Vol. 9, No. 5 Oktober 2026, Hal. 845–855 p-ISSN: 2622 – 6014; e-ISSN: 2745 – 8644

JURNAL
PROMOTIF PREVENTIF

Faktor-Faktor yang Berhubungan dengan Permasalahan Suara Anak Prasekolah di Surakarta: Studi Potong Lintang dengan Analisis Jalur

Factors Associated with Voice Problems in Preschool Children in Surakarta, Indonesia: A Cross-Sectional Study Using Path Analysis

Anggi Resina Putri*, Nadya Susanti
Speech Therapy, Health Polytechnics Ministry of Health, Surakarta, Indonesia

Article Info

Article History
Received: 29 Sep 2026
Revised: 13 Okt 2026
Accepted: 28 Okt 2026

ABSTRACT / ABSTRAK

*Voice disorders in preschool children may affect communication, social interaction, and learning. This study aimed to analyze factors associated with voice disorders in preschool children. A cross-sectional study was conducted among 100 children from two kindergartens in Surakarta, Indonesia, using random sampling. Voice disorders were assessed using the Pediatric Voice Handicap Index (pVHI). Data were analyzed using the Chi-square test and path analysis. The prevalence of voice disorders was 66%, and all factors showed significant associations in the bivariate analysis (*p*<0.001). Path analysis identified functional factors (b=4.47;* p*<0.001), environmental factors (b=3.78;* p*<0.001), and vocal behavior (b=2.66;* p*=0.025) factors directly associated with the outcome in the specified model. Physiological, psychological, and social factors were indirectly associated with voice disorders through functional, environmental, and vocal behavior pathways. Voice disorders in preschool children are associated with interconnected factors, particularly functional, environmental, and vocal behavior factors.*

Keywords: *voice disorders; preschool children; path analysis; vocal behavior; environmental factors.*

Gangguan suara pada anak prasekolah dapat memengaruhi komunikasi, interaksi sosial, dan proses belajar. Penelitian ini bertujuan menganalisis faktor-faktor yang berhubungan dengan gangguan suara pada anak prasekolah. Studi potong lintang dilakukan pada 100 anak dari dua taman kanak-kanak di Surakarta, Indonesia, menggunakan teknik *random sampling*. Gangguan suara dinilai menggunakan *Pediatric Voice Handicap Index* (pVHI). Analisis dilakukan dengan uji Chi-square dan analisis jalur. Prevalensi gangguan suara sebesar 66%, dan seluruh faktor menunjukkan hubungan signifikan pada analisis bivariat (*p*<0,001). Analisis jalur mengidentifikasi faktor fungsional (b=4,47; *p*<0,001), lingkungan (b=3,78; *p*<0,001), dan perilaku vokal (b=2,66; *p*=0,025) sebagai factor yang berhubungan langsung dalam model. Faktor fisiologis, psikologis, dan sosial berhubungan secara tidak langsung melalui jalur fungsional, lingkungan, dan perilaku vokal. Gangguan suara berkaitan dengan berbagai faktor yang saling berhubungan, terutama faktor fungsional, lingkungan, dan perilaku vokal.

Kata kunci: Gangguan suara; anak prasekolah; analisis jalur; perilaku vokal; faktor lingkungan.

Corresponding Author*:*

Name : Anggi Resina Putri
Affiliate : Jurusan Terapi Wicara, Poltekkes Kemenkes Surakarta
Address : Jl. Letjend Sutoyo Mojosongo Surakarta, Jawa Tengah 57127
Email : anggiresinaputri@gmail.com

INTRODUCTION

Voice disorders are among the communication problems affecting preschool- and school-aged children and may have consequences for communication, academic performance, and psychosocial development. During early childhood, vocal function plays an important role in language acquisition, social interaction, and classroom participation. Persistent voice problems may therefore be associated with difficulties in educational participation, emotional well-being, and quality of life. Despite their clinical significance, pediatric voice disorders may remain underrecognized because abnormal vocal quality is sometimes perceived as a temporary condition or a normal characteristic of childhood (Campano et al., 2023).

