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Noise Exposure, Auditory Ailments, and Non-auditory Effects that Influence the Workability of all Teachers: A Scoping Review

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Abstract

Background: Noise exposure has impacts on health and workability. There are not enough scoping reviews on how noise exposure affects the health and workability of primary and high school teachers. Therefore, this study provides a scoping review of such a topic.

Materials and Methods: A search of Google Scholar, JSTOR, Elsevier, PubMed, and reference lists of literature published between 2000 and 2022 was done to find empirical data in the literature on teachers' exposure to noise and its consequences on their hearing and workability. The PRISMA-ScR protocol was applied.

Results: All 20 studies reviewed, used a cross-sectional design. 50% of the studies used a calibrated sound level meter to implement the direct noise level evaluation method, while 75.0% used questionnaires. The main school-related noise source was students' activities (n = 12, 60.0%), and the main non-school-related noise source was vehicles (n = 6, 30%). These led to temporary hearing loss (n = 6, 30.0%). The non-auditory effects, such as shouting and disturbance (n = 8, 40% each) and annoyance (n = 7, 35% each), influenced the workability (performance) of the teachers as well as their interactions in the classroom. The noise levels that produced the effects were 50.0 to 92.1 dBA on primary school teachers and 68.9 to 95.2 dBA on high school teachers.

Conclusions: Noise leads to hearing loss and poor workability of teachers. Regular school noise monitoring and surveillance to identify noisy areas and apply interventions is to be done.

Keywords: Noise, Health, Adverse Effects, Employees, Schools

Introduction

Noise pollution poses a severe threat to public health in both developed and developing nations, with urbanization, industrialization, and overcrowding among the main contributors to increasing noise levels that often exceed allowable limits [1,2]. As civilization develops, ambient noise variety and volume have grown gradually and consistently [3-5].

Noise exposure is an occupational hazard affecting people in many workplace environments, including teachers [6-8, 9]. In schools, noise emanates from various sources, such as classroom chatter, equipment operation, outdoor activities, and school events [10-12]. Continuous exposure to elevated noise levels can have detrimental effects on auditory health and workability [13]. This introduction explores the interconnectedness of noise exposure, auditory ailments, and non-auditory effects, elucidating their effects on the workability of teachers.

Noise exposure in schools significantly risks teachers' auditory health [14,15]. According to the World Health Organization (WHO), prolonged exposure to noise levels exceeding 85 decibels (dB) results in irreversible hearing loss over time [16]. In classrooms, noise levels

often exceed this threshold due to various activities and environmental factors. Constant exposure to such high noise levels can cause noise-induced hearing loss (NIHL), tinnitus, and other auditory effects among teachers [13, 17].

Aside from auditory effects, noise exposure affects non-auditory aspects of teachers' well-being and workability. High classroom noise levels can cause increased stress levels, fatigue, and decreased concentration among teachers [13, 18,19]. These non-auditory effects impair teachers' cognitive functioning and compromise their ability to manage classrooms and deliver quality education effectively. Moreover, chronic exposure to noise-induced stress can contribute to burnout and attrition rates among educators, further increasing workforce shortages in the education sector [9].

Noise exposure in schools produces auditory health and non-auditory effects and impacts their teachers' overall workability [10,12]. Workability encompasses various psychological, physical, and social factors that determine an individual's ability to perform their job effectively [20]. For teachers, whose functions require clear communication, attention, and cognition, the negative effects of noise exposure can affect their ability to fulfill job tasks. Constant exposure to high noise levels can hinder teachers' communication with students, leading to misunderstandings and reduced instructional effectiveness [21].

Despite the acknowledged impact of noise exposure on teachers' auditory health and workability, there is a lack of scoping reviews examining its effects on primary and high school teachers. Since there is uncertainty about the type of knowledge that has been published in the field of literature regarding the challenges these teachers face in noisy settings, the main goal of this article was to provide a scoping review of evidence on the impacts of noise exposure on the health and workability of primary and high school teachers. The following research questions were developed: What is understood from the literature about the effects of noise exposure on auditory health and non-auditory effects that influence the workability of primary and high school teachers? What are the school-related and non-school-related noise sources? In addition, the study identified knowledge gaps for future studies.

Materials and Methods

Protocol: The protocol used the Preferred Reporting Items for Systematic Reviews and Meta-analyses extension for scoping reviews protocols (PRISMA-ScR) [22]. Upon receiving feedback from peers, including the supervisor, the draft protocol was revised. The primary author can issue a copy of the final protocol upon request; it was not registered.

