# ASSOCIATION BETWEEN PERCEIVED ACOUSTIC COMFORT AND WELLBEING FOR SCHOOLTEACHERS AT WORK: A CROSS-SECTIONAL SURVEY IN THE UK

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## 1 INTRODUCTION

The impact of school acoustics on both students and teachers is critical. Although the negative effects of noise on teachers have been investigated, research has primarily concentrated on its impact on children. For instance, studies have shown that noise can lead to stress in children, potentially resulting in health issues such as asthma, fatigue, and headaches [(1)]. Additionally, noise has been associated with decreased memory, lower motivation, and impaired reading skills in school children, which can negatively impact their academic performance [(2)]. Moreover, studies demonstrated the effects of reverberation and noise level on student's concentration engagement and overall wellbeing [(3)]. In terms of age-related differences, noise negative effects on both primary and secondary school children have been studied [(4,5,6)]. It is apparent that the negative impacts of school acoustic on children have been studied extensively, as they are primary occupants of schools. However, teachers spent a significant amount of their lifetime in schools. While the large numbers of students make their experience important, it is also crucial to study the effects of noise on teachers' perception, health, and wellbeing.

Noise has been identified as a primary factor contributing to discomfort in teachers' workplaces, potentially leading to vocal health issues [(7,8)]. In particular, high reverberation and background noise levels can affect teachers' concentration, leading them to raise their voices, which can further strain their vocal health [(9)]. According to research, acoustic conditions in classrooms have been linked to vocal health concerns for teachers, emphasizing the need for attention to classroom acoustics to support teacher wellbeing [(10)]. It is likely that, poor acoustic environments affect teachers' not only physical health, but they can also impact teachers' mental health and overall wellbeing. Teachers' wellbeing could be directly affected by where they work. The state of overall health and satisfaction experienced by individuals in relation to their work environment refers to Job specific wellbeing.

Teachers' job specific wellbeing is a crucial aspect with significant consequences for both educators and students. Several factors can influence teacher wellbeing, including work related stress, availability of support, and the overall school environment [(11)]. Family support, positive teaching profession, and a supportive school environment can be essential elements in improving teachers' wellbeing. Among these factors, the physical environment within schools, covering factors like classroom acoustics, lighting, and thermal conditions, can also impact teacher wellbeing [(12)]. Excessive noise levels in classrooms, for instance, have been associated with acoustics related symptoms among teachers [(12)]. Research has indicated that noise and poor classroom acoustics can affect teachers' overall wellbeing [(13)]. Studies highlight that poor acoustic conditions are associated with negative effects on teachers' vocal health and overall wellbeing [(14)]. Not only poor acoustic conditions and noise but also overall school soundscape found crucial for enhancing learning environments and reducing stress [(15)]. The literature emphasizes the need for improved soundscape in schools to support teacher health and wellbeing. Therefore, addressing both the psychosocial and physical aspects of the school environment is essential to promote and maintain teacher wellbeing. Moreover, it is critical to see how teachers' job specific wellbeing relates the acoustic environment of schools.

The primary objective is to investigate the relationship between acoustic comfort and teachers' job specific wellbeing. The acoustic environment plays a crucial role in creating a conducive learning environment for both students and teachers. However, the impact of acoustic comfort on the wellbeing of teachers remains an area that requires further exploration. Examining the correlation between acoustic comfort and teacher wellbeing aims to shed light on the potential effects of noise, sound quality, and overall soundscape on teachers' daily experiences. In this study, it is questioned whether there is an association between perceived acoustic comfort and teacher wellbeing in school environments. The findings from this study will contribute to the existing body of knowledge in the field and provide insights for educational institutions to improve the acoustic environments within their facilities. This knowledge may inform strategies for improving school environments to better support teacher wellbeing.

# 2 METHODOLOGY

An online questionnaire targeting UK teachers was developed as the method to collect information on teachers' well-being and overall acoustic comfort. The questionnaire was distributed to 480 teachers. Following data cleaning, 28 questionnaires were discarded, leaving a final sample size of 452 teachers.

## 2.1 Participants

A total of 452 teachers from various UK educational institutions participated in this study, selected through random sampling to ensure a representative sample and decrease selection bias. Participants were recruited via Prolific an online questionnaire participant recruitment tool [16]. The sample was designed to cover a wide array of teaching experiences, educational backgrounds. Ethical approval was obtained from the UCL BSEER Local Research Ethics Committee. The study achieved a margin of error of about 4.6% at a 95% confidence level.