The prevalence of pediatric voice disorders varies considerably across populations, with previous studies reporting rates ranging from 6% to 23% among school-aged children(Alrahim et al., 2022). This wide variation reflects differences in diagnostic criteria, assessment methods, and population characteristics, highlighting the need for further epidemiological evidence to support effective prevention and early intervention strategies. Delayed recognition of voice disorders, particularly during the preschool years, may postpone appropriate management and increase the risk of long-term communication and social difficulties (Szkiełkowska et al., 2020). However, prevalence estimates and risk-factor findings from other populations cannot automatically be generalized to Indonesian preschool children, whose family environments, vocal habits, and educational contexts may differ.

Voice production involves the coordinated functioning of the respiratory, laryngeal, and resonatory systems and is influenced by behavioral and contextual conditions. Previous literature has identified excessive vocal behaviors, such as frequent shouting and loud talking, as factors associated with vocal problems in children. Environmental conditions and psychosocial circumstances have also been discussed in relation to vocal health (Hoffmann & Cielo, 2021). These findings support a multidimensional approach to understanding pediatric voice problems. Nevertheless, evidence concerning individual risk factors does not, by itself, establish how different domains may be interrelated or whether their associations with voice problems may occur through other factors.

In this study, six constructs—physiological, psychological, vocal behavior, environmental, functional, and social factors—were selected to represent complementary domains potentially associated with preschool children's voice problems. Physiological factors represent aspects of children's physical condition relevant to voice production, whereas psychological factors represent emotional and psychological circumstances that may be associated with vocal function. Vocal behavior covers patterns of voice use that may contribute to vocal strain. Environmental factors represent conditions surrounding children, while functional factors concern voice-related difficulties in everyday activities. Social factors represent interpersonal and social-contextual circumstances that may be associated with children's vocal health. These domains were considered together to capture the potential interrelationships between children's characteristics, their voice-use behaviors, and their surrounding contexts. Although prior literature provides a rationale for considering multiple domains, the specific pathways connecting all six constructs should be regarded as hypotheses to be examined rather than established causal mechanisms.

A key knowledge gap is the limited context-specific understanding of how physiological, psychological, behavioral, environmental, functional, and social factors are interrelated in association with voice problems among preschool children in Indonesia, particularly in Surakarta. In particular, it remains unclear whether the associations observed between these domains and voice problems are predominantly direct or may also be statistically mediated through other measured factors. Examining each factor separately using conventional bivariate analyses can identify individual associations but cannot adequately characterize a network of direct and indirect relationships within a single model. Path analysis provides an analytical approach to estimate these relationships simultaneously, quantify specified direct and indirect associations, and assess whether the proposed pattern of relationships is consistent with the observed data. However, the interpretation of indirect associations depends on the specified model and does not establish temporal order or causation in a cross-sectional study.

The novelty of this study lies in its integrated examination of six interrelated domains and the use of path analysis to investigate their direct and indirect associations with voice problems among preschool children in Surakarta, Indonesia. Rather than evaluating risk factors exclusively as separate associations, this study examines how the selected domains may be statistically connected within a single analytical framework. The findings are intended to contribute context-specific evidence on the relationships among these factors and to inform future research on early identification of voice problems in preschool children.

Therefore, this study aimed to examine the direct and indirect associations among physiological, psychological, vocal behavior, environmental, functional, and social factors in relation to voice problems among preschool children in Surakarta, Indonesia, using path analysis. The findings may inform the development of context-sensitive approaches to early identification and support multidisciplinary health promotion involving speech-language therapists, healthcare professionals, teachers, and parents. Such approaches warrant further evaluation to determine their feasibility and effectiveness in promoting vocal health during early childhood (Campano et al., 2023) (Ramos et al., 2022).