Eligibility criteria: The included literature consisted of full-text articles on the effects of noise exposure on auditory health. Also, the literature that reported on effects that influenced the workability of teachers, as well as classroom interactions, were included. Hence, the inclusion criteria were: a) full-text papers that discussed the effects of noise exposure on primary and high school teachers; b) English-language articles in their entirety; c) between 2000 and 2022, full-text publications. Before inclusion, the authors reviewed the full texts. Scholarly works that solely discussed school noise levels, review articles, and only summaries; articles that discussed the effects of noise pollution in different settings, such as hospitals and commercial locations, and those that discussed how noise influences other populations not specified were eliminated.

Information sources and search strategy: To find documents of interest, the following reference sources were searched from 1 November 2022 to 14 November 2022: Google Scholar, JSTOR, Elsevier, and PubMed databases using Medical Subject Heading (MeSH) terms such as [(noise) or (sound) AND (health) AND (adverse effects) or (side effects) AND (employees) or (workers) or (personnel) or (teaching) or (professional) AND (schools)]. The literature review covered 2000 - 2022. A scoping literature review was done to find all the empirical data in the literature on primary and high school teachers' exposure to noise and its consequences on their hearing and workability. Before final selection, specified literature was scanned to find reports on the health impacts of noise exposure. The technique (Fig. 1) was based on PRISMA-ScR [22]. Lastly, to locate and supplement the already-chosen literature on this topic, reference lists of similar studies were scanned.

Study selection process: The authors, solely responsible for searches and screening based on keywords in this study, gathered search results into a folder and imported them into Mendeley Desktop 1.19.5 for Windows. Other authors rescreened all articles initially presented. The relevance of each article to the study was of prime interest; therefore, the authors analyzed the entire articles before selection.

Data items and data collection process: A qualitative content analysis was done to describe and summarise the relevant content of the literature. After the content analysis, the following characteristics were taken from the chosen literature: data on cited references, including author, publication year, and country information; population and sample size; methods; noise sources and types; study design; and significant findings or conclusions. The PRISMA-ScR (Fig. 1) outlines four stages, including i) the identification stage, where the databases and the number of articles discovered, including bibliographies, were counted; ii) the eligibility stage, where abstracts were checked to reject some materials; iii) screening stage, where full-texts were checked to eliminate some literature from stages i and ii; and iv) the inclusion stage, where the number of papers that fulfilled the inclusion criteria were recorded.

Methodological quality appraisal: The risk of bias or methodological quality of the included publications was not evaluated, which aligns with guidance for scoping reviews [22,23].

Synthesis: To reach a conclusion and offer suggestions for future research, a critical synthesis rather than a meta-analysis was used to identify strengths and flaws in the available literature [22]. The synthesis included quantitative descriptive analysis, qualitative content analysis of the constituent parts of the study objectives, and a conceptual description of scoping reviews. A summary table for both primary and high school teacher categories on the countries, populations, study designs, methods, noise sources, types, and general findings was presented. The noise sources were separated into school-related and non-school-related noise and summarised them. Additionally, the studies were grouped depending on outcomes that related to auditory health effects and effects that influenced the workability of primary and high school teachers.