In this study, the demographics and background information of participants were collected. Participants were distributed across various age groups: 34.8% were aged 35-44, 29.3% were aged 25-34, 20.7% were aged 45-54, 10.6% were aged 18-25, 3% were aged 55-64, and the rest were 65 and over. Most participants (81.6%) identified as female, while 17.9% identified as male. Regarding experience at their current school, 38.5% of teachers reported working in their current school for 1-5 years. The least common durations of employment were over 20 years and 16-20 years, each representing about 4-5% of the participants. Among the teachers, 51% work in primary schools, 31% in secondary schools, 2% in kindergartens, 3% in colleges, and 7% in social institutions. Additionally, 48% work in urban schools, 35% in semi-urban areas, and 16% in rural schools (Figure 1). Overall, this collection of demographic and background information provides valuable context for understanding the study's findings and ensuring their applicability to diverse schools and populations.

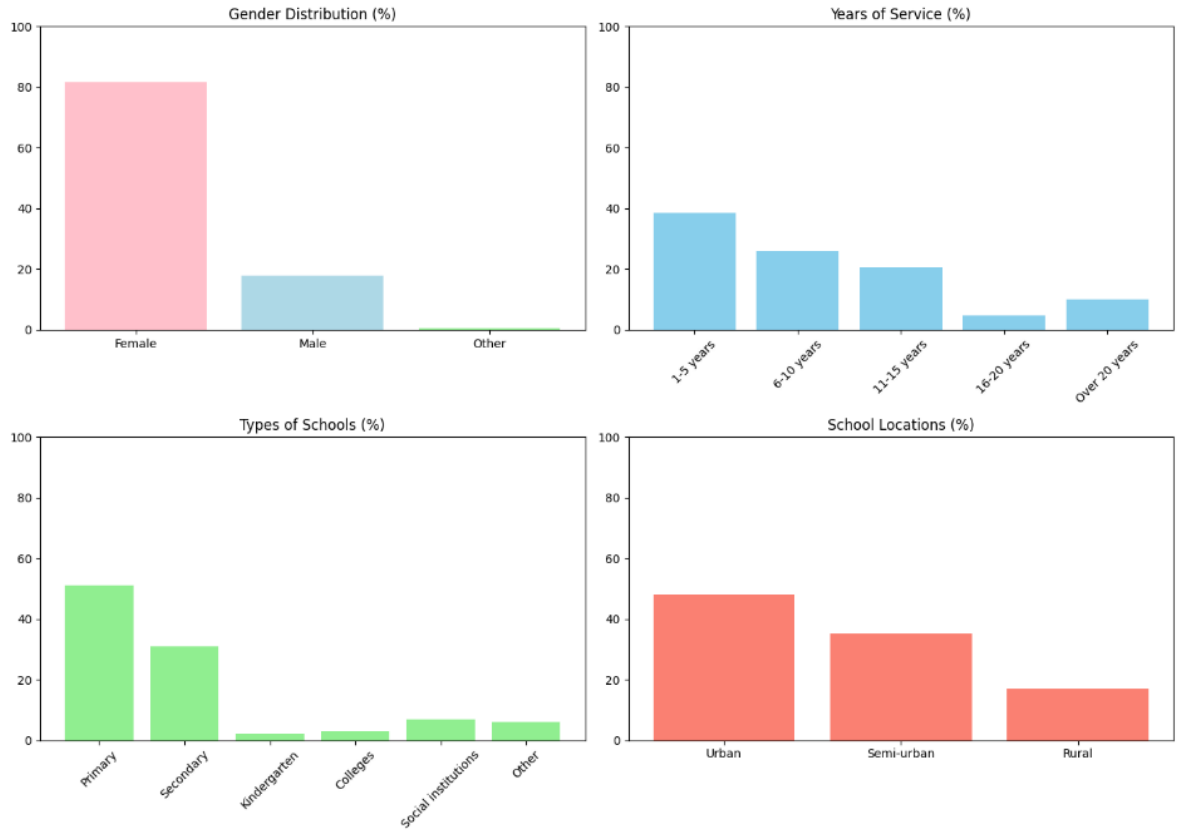


Figure 1. Background information of participants

## 2.2 Data Collection

Data collection was completed through an online questionnaire consisting of 3 main sections. This questionnaire was prepared using Research Electronic Data Capture (RedCap) platform [17]. A unique link to access the questionnaire ensuring teachers' responses remained confidential has been sent by Prolific. On Prolific, participant's age, gender, occupation and country could be customized. The selection criteria were arranged to include currently working teachers in the United Kingdom aged 18 and over. This ensured a targeted sample for the research objectives.