RESEARCH METHODS

This study employed an analytical cross-sectional design to examine factors associated with voice problems in children. The independent variables included excessive voice use, sex, parenting practices, exposure to a smoking environment, and inappropriate eating habits, while the dependent variable was voice problems. The study was conducted in Surakarta, Indonesia, which comprises five subdistricts. To provide representation from different areas of the city, participants were recruited from two kindergartens located in Banjarsari and Jebres subdistricts. A total of 100 children participated in the study. Data collection was conducted from April to August 2026. Participants were selected using random sampling. Simple random sampling was based on the principle that each eligible individual had an equal and independent probability of being selected for inclusion in the sample.

Voice problems were assessed using the validated Pediatric Voice Handicap Index (pVHI), completed by parents or primary caregivers. The instrument demonstrated a Cronbach's alpha of 0.97. Vocal behavior referred to habitual voice use, such as shouting or

excessive voice use. Environmental factors referred to environmental exposures, such as noise or irritants. Functional factors referred to indicators of voice-related functional limitations, whereas social factors referred to indicators of social interaction or participation. Data were collected using structured questionnaires completed by parents or primary caregivers after informed consent had been obtained.

Data were analyzed using univariate, bivariate, and multivariable analyses. Associations between the independent variables and voice problems were examined using logistic regression. Path analysis was also conducted to examine the direct and indirect associations among the study variables. Statistical analyses were performed using [insert statistical software and version], with statistical significance set at $p < 0.05$. Multivariate analysis was performed using path analysis to evaluate the simultaneous effects of the independent variables on voice disorders among preschool children. This approach enabled the examination of both direct and indirect relationships among the study variables. The analyses were conducted using Stata version 17.0. The path analysis model included seven observed variables: physiological factors, psychological factors, vocal behavior, environmental factors, functional factors, social factors, and voice disorders. This study was reviewed and approved by the Health Research Ethics Committee of Universitas Muhammadiyah Purwokerto (approval number: KEPK/UMP/199/VI/2026).

RESULTS

Univariate analysis

Table 1. Descriptive Statistics for Continuous Variables

Variable	N	Mean	SD	Min	Max
Voice disorders	100	48.39	13.87	20	78
Physiological factors	100	10.12	3.85	3	18
Psychological factors	100	9.78	3.64	3	17
Vocal behavior	100	9.77	3.82	3	17
Environmental factors	100	9.69	3.69	3	17
Functional factors	100	9.78	4.02	3	18
Social factors	100	7.69	3.61	2	15

Source: Primary Data, 2026

Table 1 presents the descriptive statistics for voice disorders and the six factors examined in the study. The mean voice disorder score was 48.39 (SD = 13.87), with scores ranging from 20 to 78. Among the six factors, physiological factors had the highest mean score (10.12, SD = 3.85), whereas social factors had the lowest (7.69, SD = 3.61). The mean scores for psychological factors, vocal behavior, environmental factors, and functional factors were relatively similar. These findings describe the observed scores in the study sample and do not, by themselves, indicate the distribution of the data or the representativeness of the wider population.

Bivariate Analysis

Bivariate analysis was performed using the Chi-square test to examine the associations between the independent variables and voice disorders, with statistical significance set at $p < 0.05$

Table 2. Bivariate Analysis of Determinants of Voice Disorders Among Preschool Children in Surakarta.

Variables		No Voice Disorders n (%)	Voice Disorders n (%)	OR	*p*
Physiological factors	Low risk	26 (65.00)	14 (35.00)	12.07	<0.001
	High risk	8 (13.33)	52 (86.67)		
Psychological factors	Low risk	29 (65.91)	15 (34.09)	19.72	<0.001
	High risk	5 (8.93)	51 (91.07)		
Vocal behavior	Low risk	22 (62.86)	13 (37.14)	7.47	<0.001
	High risk	12 (18.46)	53 (81.54)		
Environmental factors	Low risk	32 (76.19)	10 (23.81)	89.60	<0.001
	High risk	2 (3.45)	56 (96.55)		
Functional factors	Low risk	30 (78.95)	8 (21.05)	54.38	<0.001
	High risk	4 (6.45)	58 (93.55)		
Functional factors	Low risk	32 (68.09)	15 (31.91)	54.40	<0.001
	High risk	2 (3.77)	51 (96.23)		

