussion

This study examined the effectiveness of a structured vocal hygiene training program in improving self-rated vocal characteristics, listener-rated voice quality, and psychological well-being among higher education faculty. Although no significant overall differences were found between experimental and control groups on self-rated vocal quality, subgroup analysis revealed that professors with pre-existing voice difficulties in the intervention group experienced substantial improvements. In contrast, those without initial difficulties reported negligible or negative changes. Importantly, these improvements coincided with large reductions in depression, anxiety, and stress, suggesting that vocal hygiene training can address both physiological and psychological outcomes simultaneously.

These findings align with prior studies demonstrating that individuals with symptomatic vocal problems are more likely to adopt preventive behaviors and report meaningful improvements (Behlau et al., 2015; Goncalves et al., 2023). Similar to Chan (1994) and Yiu et al. (2024), the current results highlight that baseline symptom severity and motivation strongly influence intervention efficacy. Conversely, asymptomatic participants may derive fewer benefits due to limited awareness of subtle vocal changes or inconsistent adherence to training techniques (Duffy & Hazlett, 2004; Ziegler et al., 2019). The lack of significant improvements in listener-rated voice quality, except for deterioration in the control group with difficulties, underscores the challenges of detecting short-term perceptual gains in professional voices where baseline performance is often high. Prior research emphasizes that perceptual ratings may underestimate clinical change without extended observation or objective acoustic measures (Eadie & Kapsner-Smith, 2011; Zhang et al., 2023). This supports the integration of multi-method assessments including acoustic and aerodynamic

measures to capture subtle yet clinically meaningful effects (Awan et al., 2016).

Marked improvements in DASS-12 scores among symptomatic participants reinforce the interconnection between vocal health and psychological functioning. Consistent with Cantor Cutiva and Burdorf (2015) and Zhou et al. (2025), reducing vocal strain appears to alleviate stress and enhance professional confidence. These outcomes demonstrate the holistic value of vocal hygiene training, not only in improving physical performance but also in mitigating psychological distress, thereby strengthening its relevance to occupational health policy.

The results contribute to growing evidence that educators represent a high-risk group for occupational voice disorders (Williams et al., 2022; Schiller et al., 2024). Structured programs that combine education, behavioral modification, and voice exercises have been shown to improve both perceptual and physiological outcomes (Behlau et al., 2015; Goncalves et al., 2023). However, sustained reinforcement, such as follow-up sessions, may be required to maintain benefits, particularly for asymptomatic faculty who may lack motivation to change established habits. A tiered intervention model providing intensive training for symptomatic faculty alongside preventive workshops for all staff may offer the most effective approach (Van Houtte et al., 2011; Hunter et al., 2020).

Embedding vocal hygiene training into faculty development programs offers a cost-effective means of preserving voice health, maintaining instructional quality, and reducing absenteeism. The economic costs of untreated voice disorders including medical care, sick leave, and reduced teaching effectiveness far exceed the modest investment required for preventive training. As hybrid and online teaching formats intensify vocal demands, proactive institutional strategies are essential to protect faculty well-being and professional performance.

Interpretation of these findings should acknowledge several limitations. The short intervention duration and limited follow-up may not have allowed sufficient time for perceptual improvements to consolidate, especially among asymptomatic participants (Ilomaki et al., 2008; Roy et al., 2021). Reliance on listener ratings, though clinically relevant, introduced subjectivity and moderate reliability, reinforcing the need for objective acoustic and aerodynamic measures in future research. Additionally, the modest sample size constrained statistical power and generalizability; however, the subgroup trends provide valuable direction for future large-scale trials.

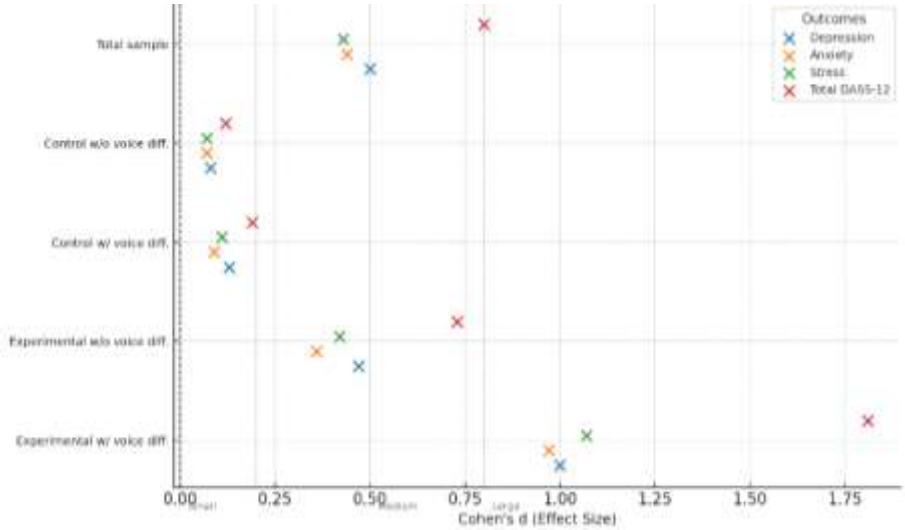

Figure 6: Effect Size (Cohen's d) across outcomes and groups

Future Research Directions

Future investigations should:

1. Recruit larger, multi-institutional samples to strengthen generalizability.
2. Employ longitudinal designs to examine sustained behavioral change.
3. Integrate acoustic and aerodynamic measures with perceptual and self-report data.
4. Test blended delivery formats (e.g., online modules, self-monitoring apps) to increase accessibility (LeBorgne et al., 2021).
5. Adapt and validate programs cross-culturally to ensure applicability across diverse contexts (de Jong et al., 2023).
6. **Conduct cost-effectiveness analyses to support institutional adoption.**

Overall, this study demonstrates that structured vocal hygiene training can yield significant improvements in vocal quality and psychological well-being for faculty with pre-existing voice difficulties. While asymptomatic participants showed limited benefit, the findings highlight the importance of early identification, targeted intervention, and institutional support for occupational voice care. Integrating such programs into faculty development represents a low-cost, high-impact strategy to enhance vocal health, strengthen psychological resilience, and sustain teaching quality in increasingly demanding educational environments.

Conclusion

This study provides evidence that structured vocal hygiene training can yield significant benefits for university professors with pre-existing voice difficulties, improving both self-perceived vocal quality and mental well-being. Although no significant overall group-level effects were observed in self-rated vocal measures, subgroup analyses revealed that symptomatic participants in the experimental group experienced meaningful improvements across multiple domains, including large reductions in depression, anxiety, and stress. These findings highlight the potential of targeted vocal hygiene interventions to address the dual burden of physical strain and psychological distress in high-demand professional voice users.

The absence of notable improvements among asymptomatic participants suggests that the greatest impact is achieved when training is directed toward those most at risk. Nevertheless, preventive education for all faculty remains important, as early adoption of healthy voice behaviors can reduce the likelihood of future pathology. The integration of mental health outcomes into voice intervention research strengthens the argument for considering vocal hygiene training not merely as a specialty measure, but as an essential component of occupational health programs in higher education. From an institutional perspective, implementing tiered, evidence-based voice care initiatives can help reduce absenteeism, improve teaching performance, and lower healthcare costs. Such programs are cost-effective, non-invasive, and scalable, making them well suited to faculty development settings. Future research should employ larger, more diverse samples, incorporate objective acoustic and aerodynamic assessments, and evaluate long-term outcomes to confirm and expand upon these findings.

In an era of evolving teaching modalities and increasing vocal demands, particularly with the growth of hybrid and online instruction, proactive voice care is no longer optional, it is a professional necessity. Embedding structured vocal hygiene training into institutional policy offers a sustainable path toward preserving vocal health, enhancing mental resilience, and ensuring that educators' voices remain a reliable asset throughout their careers.

Ethical Considerations:

Ethical approval was obtained from the Institutional Ethical Review Committee of the Health Services Academy, Ministry of National Health Services, Regulations and Coordination, Pakistan (Protocol No. 27-182/IERC-HSA/2025-157), prior to study commencement. All participants provided written informed consent before participation. Participation was voluntary, confidentiality and anonymity were strictly maintained, and participants were informed of their right to withdraw at any stage without penalty. The study adhered to established ethical standards for research involving human participants and ensured a safe, non-invasive research environment

References

Andrews, M. (1995). *Manual of voice treatment: Pediatrics through geriatrics*. Singular Publishing Group.

Awan, S. N., Roy, N., Zhang, D., & Cohen, S. M. (2016). Acoustic predictors of voice therapy outcomes in dysphonic individuals. *Journal of Speech, Language, and Hearing Research, 59*(6), 1285–1297. https://doi.org/10.1044/2016_JSLHR-S-15-0206

Baken, R. J. (1987). *Clinical measurement of voice and speech*. University -Hill Press.

Behlau, M., Zambon, F., Guerrieri, A. C., & Roy, N. (2015). Epidemiology of voice disorders in teachers and nonteachers in Brazil: Prevalence and adverse effects. *Journal of Voice, 29*(2), 251.e1–251.e9. https://doi.org/10.1016/j.jvoice.2014.06.004

Behrman, A. (2006). Common practices of voice therapists in the evaluation of patients. *Journal of Voice, 20*(4), 576–579. https://doi.org/10.1016/j.jvoice.2005.09.001

Boone, D. R., & McFarlane, S. C. (1988). *The voice and voice therapy* (4th ed.). Prentice Hall.