The first section of the questionnaire collects background information of the participants. The second section asks teachers to evaluate acoustic comfort. The third section evaluates teacher wellbeing.

Background information was gathered on age, gender and work experience. Additionally, teachers were asked about the school type (e.g., primary, secondary) they teach and the type of area they work in, such as urban, rural, or semi-urban.

Acoustic comfort is evaluated using a five-point Likert scale based on the question, 'How frequently do you find the acoustic environment in your school to be comfortable? (1: never; 5: very often).

The part that evaluates teachers' professional wellbeing follows The Teacher Subjective Wellbeing Questionnaire (TSWQ) and its items (Table 1). TSWQ is a self-assessment tool intended to evaluate teachers' job specific wellbeing and positive psychological experiences within their work environment [18]. The items are shown in detail in table 1. This rating scale evaluates teachers' wellbeing on two elements: school connectivity and teaching efficiency. This system evaluates with a four-point Likert scale. Eliminating the neutral option encourages respondents to give more definitive and clear responses, which may enhance the questionnaire's ability to detect differences in teachers' wellbeing.

TSWQ scale scores are evaluated by summing item replies as follows:

• Teaching Efficacy subscale: The total score for this subscale is obtained by summing the responses to items 2, 4, 6, and 8.

• School Connectedness subscale: The total score for this subscale is derived from summing the responses to items 1, 3, 5, and 7.
• Teacher Wellbeing composite scale: The overall score for this scale is calculated by adding the responses to all items.

Table 1. The teacher Subjective Wellbeing Questionnaire Items

| NO | ITEMS | Almost Never | Sometimes | Often | Almost Always |
|---|---|---|---|---|---|
| 1 | I feel like I belong at this school. | 1 | 2 | 3 | 4 |
| 2 | I am a successful teacher. | 1 | 2 | 3 | 4 |
| 3 | I can really be myself at this school. | 1 | 2 | 3 | 4 |
| 4 | I am good at helping students learn new things. | 1 | 2 | 3 | 4 |
| 5 | I feel like people at this school care about me. | 1 | 2 | 3 | 4 |
| 6 | I have accomplished a lot as a teacher. | 1 | 2 | 3 | 4 |
| 7 | I am treated with respect at this school. | 1 | 2 | 3 | 4 |
| 8 | I feel like my teaching is effective and helpful. | 1 | 2 | 3 | 4 |

## 2.3 Data Analysis

A Spearman's rank order correlation was conducted to examine the association between acoustic comfort and job specific wellbeing among schoolteachers. The analysis was performed using SPSS (Statistical Package for the Social Sciences).

# 3 RESULTS

This section presents the findings from the analysis of teachers' wellbeing, teaching efficacy, and school connectedness, and their relationship with perceived acoustic comfort. Using the TSWQ interpretation guidelines. Teachers' wellbeing, teaching efficacy, and sense of school connectedness are evaluated through various scores derived from questionnaire responses. The analysis aimed to clarify how acoustic comfort correlates with these variables, providing insights into its potential impact on teachers' professional experiences. The following results detail the composite scores for each measure and the correlations between acoustic comfort and the respective variables.

According to TSWQ interpretation guideline based on the average item response, the composite score of teachers' wellbeing score was 24.5. The score falls between "often" and "almost always," suggesting that teachers in this study generally report a high level of well-being in their professional roles.

Teaching Efficacy score was 12.7. This score reveals the average level of teachers' perceived effectiveness and confidence in their teaching. It indicates that teachers, on average, feel moderately effective in helping students learn and confident in their teaching abilities, with responses typically falling between "often" and "always."

School Connectedness score was 11.8. This score represents the average level of teachers' perceived connectedness and sense of belonging within the school environment. In general, teachers feel a moderate sense of connection to their school community, with responses generally falling between "sometimes" and "often."

Figure 2 presents the Spearman correlation coefficients ($r_s$) between acoustic comfort and three different variables: overall wellbeing, teaching efficacy, and school connectedness. Results showed a significant positive correlation between acoustic comfort and wellbeing ($r_s$≈0.3), with a p-value less than 0.001, indicating a strong statistical significance. A very weak positive correlation between acoustic comfort and teaching efficacy found ($r_s$≈0.05), with a p-value of 0.532, suggesting that this

correlation is not statistically significant. A slight positive correlation between acoustic comfort and school connectedness ($r_s$≈0.1), with a p-value of 0.245, which also did not reach statistical significance (Figure 2). Overall, acoustic comfort is significantly related to teacher wellbeing but shows minimal and statistically insignificant correlations with teaching efficacy and school connectedness.