Source: Primary Data (processed), 2026

Table 2 presents the results of the bivariate analysis. All independent variables were significantly associated with voice disorders among preschool children ($p < 0.001$). Children with high-risk physiological factors were 12.07 times more likely to experience voice disorders than those with low-risk physiological factors (OR = 12.07). High-risk psychological factors increased the likelihood of voice disorders by 19.72 times (OR = 19.72), whereas high-risk vocal behavior was associated with a 7.47-fold higher risk (OR = 7.47). Environmental factors showed the strongest association, with children in the high-risk group being 89.60 times more likely to develop voice disorders than those in the low-risk group (OR = 89.60). Likewise, high-risk functional and social factors were associated with 54.38-fold (OR = 54.38) and 54.40-fold (OR = 54.40) greater odds of voice disorders, respectively. These findings indicate that all investigated determinants were significantly associated with voice disorders, with environmental factors demonstrating the strongest association.

Path Analysis

Table 3 presents the results of the path analysis. The proposed model demonstrated an acceptable fit to the empirical data. Voice disorders among preschool children were directly influenced dengan directly associated within the specified model by functional factors, environmental factors, and vocal behavior. Functional factors showed the strongest direct effect on voice disorders (b = 4.47, 95% CI: 2.06–6.88, p < 0.001), followed by environmental factors (b = 3.78, 95% CI: 1.70–5.86, p < 0.001) and vocal behavior (b = 2.66, 95% CI: 0.33–5.00, p = 0.025). Children with high-risk profiles for these factors were more likely to experience voice disorders than those with low-risk profiles.

The analysis also identified several significant indirect pathways. Physiological factors influenced voice disorders through functional factors (b = 1.36, 95% CI: 0.40–2.32, p = 0.005) and vocal behavior (b = 1.28, 95% CI: 0.23–2.32, p = 0.017). Psychological factors exerted indirect effects through functional factors (b = 2.47, 95% CI: 0.96–2.87, p < 0.001) and environmental factors (b = 1.20, 95% CI: 0.11–2.30, p = 0.030). In addition, social factors indirectly affected voice disorders through environmental factors (b = 2.94, 95% CI: 1.83–4.06, p < 0.001) and vocal behavior (b = 2.48, 95% CI: 1.34–3.61, p < 0.001).

The hypothesized relationships between the exogenous and endogenous variables are illustrated in Figure 1**.**