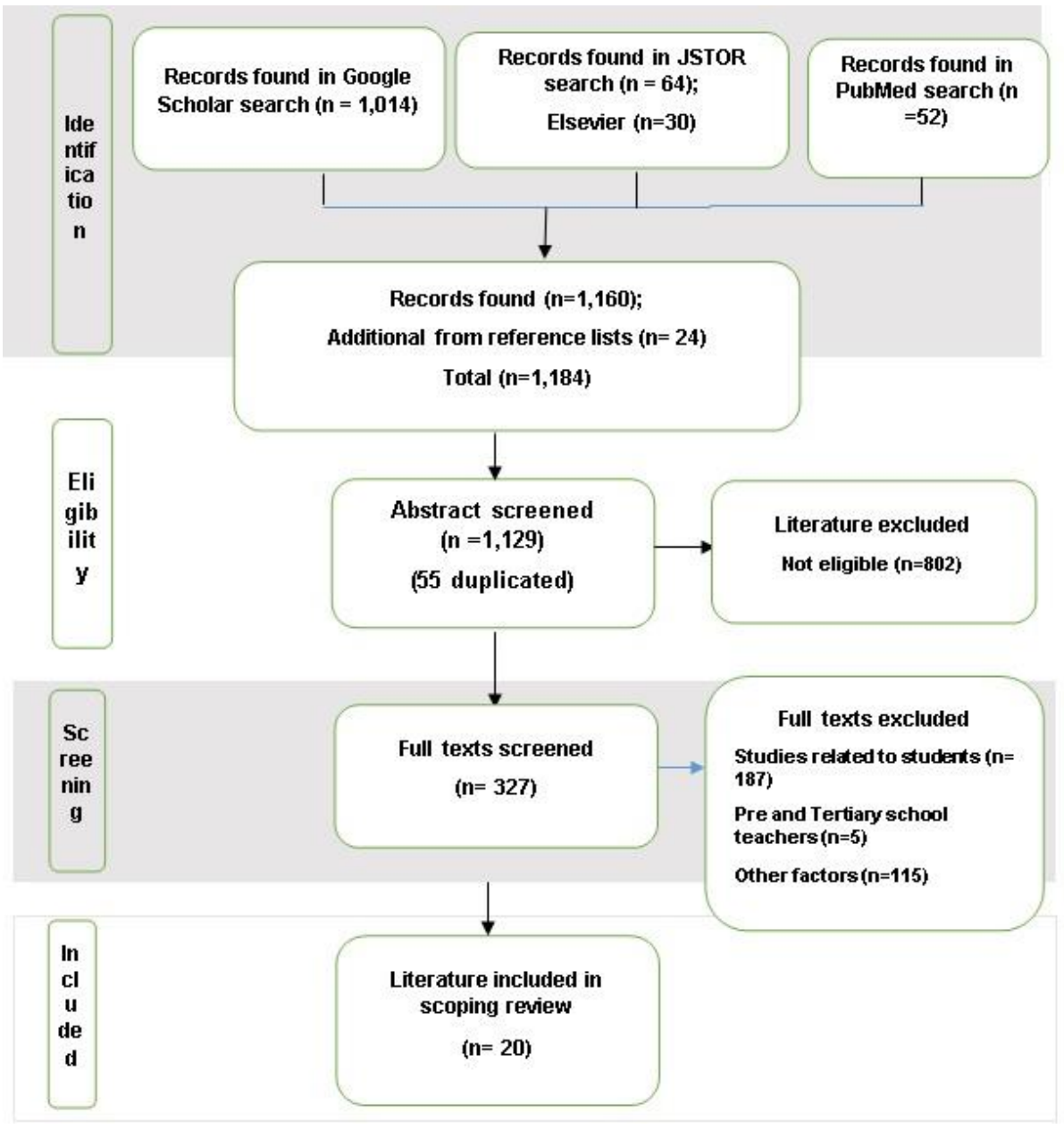

Fig. 1. A flow chart for choosing studies using PRISMA-ScR [22].

Results

The survey using Google Scholar, JSTOR, Elsevier, and PubMed yielded 1,014, 64, 30, 52, and 24 extra publications from references lists in some articles (Fig. 1). 802 articles were excluded after removing 55 duplicates from the abstract screening and 307 more papers following full-text reviews. Twenty papers were eligible for inclusion for the scoping review. Four (n = 4) out of the twenty (n = 20) articles included in the study were from Brazil, representing 20.0% (Table 1). All the studies had a cross-sectional design (100.0%, n = 20) and were concerned with the primary and high school teaching populations. 5% and 10% of the included studies employed the dosimeter and audiometry, respectively, while 50% used the direct noise level assessment approach (using a calibrated sound level meter). Fifteen articles, or 75.0%, used the indirect assessment technique (questionnaires). The

main school-related noise source was students' activities (n = 12, 60.0%), while the main non-school-related noise source was vehicles (n = 6, 30%). These led to temporary hearing loss (n = 6,30.0%) and tinnitus (n = 3,15.0%). The non-auditory effects such as disturbances and shouting (n = 8, 40% for both), annoyance (n = 7, 35%), tiredness, and stress (n = 6, 30% for both) influenced the workability of primary and high school teachers. These effects also affected interactions in the classroom. The chronic health impact of noise exposure identified was mainly dysphonia (n = 9, 45.0%).

Study characteristics: The different focus areas of the review and their characteristics are expanded in Table 1. The findings ' charts and graphs are presented (Fig. 2–6).