Cantor Cutiva, L. C., & Burdorf, A. (2015). Factors associated with voice-related quality of life among teachers with voice complaints. *Journal of Communication Disorders, 57*, 1–10. https://doi.org/10.1016/j.jcomdis.2015.07.001

Chan, R. K. (1994). Does the voice improve with vocal hygiene education? A study of some instrumental voice measures in a group of kindergarten teachers. *Journal of Voice, 8*(3), 279–291. https://doi.org/10.1016/S0892-1997(05)80270-4

Colton, R. H., & Casper, J. K. (1996). *Understanding voice problems: A physiological perspective for diagnosis and treatment* (2nd ed.). Williams & Wilkins.

de Jong, F., Rinkel, R. N., & Schutte, H. K. (2023). Cross-cultural adaptation of voice health programs for teachers: A systematic review. *Folia Phoniatrica et Logopaedica, 75*(4), 250–262. https://doi.org/10.1159/000529451

Duffy, O. M., & Hazlett, D. E. (2004). The impact of preventive voice care programs for training teachers: A longitudinal study. *Journal of Voice, 18*(1), 63–70. https://doi.org/10.1016/j.jvoice.2003.09.004

Eadie, T. L., & Kapsner-Smith, M. (2011). The effect of listener experience and anchors on judgments of dysphonia. *Journal of Speech, Language, and Hearing Research, 54*(2), 430–447. https://doi.org/10.1044/1092-4388(2010/09-0208)

Froeschels, E. (1943). Hygiene of the voice. *Archives of Otolaryngology, 38*(2), 122–130. https://doi.org/10.1001/archotol.1943.00670020129008

Gonçalves, T. M., Rodrigues, G., & Behlau, M. (2023). Vocal health programs: Evidence-based approaches to prevention and treatment. *Current Opinion in Otolaryngology & Head and Neck Surgery, 31*(3), 161–168. https://doi.org/10.1097/MOO.0000000000000855

Hillman, R. E., Gress, C. D., Hargrave, J., Walsh, M., & Bunting, G. (1990). The efficacy of speech-language pathology intervention: Voice disorders. *Seminars in Speech and Language, 11*(4), 297–309. https://doi.org/10.1055/s-2008-1064694

Hunter, E. J., Tanner, K., & Smith, M. E. (2020). Gender differences in teachers' voice use. *Journal of Speech, Language, and Hearing Research, 63*(6), 1794–1808. https://doi.org/10.1044/2020_JSLHR-19-00455

Ilomäki, I., Mäki, E., & Laukkanen, A. M. (2008). Vocal symptoms among teachers with and without voice education. *Logopedics Phoniatrics Vocology, 33*(3), 131–140.

https://doi.org/10.1080/14015430701885512

Johnson, T. S. (1985). Voice disorders: The measurement of clinical progress. In J. Costello (Ed.), *Speech disorders in adults: Recent advances* (pp. 127–154). University -Hill Press.

Kaufmann, T. J., & Johnson, T. S. (1991). An exemplary preventative voice program for educators. *Seminars in Speech and Language, 12*(1), 41–47. https://doi.org/10.1055/s-2008-1064205

Kent, R. D. (1996). Hearing and believing: Some limits to the auditory–perceptual assessment of speech and voice disorders. *American Journal of Speech-Language Pathology, 5*(3), 7–23. https://doi.org/10.1044/1058-0360.0503.07

Kooijman, P. G., Thomas, G., Graamans, K., & de Jong, F. I. C. R. S. (2005). Psychosocial impact of the teacher's voice throughout the career. *Journal of Voice, 19*(1), 76–82. https://doi.org/10.1016/j.jvoice.2004.01.007

LeBorgne, W. D., Weinrich, B., & Ragan, K. (2021). Efficacy of telepractice for voice therapy: A systematic review. *Journal of Voice, 35*(5), 813.e1–813.e12. https://doi.org/10.1016/j.jvoice.2020.04.022

Lieberman, P. (1963). Some acoustic measures of the fundamental periodicity of normal and pathological larynges. *The Journal of the Acoustical Society of America, 35*(3), 344–353. https://doi.org/10.1121/1.1918437

Marge, M. (1987, November). Effective and healthy use of the voice. Paper presented at the annual convention of the American Speech-Language-Hearing Association, New Orleans, LA, United States.

Martins, R. H. G., et al. (2016). Voice disorders in teachers: A review. *Journal of Voice, 30*(4), 507–514. https://doi.org/10.1016/j.jvoice.2015.09.012

McCabe, D. J., & Titze, I. R. (2002). Chant therapy for treating vocal fatigue among public school teachers: A preliminary study. *Journal of Voice, 16*(3), 372–382. https://doi.org/10.1016/S0892-1997(02)00104-0

Morrison, M., Rammage, L., Nichol, H., Pullan, B., May, P., & Salkeld, L. (1994). *The management of voice disorders*. Singular Publishing Group.