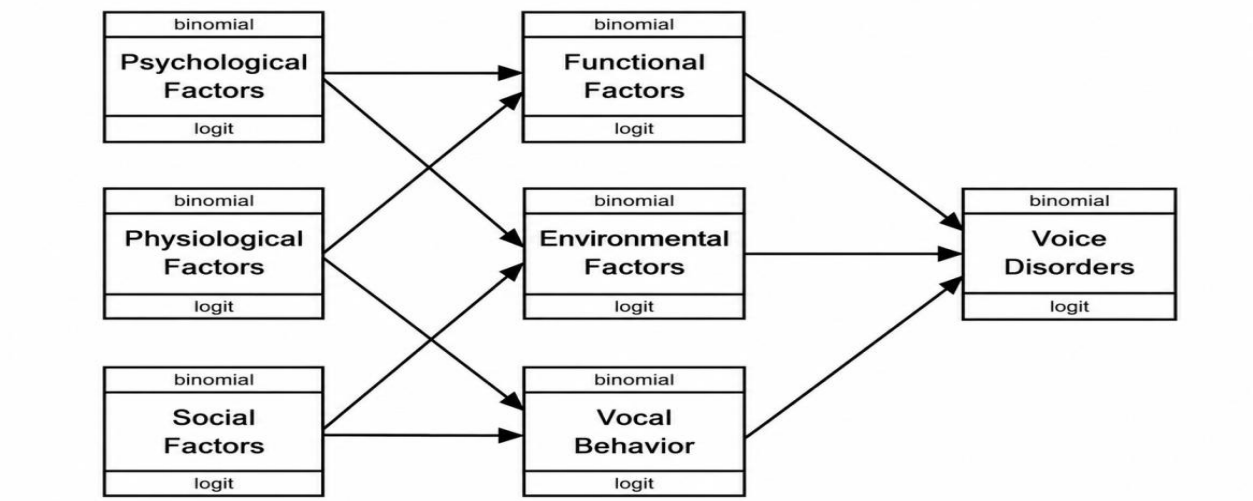


Figure 1. Path Analysis Model Specification of the Determinants of Voice Disorders Among Preschool Children in Surakarta

Table 3 Results of the Path Analysis of Determinants of Voice Disorders Among Preschool Children in Surakarta

Dependent Variable	Independent Variable	B	95% CI		*p*
			Lower limit	Upper limit	
Direct Effects					
Voice disorders ←	Functional factors	4.47	2.06	6.88	<0.001
←	Environmental factors	3.78	1.70	5.86	<0.001
←	Vocal behavior	2.66	0.33	5.00	0.025
Indirect Effects					
Functional factors ←	Physiological factors	1.36	0.40	2.32	0.005
←	Psychological factors	2.47	0.96	2.87	<0.001
Environmental Factors ←	Social factors	2.94	1.83	4.06	<0.001
←	Psychological factors	1.20	0.11	2.30	0.030
Vocal behavior ←	Physiological factors	1.28	0.23	2.32	0.017
←	Social factors	2.48	1.34	3.61	<0.001
Log likelihood =	**−153.94**				
N observations =	**100**				

DISCUSSION

This study found that voice problems were common among the 100 preschool children assessed in two kindergartens in Surakarta, with 66% classified as having voice problems according to the study criteria. The bivariate analyses also showed associations between voice problems and all six examined factors: physiological, psychological, vocal behavior, environmental, functional, and social factors. In the path analysis, functional factors, environmental factors, and vocal behavior showed direct associations with voice problems, whereas physiological, psychological, and social factors were associated with voice problems through indirect pathways in the proposed model. These findings highlight the interconnected nature of the factors associated with preschool voice problems, although the cross-sectional design does not establish temporal relationships or causality.

The proportion of children classified as having voice problems warrants careful interpretation. Comparisons with previous studies should consider differences in participant characteristics, assessment instruments, case definitions, and cutoff scores. Studies based on caregiver-reported voice handicap questionnaires may yield different proportions from those using clinical voice examinations or perceptual assessments. Therefore, the observed proportion of 66% should not be interpreted as a population prevalence estimate or directly compared with published prevalence figures unless the assessment methods and definitions of voice problems are sufficiently comparable. Furthermore, because the sample included children from only two kindergartens, the findings may reflect characteristics of these particular settings. The precision of the estimated proportion should also be considered; a larger sample drawn from a wider range of settings would help establish a more precise estimate and improve the applicability of the findings.

Physiological factors were associated with voice problems in the bivariate analysis and were linked to voice problems indirectly through functional factors and vocal behavior in the path analysis. Physiological conditions may be related to differences in phonatory function, respiratory support, or the effort required for voice production. These possibilities are consistent with discussions of pediatric voice disorders in previous literature (Milea et al., 2024);(Chan, 2021). However, because the present study used a cross-sectional design, the findings cannot establish whether physiological conditions preceded functional difficulties or changes in vocal behavior. The observed indirect pathways should therefore be interpreted as relationships consistent with the proposed model rather than confirmed physiological mechanisms.