Table 1. Descriptive statistics of the characteristics of all included studies

Extracted data			n	(%)
Study country		India	1	(5.0)
		Macedonia	1	(5.0)
		Sweden	1	(5.0)
		Kuwait	1	(5.0)
		Malaysia	1	(5.0)
		Poland	1	(5.0)
		Egypt	2	(10.0)
		Brazil	4	(20.0)
		Colombia	1	(5.0)
		Germany	1	(5.0)
		Nigeria	1	(5.0)
		Turkey	2	(10.0)
		Iran	1	(5.0)
		China	1	(5.0)
		Greece	1	(5.0)
Study design		Cross-sectional	20	(100.0)
Study population		Primary school teachers	9	(45.0)
		High school teachers	5	(25.0)
		Both primary and high school teachers	6	(30.0)
Assessment methods		Sound Level Meter	10	(50.0)
		Noise Dosimeter	1	(5.0)
		Ear canal inspection and audiometry	2	(10.0)
		Questionnaires	15	(75.0)
Noise sources	**School-related**	Students activities	12	(60.0)
		Air conditioners in classrooms	2	(10.0)
		Nearby classrooms	2	(10.0)
		School bells	2	(10.0)
		Video player	1	(5.0)
		Overhead projector	1	(5.0)
	Non-school related	Vehicles/vehicular traffic	6	(30.0)
		Surrounding/outdoor noise	4	(20.0)
		Construction work	1	(5.0)
Auditory health effects		Temporary hearing loss	6	(30.0)
		Tinnitus (ringing in ear)	3	(15.0)
		Ear pain	1	(5.0)
Non-auditory effects		Disturbances/distractions	8	(40.0)
		Stress	6	(30.0)
		Loss of concentration	4	(20.0)
		Shouting during teaching	8	(40.0)
		Voice cracking	3	(15.0)
		Interference with conversation	2	(10.0)
		Irritation/Annoyance	7	(35.0)
		Poor speech intelligibility	3	(15.0)
		Temporary dizziness	2	(10.0)
		Tiredness/exhaustion /fatigue	6	(30.0)
		Acute headaches	5	(25.0)

n= frequency, % = percentage

Synthesis of Key Findings:

Auditory ailments: Eight of the studies analysed in this review discussed the consequences of loud environments on primary and high school teachers' auditory health, including temporary hearing loss, tinnitus, and ear pain (Table 2). Primary school teachers suffered these three auditory ailments [9, 17, 24-27, 28], unlike high school teachers who reported temporary hearing loss only [9, 17, 28-29].

Non-auditory effects: Except for an article [17], nineteen studies examined how noise exposure produces non-auditory effects that influence primary and high school teachers' workability. Disturbances/distractions, stress, loss of concentration, shouting, cracking of voice, disruption of communication, irritation/annoyance, poor speech intelligibility, temporary dizziness, tiredness/exhaustion/fatigue, and acute headaches influenced the workability of primary and high school teachers as well as interactions in the classroom [9-11,24-39]. Deborah and Faithwin discovered a relationship between noise exposure and interference with communication, loss of attention, tension, and fatigue [33]. Rezende and colleagues' research showed comparable outcomes [38].

Noise sources: The 20 studies identified noise exposure sources in the primary and high school teacher populations. The noise sources were grouped into school-related and non-school-related ones. The school-related noise sources included students' activities, conversations, air-conditioners in classrooms, noise from nearby classrooms, school bells, a video player, and an overhead projector used in the classrooms. The non-school-related noise sources were vehicles and vehicular traffic, the surrounding area, and construction works [9-11, 17, 27-39].