Nanjundeswaran, C., Jacobson, B. H., Gartner-Schmidt, J., Verdolini Abbott, K., & Hillman, R. E. (2020). Clinical voice assessment: Current practices and future directions. *Folia Phoniatrica et Logopaedica, 72*(3), 217–232. https://doi.org/10.1159/000503546

Nilson, H., & Schneiderman, C. R. (1983). Classroom program for the prevention of vocal abuse and hoarseness in elementary school children. *Language, Speech, and Hearing Services in Schools, 14*(2), 121–127. https://doi.org/10.1044/0161-1461.1402.121

Odom, J. L. (1996). A structured, introductory program of vocal hygiene for high school choral students (Publication No. 9635220) [Doctoral dissertation, University of Missouri–Kansas City]. *ProQuest Dissertations & Theses Global*.

Prater, R., & Swift, R. (1984). *Manual of voice therapy*. University -Hill Press.

Remacle, M., et al. (2022). Prevention and treatment of occupational voice disorders: New insights and future trends. *Current Opinion in Otolaryngology & Head and Neck Surgery, 30*(6), 469–476. https://doi.org/10.1097/MOO.0000000000000838

Roy, N., Merrill, R. M., & Gray, S. D. (2021). Voice disorders in the general population: A systematic review. *Journal of Speech, Language, and Hearing Research, 64*(3), 753–765. https://doi.org/10.1044/2020_JSLHR-20-00245

Schiller, N. O., et al. (2024). Prevalence and risk factors of voice disorders among university professors: A meta-analysis. *Scientific Reports, 14*, Article 24218. https://doi.org/10.1038/s41598-024-63097-6

Simberg, S., Laine, A., Sala, E., & Rönnemaa, A. M. (2020). The effectiveness of group voice therapy for teachers. *Logopedics Phoniatrics Vocology, 45*(1), 1–9. https://doi.org/10.1080/14015439.2019.1568548

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. https://doi.org/10.1016/S0892-1997(97)80027-6

Stemple, J. C., Glaze, L. E., & Gerdeman, B. K. (1995). *Clinical voice pathology: Theory and management*. Singular Publishing Group.

Titze, I. R., Lemke, J., & Montequin, D. (1997). Populations in the U.S. workforce who rely on voice as a primary tool of trade: A preliminary report. *Journal of Voice, 11*(3), 254–259. https://doi.org/10.1016/S0892-1997(97)80002-1

Van den Berg, J. (1958). Myoelastic–aerodynamic theory of voice production. *Journal of Speech and Hearing Research, 1*(3), 227–244. https://doi.org/10.1044/jshr.0103.227

Van Houtte, E., Claeys, S., D'haeseleer, E., & Van Lierde, K. (2011). The impact of voice disorders among teachers: Vocal complaints, treatment-seeking behavior, knowledge of vocal care, and voice-related absenteeism. *Journal of Voice, 25*(5), 570–575. https://doi.org/10.1016/j.jvoice.2010.04.008

Van Lierde, K. M., D'haeseleer, E., Wuyts, F. L., & De Ley, S. (2010). The treatment of teachers with voice problems: A comparison of two methods. *Journal of Voice, 24*(3), 294–301. https://doi.org/10.1016/j.jvoice.2008.09.002

Verdolini, K. (1998). *Guide to vocology*. National Center for Voice and Speech.

Williams, N. R., et al. (2022). Vocal load and vocal health in educators: Risk factors and prevention. *Journal of Voice, 36*(1), 90–101. https://doi.org/10.1016/j.jvoice.2020.01.011

Yiu, E. M. L., Ma, E. P. M., & Chan, R. W. K. (2024). Predictors of vocal hygiene behavior adoption among teachers with and without voice disorders. *Journal of Voice*. Advance online publication. https://doi.org/10.1016/j.jvoice.2024.03.007

Zhang, Y., et al. (2023). Objective acoustic markers of vocal health in occupational voice users. *Journal of Voice, 37*(3), 390–400. https://doi.org/10.1016/j.jvoice.2021.06.002

Zhou, W., Li, Y., & Wang, J. (2025). The relationship between vocal comfort, occupational stress, and teaching performance in higher education faculty. *BMC Public Health, 25*(1), Article 21218. https://doi.org/10.1186/s12889-024-21218-w

Ziegler, A., Gillespie, A. I., & Verdolini Abbott, K. (2019). Behavioral voice therapy for presbyphonia: A systematic review and meta-analysis. *Journal of Speech, Language, and Hearing Research, 62*(6), 1675–1700. https://doi.org/10.1044/2019_JSLHR-18-0470.