Psychological factors were also associated with voice problems in the bivariate analysis. In the path model, these factors were linked indirectly to voice problems through functional and environmental factors. Emotional regulation, attention, and behavioral characteristics may be related to how children use their voices and respond to communication demands. Previous literature has discussed potential relationships among psychological or behavioral difficulties, vocal behaviors, and pediatric voice problems (Lee et al., n.d.);(Kaline et al., n.d.);(Feinstein et al., 2022). Nevertheless, the present model did not establish that psychological difficulties caused functional limitations or changes in environmental exposure. Other explanations, including overlapping questionnaire content,

shared caregiver perceptions, and unmeasured family or developmental characteristics, may also contribute to the observed associations.

Vocal behavior demonstrated a direct association with voice problems in the path analysis and was also associated with voice problems in the bivariate analysis. Behaviors such as shouting and excessive voice use may increase vocal load and mechanical stress on the vocal folds. Previous studies have discussed the relationship between phono traumatic vocal behaviors and pediatric voice disorders (Poulain et al., 2020);(Stojanovic et al., 2023). The present findings are compatible with this literature but do not establish that the reported behaviors preceded the voice problems. Children who already experience voice difficulties may also change how they use their voices, making the direction of the relationship uncertain.

Environmental factors showed a direct association with voice problems in the path analysis. Environmental exposures, including secondhand smoke, airborne irritants, and noise, may be relevant to children's vocal health and everyday voice use. Previous research has examined associations between environmental conditions and voice-related difficulties in children(Ramos et al., 2022);(Aoki et al., 2021);(Fasano et al., 2023) However, the interpretation depends on the specific environmental indicators measured in the present study. For example, exposure to smoke or irritants represents a different potential pathway from noise, which may influence vocal effort and communication behavior. These exposures should not be treated as interchangeable, and the findings do not establish that any particular exposure caused the reported voice problems.

Functional factors showed a direct association with voice problems and had the largest direct path coefficient among the factors reported in the model. This finding indicates that functional indicators were closely associated with voice problem scores within the specified analysis. The interpretation, however, depends on how these indicators were operationally defined. If the functional measures include difficulties that overlap conceptually with the voice disorder outcome, the strength of the association may partly reflect shared measurement content rather than a distinct underlying mechanism. Previous research has discussed relationships between functional, neuromotor, and regulatory characteristics and children's communication abilities (Bielova & Konopliasta, 2023);(Patel et al., 2021). Such findings provide context, but evidence concerning broader communication difficulties should not automatically be interpreted as direct evidence about voice disorders.

Social factors were associated with voice problems in the bivariate analysis but did not demonstrate a direct association in the path model. Instead, they were linked indirectly through environmental factors and vocal behavior. This pattern suggests that the relationship between social conditions and voice problems may be represented in the model through children's environments and patterns of voice use. Family communication practices, household conditions, and opportunities for social interaction may be relevant to children's everyday vocal experiences. Previous studies have discussed associations between social circumstances and children's communication-related outcomes (Volgina et al., 2021);(Rosdiana et al., 2024) However, social factors are broad constructs, and their interpretation should be limited to the specific indicators assessed in this study. The indirect pathways do not establish that social circumstances necessarily produce environmental exposures or particular vocal behaviors.

Taken together, the path analysis provides a framework for understanding how physiological, psychological, and social factors may be statistically related to voice problems through functional, environmental, and behavioral factors. The direct and indirect associations should not be interpreted as proof of mediation mechanisms unless the indirect effects were formally estimated and their uncertainty assessed. In addition, the relatively small sample and the potential overlap among questionnaire-based measures may affect the stability and interpretation of the path coefficients. The findings therefore require confirmation in studies using larger samples, clearly differentiated measures, and methods capable of establishing temporal ordering.