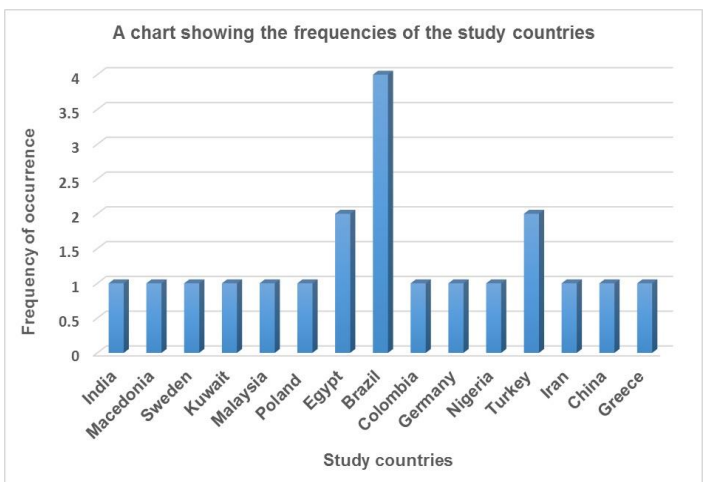

Fig. 2. Frequencies of study countries

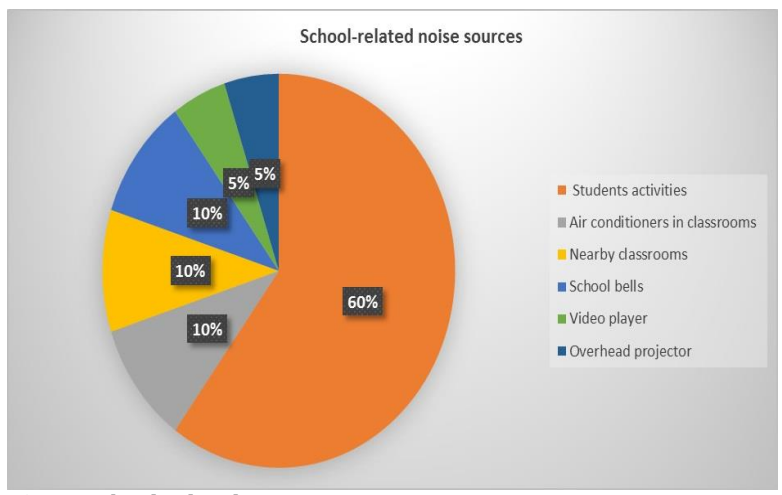

Fig. 3. School-related noise sources

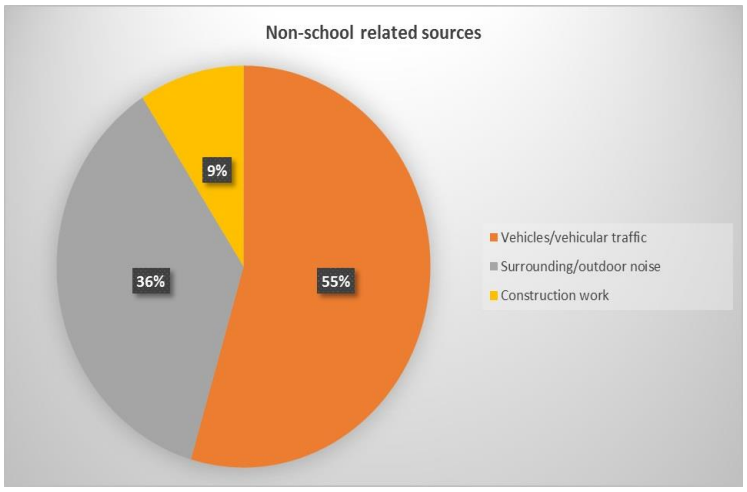

Fig. 4. Non-school-related noise sources

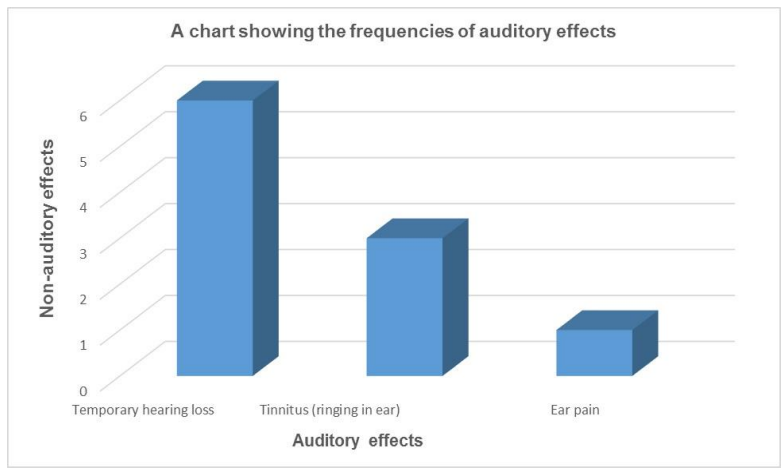

Fig. 5. Auditory effects of noise

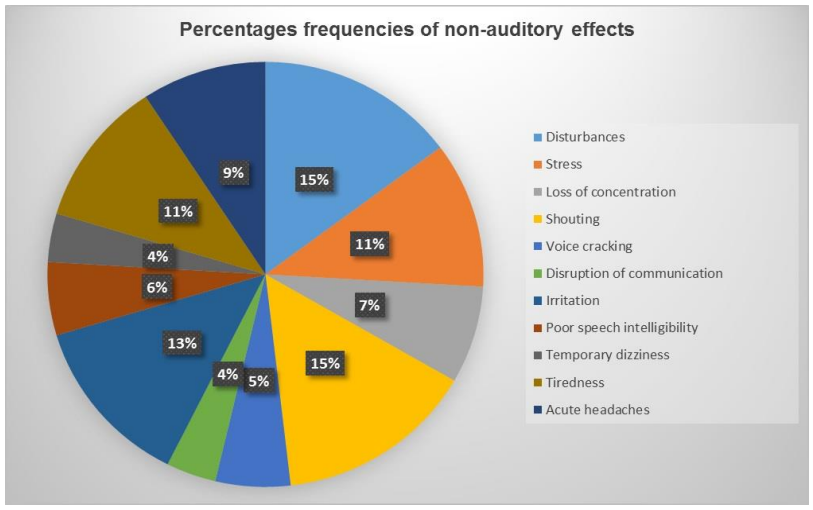

Fig. 6. Non-auditory effects of noise

Table 2. Summary table showing results/findings of the reviewed studies.

	Author, Year, Country	Study Design, Sample Size	Assessment Methods	Noise Levels (dBA)	School-related noise sources	Non-school-related noise Sources	Auditory ailments	Extra-auditory effects
Studies involving primary school teachers only	Augustynska et al. (2010) [24] Poland	Cross-sectional n=187	Questionnaire, Sound Level Meter	66 to 78 dB	School bell, students' conversation, air-conditioners	Outdoor noise, vehicular traffic	Temporary hearing loss, ear pain, tinnitus	Emotional tension, irritation, difficulty concentrating, dizziness, teachers shouting, tiredness, annoyance.
	Novanta et al. (2020) [25] Brazil	Cross-sectional n=67	Distortion-product otoacoustic emissions equipment(Audiometry)	76.9 dB(A)	Students' activities	Nil	Temporary hearing loss	Frequent shouting by teachers
	Bulunuz et al. (2021) [26] Turkey	Cross-sectional n=8	Interviews	Not reported	school bell and students' activities	Vehicular traffic	Tinnitus	Hypersensitivity, migraine, severe headache, difficulty in communication.
	Eysel-Gosepath et al. (2012) [27] Germany	Cross-sectional n=43	Questionnaire	85 dB(A)	Students' activities	Nil	Tinnitus	Annoyance, disturbances, tiredness, mental strain.
	Abo-Hasseba et al. (2017) [36] Egypt	Cross-sectional n=140	Questionnaire	Not reported	Nearby classrooms	Nil	Nil	Shouting
	Phadke et al. (2019) [37] Egypt	Cross-sectional n=140	Questionnaire	Not reported	Students' activities, nearby classrooms, chatter	road traffics	Nil	Voice cracking
	Guidini et al.(2012) [30] Brazil	Cross-sectional n=10	Sound Level Meter, GRBASI Protocol	58.24 dB(A)	Students' activities	Nil		Shouting
	Gokdogan & Gokdogan (2016) [31] Turkey	Cross-sectional n=12	Sound Level Meter, Questionnaire	50 to 70 dB(A)	Students' activities	Nil	Nil	Annoyance
	Karami et al. (2012) [32] Iran	Cross-sectional n=384	Questionnaire	Not reported	Nil	Traffic noise	Nil	Disturbances, annoyance, tiredness, shouting, and loss of concentration
Studies involving high school	Skarlatos & Manatakis (2003) [10] Greece	Cross-sectional n=130	Sound Level Meter, Questionnaire	71.9 dBA	Students' activities	Nil	Nil	Poor speech intelligibility

teachers only	Deborah et al (2012) [34] India	Cross-sectional n=10	Questionnaire, Sound pressure level	80 dB (A)	Students' activities	Vehicular traffic, construction work, outdoor noise	Nil	Disturbance, inhibition of speech intelligibility, and stress
	Obafemi & Ofondu (2015) [33] Nigeria	Cross-sectional n=22	Questionnaire	84.92 dB (A)	Nil	Busy areas outside	Nil	Disruption of communication, loss of concentration, shouting, stress, headache, tiredness, annoyance.
	Seetha et al. (2008) [35] Malaysia	Cross-sectioal n= 44	Sound Level Meter, Questionnaire	95.2 dB(A)	Students' activities	Vehicles	Nil	Stress, headache, shouting, loss of concentration, disturbance, and inhibition of speech intelligibility
	Enmarker & Boman (2004) [29] Sweden	Cross-sectioal n= 166	Questionnaire	Not reported	Nil	Chatter	Temporary hearing loss	Stress and annoyance
Studies involving both primary and high school teachers	Hadzi-Nikolova et al. (2013) [9] Macedonia	Cross-sectional n= 40	Noise dosimeter, Questionnaire	79.8dB(A) and 78.7dB(A) respectively	Students' activities	Outdoor noise	Temporary hearing loss	Headaches, dizziness, and shouting
	Cutiva & Burdorf (2015) [11] Colombia	Cross-sectional n= 621	Questionnaire, Sound Level Meter.	>80 dBA	Studies activities	Outdoor noise	Nil	Cracking of voice
	Martins et al. (2007) [17] Brazil	Cross-sectional n= 40	Sound level meter, Audiometry	87.4dB(A) and 89.0dB(A) respectively	Students' activities	Nil	Temporary hearing loss	Nil
	Yassin et al. (2016) [28] Kuwait	Cross-sectional n=250	digital sound level meter, Questionnaire, Interview	92.1 dB and 87.6 dBA respectively	Air conditioners in classrooms, Students' activities	Nil	Temporary hearing loss	Headache, shouting, fatigue and disturbance.
	Rezende et al.(2019) [38] Brazil	Cross-sectional n= 6,500	Questionnaire	Nil	Video player, overhead projector	Nil	Nil	Disturbances
	Chan et al. (2015) [39] China	Cross-sectional n=146	Sound Level Meter	70.1 and 68.9 dBA	Nil	Vehicular traffic, loudspeakers	Nil	Voice cracking