Several limitations should be considered when interpreting these findings. First, the sample comprised 100 preschool children from only two kindergartens in Surakarta, which limits the extent to which the results can be generalized to children in other geographical, socioeconomic, and educational settings. The sample size may also have reduced the precision of estimates, particularly in the path analysis involving several interrelated variables. Second, voice problems and associated factors were assessed using questionnaires completed by parents or primary caregivers. Although the pVHI demonstrated high internal consistency (Cronbach's alpha = 0.97), caregiver reports may be influenced by recall, subjective interpretation, and differences in observations across home and school settings. Internal consistency does not, by itself, establish diagnostic accuracy. If an independent clinical voice assessment was not conducted, the classification of voice problems could not be independently confirmed. Third, the cross-sectional design does not establish temporal order or causality. Accordingly, the path coefficients represent associations within the proposed model rather than confirmed direct, indirect, or causal mechanisms.

Despite these limitations, the findings indicate that preschool voice problems should be considered in relation to a range of behavioral, environmental, functional, physiological, psychological, and social characteristics. The results may support further investigation and inform discussions about voice health education, caregiver awareness, and the identification of children who may benefit from additional assessment. They do not establish the effectiveness of any specific preventive or therapeutic intervention. Future research should include larger and more diverse samples, clearly defined and validated measures, and clinical voice assessments where feasible. Longitudinal studies would also help clarify the temporal relationships among the examined factors and determine whether the indirect pathways identified in this study are reproducible.

CONCLUSION AND RECOMMENDATIONS

This study identified significant associations between physiological, psychological, vocal behavior, environmental, functional, and social factors and voice problems in preschool children. Path analysis revealed direct associations involving functional, environmental, and vocal behavior factors, while physiological, psychological, and social factors were associated with voice problems through indirect pathways in the proposed model. These findings highlight the multifactorial nature of voice problems in preschool children, although causal relationships cannot be established from the cross-sectional design.

Parents and preschool teachers should be encouraged to promote healthy voice use and seek professional assessment for children with persistent voice complaints. Future

multicenter longitudinal studies using adequately powered samples, validated instruments, and clinical voice assessments are needed to clarify the temporal relationships among these factors and validate the pathways identified in this study.

REFERENCES

Akhmetzyanova, A., & Artemyeva, T. (2023). *EPV0745 The study of speech and communication in preschool children with autism spectrum disorder EPV0747 The specifics of understanding emotions in children with disabilities Validation of the Arabic Version of the Kessler Psychological Distress Scale (K6) among college students in Kuwait*. 1402. https://doi.org/10.1192/j.eurpsy.2023.2052

Alrahim, A., Alshaibani, A. K., Algarni, S., Alsaied, A., Alghamdi, A. A., Alsharhan, S., & Al-Bar, M. (2022). Prevalence and Determinants of Hoarseness in School-Aged Children. *International Journal of Environmental Research and Public Health*, *19*(9). https://doi.org/10.3390/ijerph19095468

Aoki, T., Takeyama, T., Sakamoto, Y., Shimada, A., Kondo, E., Nakano, S., Fukuda, J., Azuma, T., Sato, G., Kitamura, Y., Hosokawa, K., Udaka, J., & Takeda, N. (2021). Effects of vocal nodules on acoustic characteristics of voice in children: An acoustic analysis of voice. *Journal of Medical Investigation*, *68*(3.4), 276–279. https://doi.org/10.2152/jmi.68.276

Bielova, O., & Konopliasta, S. (2023). *Functionality of oral and articulatory praxis in older preschool children with logopathology*. *18*(6). https://doi.org/10.22141/2224-0551.18.6.2023.1627

Broeck, R. Van Den, Gistelinck, L., Vettori, S., Deferm, W., Vos, S., & Bollen, B. (2025). *Social orienting in prematurely born preschoolers : a case control study showing altered neural tuning towards voices , not faces*.

Campano, M., Cox, S. R., Caniano, L., & Koenig, L. L. (2023). A Review of Voice Disorders in School-Aged Children. *Journal of Voice*, *37*(2), 301.e1-301.e7. https://doi.org/10.1016/j.jvoice.2020.12.018

Chan, K. (2021). *The Workings of the Human Voice : Common Pathologies and Holistic Approaches to Vocal Health*.