GRBASI = Grade, Roughness, Breathiness, Asthenia, Strain, and Instability

Noise Levels: Some studies only measured the impacts of noise exposure on the primary and high school teachers, without a quantitative analysis of the noise levels. However, the few others that measured the noise levels reported that the subjects were exposed to noises far beyond the acceptable equivalent continuous sound pressure levels (LAeq) permitted for schools in the various countries of study. The ranges of noise level in the included studies that caused the effects were 50.0 to 92.1 dBA on primary school teachers and 68.9 to 95.2 dBA on high school teachers [17, 21, 24,25,28,31-35,39].

Discussion

The scoping review aimed to understand from the literature the effects of noise exposure on auditory health and non-auditory effects that influence the workability of teachers and classroom interactions. Also, school-related and non-school-related noise sources were evaluated. The study found that the teachers were exposed to noise levels of 50.0–92.1 dBA and 68.9–95.2 dBA, respectively. These noise levels were beyond the acceptable equivalent continuous sound pressure levels (LAeq) permitted for schools in various study countries. The school-related noise source was primarily students' activities, while the non-school-related noise source was vehicles. Most of the included studies reported temporary hearing loss and dysphonia from noise exposure. Non-auditory effects such as shouting, disturbance, and annoyance were key factors that influenced the workability of primary and high school teachers and their classroom interactions. The findings of this study mean that noise is a potential and critical occupational hazard that has implications for the health of exposed primary and high school teachers. Another implication of the findings relates to teaching and learning. The findings suggest that noise exposure leads to effects that influence the workability of teachers. The classroom interactions between teachers and students are ineffective in such cases, which ultimately affects students' cognitive and learning abilities. The findings call policymakers and stakeholders to safeguard their school environments from noise penetration to prevent its effects on teaching and learning.

Furthermore, the study identified 20 articles that reported on the impacts of elevated noise levels on primary and high school teachers' health and workability published between 2000 and 2022 [17,24-27-29,34,38-39]. The findings indicate insufficient research on the above topic. There was no article found on a scoping review of this nature, which indicates that most researchers have been blind to this particular topic of review.

Small sample sizes, a lack of a thorough epidemiological approach to understanding the health effects of noise, and a lack of audiometric testing facilities to assess noise-induced hearing loss were some of the main flaws of most examined publications [24,29,34-35]. Additionally, there is a lack of information regarding the use of calibrated sound level meters to improve the quality assurance of the data gathered and used in some studies, as well as a lack of precise information regarding the frequency of measurements conducted [28,35].

Most of the studies that could have been added were not publicly available. The results are probably only applicable to papers open to the public. Furthermore, this assessment required significant work, and our conclusions are only current as of November 2022. The fact that all included studies used a cross-sectional study design was a significant drawback [17,24-29,34,38-39] that reduces the possibility of concluding regarding the causal relationship between noise exposure and the auditory and non-auditory effects. No data on the association over time between the environmental factor (noise) and the onset and persistence of auditory ailments was stated. 2/20 papers used audiometry to unbiasedly assess the primary and high school teachers' hearing issues, which is one of the study's weaknesses [17, 25]. Each of the others researched the health impacts of noise exposure using subjective methods, such as surveys and interviews [24,31-34,38,39]. Although surveys and interviews were used to collect data in some of the included studies, there is always a risk of bias. This is because the respondents' knowledge level and how they interpreted questions on the self-reports impacted the information researchers gathered, evaluated, and interpreted. No meta-analysis or quantitative techniques were used to synthesise the data about the health impacts of noise exposure on primary and high school teachers.

Additionally, the survey was restricted to the keywords and search terms used, which might have reduced the number of articles found for the study.

Additionally, the scope of the literature review was limited to the databases of Google Scholar, JSTOR, Elsevier, and PubMed, all of which were accessible to us for full-text download and evaluation. Other databases may have provided reliable papers to supplement the already analysed ones. Despite these drawbacks, this study provides important and useful contributions to our understanding of studies on the impacts of noise exposure as it stands at the moment on health as well as the effects that influence the work ability of teachers in primary and high schools.

The focus of studies in specific regions, such as Brazil, as shown by the scoping review, may be linked to various factors, including local research priorities and availability of funds. For example, Novanta et al. [25] and Rezende et al. [38] conducted a study in Brazil that

has mainly contributed to understanding the effects of noise exposure on teachers' health and workability. This suggests a regional emphasis on dealing with noise-related issues in schools. Further studies have to be conducted in other regions. The use of cross-sectional studies in the reviewed papers is aligned with the results of other studies investigating occupational noise exposure [40]. While cross-sectional designs give useful insights into the prevalence of noise exposure and its effects, longitudinal studies would better understand the causality and long-term trends in noise exposure among teachers.

The diversity of noise sources identified in the studies, ranging from students' activities to vehicular traffic, underscores the complexity of the acoustic environment in schools. A study has highlighted how students' activities lead to elevated classroom noise levels. Furthermore, the reported noise levels exceeding acceptable threshold align with findings from a study indicating a widespread problem of excessive noise exposure in schools [41]. As noted in the reviewed studies, the observed discrepancies in auditory ailments between primary and high school teachers may be attributed to variations in exposure levels and susceptibility. This is consistent with findings by Zhou et al. [42], who reported varying levels of susceptibility to NIHL among different occupational groups. The significant impact of noise exposure on non-auditory aspects, such as workability and classroom interactions, has been corroborated by studies done in various workplaces [43]. The findings of Deborah et al. [33] emphasize the role of noise-induced stress and fatigue in diminishing teachers' job performance and satisfaction.

The effect of noise exposure on teachers' workability is a crucial aspect indicated by the results of this scoping review. While the focus has been on auditory and non-auditory effects, addressing how these effects ultimately influence teachers' ability to perform their tasks effectively is imperative. Noise exposure could affect teachers' workability through increased stress, fatigue, and decreased concentration [43]. Furthermore, chronic exposure to noise-induced stress may lead to burnout and attrition rates among teachers, increasing school workforce shortages [42].

The number of research articles that satisfied the review's inclusion criteria was insufficient, meaning undertaking a systematic review with meta-analysis is inappropriate. Additionally, the dearth of research on the effects of noise on primary and high school teachers' workability and auditory health opens up new opportunities for researchers to carry out better-designed studies to understand the challenges teachers face concerning noise exposure. Education and implementing noise pollution awareness and avoidance campaigns to sensitise teachers and pupils are advised. Active school noise monitoring and surveillance needs to be established. Furthermore, it is recommended that rather than using indirect assessment techniques like the questionnaire, which the majority of researchers used in the papers reviewed, audiometric testing be used to evaluate the participants' auditory health to provide an objective perspective on the results. The limited sample sizes utilised in most studies may have led to results with little statistical significance and a wide range of variance. Therefore, to reduce the possibility of bias in the results, bigger sample sizes should be used in future investigations. Since few studies have been conducted in sub-Saharan Africa, more studies are advised.

Conclusion

The scoping review analysed and summarised information on the noise exposure of teachers. It was discovered that exposure to occupational noise had negative auditory and non-auditory impacts and influenced the workability of these teachers. The findings of the scoping review underscore the significant impact of noise exposure on teachers' workability, alongside auditory and non-auditory effects. While auditory ailments and non-auditory effects such as stress, fatigue, and decreased concentration are well-documented, it is vital to recognize their implications for teachers' overall workability.

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Conflict of interest

None declared.

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Ethical Considerations

According to the type of study, there is no need for special ethical considerations.

Authors' Contributions

Francis Osei: Conceptualization, Formal analysis, Investigation, Methodology, Project administration, Visualization, and Writing-original draft. Alhassan Sulemana: Supervision, Validation, and Writing-review and editing. Esther Effah: Data curation, Investigaton, Resources, Software. Benedicta Hlordzie: Investigation, Visualization, Formal analysis.

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