Fasano, R. M., Perry, L. K., Bulotsky-shearer, R. J., Custode, S. A., & Messinger, D. S. (2023). *Automated measures of vocal interactions and engagement in inclusive preschool classrooms*. *June*, 1586–1599. https://doi.org/10.1002/aur.2980

Feinstein, H., Abbott, K. V., & Morini, G. (2022). Developmental Changes in the Perception of Vocal Loudness and Voice Quality in 3-to 6-Year-Old Children. *American Journal of Speech-Language Pathology*, *31*(6), 2628–2642. https://doi.org/10.1044/2022_AJSLP-22-00106

Hoffmann, C. F., & Cielo, C. A. (2021). Characteristics of the Voice of Dysphonic School Children from 4:0 to 7:11 Years Old. *Journal of Voice*, *35*(4), 664.e11-664.e19. https://doi.org/10.1016/j.jvoice.2019.12.004

Kakuta, K., & Kawasaki, A. (2025). *Executive function in preschool children who stutter : a behavioral assessment study*. 1–9.

Kaline, I., Barbosa, L., Behlau, M., Lopes, L. W., Nadjara, L., & Almeida, A. (n.d.). *ARTICLE IN PRESS Voice and Self-Regulation : Integrating Review of the Literature*. https://doi.org/10.1016/j.jvoice.2020.06.023

Lee, J. M., Roy, N., Dietrich, M., & City, S. L. (n.d.). *ARTICLE IN PRESS Personality , Psychological Factors , and Behavioral Tendencies in Children With Vocal Nodules : A Systematic Review I*. https://doi.org/10.1016/j.jvoice.2018.07.016

Milea, A., Milea, A., & Sarafoleanu, C. (2024). Dysphonia in children. *Romanian Journal of Rhinology*, *14*(56), 37–39. https://doi.org/10.2478/rjr-2024-0025

Patel, N., Nabil, A., Alshammari, M., & Alkuraya, F. S. (2021). Hoarse voice in children as the presenting feature of ECM1-related lipoid proteinosis. *American Journal of Medical Genetics, Part A*, *185*(12), 3924–3925. https://doi.org/10.1002/ajmg.a.62406

Poulain, T., Fuchs, M., Vogel, M., Jurkutat, A., Hiemisch, A., Kiess, W., & Berger, T. (2020). Associations of Speaking-Voice Parameters With Personality and Behavior in School-Aged Children. *Journal of Voice*, *34*(3), 485.e23-485.e31. https://doi.org/10.1016/j.jvoice.2018.09.022

Ramos, P. H., Álvarez, M. L., León, N. I., Badía, P. I., & Napolitano, C. A. (2022). Voice Disorders in Children: Experience in the Voice Unit at Universidad Católica Clinical Hospital. *Journal of Voice*, *36*(2), 293.e1-293.e5. https://doi.org/10.1016/j.jvoice.2020.04.035

Rosdiana, I., Kesoema, T. A., Rio, H., & Widanarti, D. (2024). *Speech and language delay in Children : Effects of medical and nonmedical Risk Factors*. *13*(December), 87–99.

Stojanovic, J., Veselinovic, M., Jevtic, M., Jovanovic, M., Nikolic, D., Pficer, J. K., Zivkovic-marinkov, E., & Relic, N. (2023). *Assessment of Life Quality in Children with Dysphonia Using Modified Pediatric Voice-Related Quality of Life Questionnaire in Serbia*.

Szkiełkowska, A., Miaśkiewicz, B., Gos, E., Skarżyński, P. H., & Świerniak, W. (2020). Voice disorders in children starting school education. *Otolaryngologia Polska*, *74*(6), 16–20. https://doi.org/10.5604/01.3001.0014.1613

Volgina, S. Y., Ahmetova, A. R., & Shaidukova, L. K. (2021). *The role of risk factors in the development of speech and language disorders in preschool children*. *102*(4), 1–7. https://doi.org/10.17816/KMJ2021-537