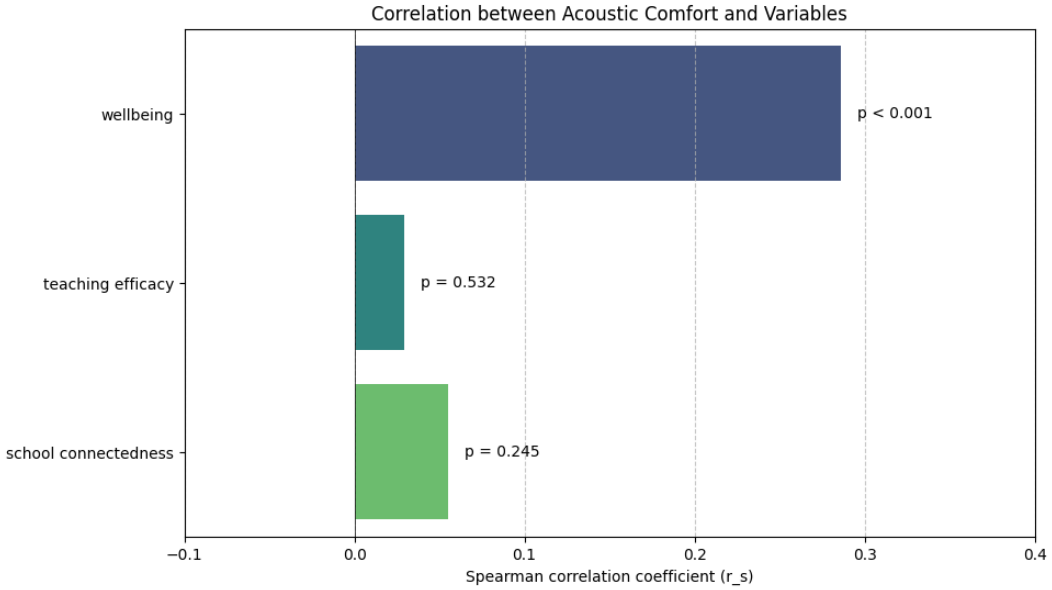


Figure 2. Correlation between Acoustic Comfort and teacher's wellbeing, teaching efficacy and school connectedness

# 4 DISCUSSION

Acoustic, lighting, and air quality factors in schools can significantly impact both teachers and student health and wellbeing. Although there are studies that highlight the importance of good acoustic design for teachers, the existing body of research is relatively limited compared to the extensive studies focused on students. This gap is notable given that the physical learning environment undeniably affects both teaching efficacy and student performance. Research has shown that classroom thermal conditions, lighting, and acoustics are related to teacher health symptoms [19]. Inadequate lighting, poor acoustics, and extreme thermal conditions can contribute to health issues among teachers, affecting their overall well-being [12]. Specifically, school acoustic conditions can lead to negative effects.

This study confirms the consensus that poor acoustic comfort detrimentally affects teacher wellbeing and health [10,7,20,12]. This is consistent with studies that have highlighted how excessive noise levels and poor acoustic environments in classrooms contribute to increased stress, fatigue, and even vocal strain among teachers. These findings underscore the importance of considering acoustic design in educational environments to support teacher health and performance, based on a study involving 452 participants in the UK. Participants comprising a diverse range of teachers from different school types underlined these results.

Moreover, our study aligns with the growing body of evidence that underscores a positive correlation between teacher wellbeing and student outcomes [21,22,23]. Healthy and satisfied teachers are more likely to create engaging and effective learning environments, which, in turn, positively influence student wellbeing and academic success. In light of these findings, this study adds to the argument that acoustic comfort is a critical factor influencing the wellbeing of both teachers and students. Improved acoustic conditions not only enhance the teaching environment but also contribute to a positive learning atmosphere, fostering better educational outcomes. This dual impact on teachers

and students underscores the importance of prioritizing acoustic considerations in the design and maintenance of educational facilities.

Given the interconnected nature of teacher and student wellbeing, it is essential for educational institutions and policymakers to prioritize acoustic comfort. Investing in better acoustic design and implementing noise reducing measures can create healthier and more productive environments. This holistic approach to improving school settings can lead to enhanced educational experiences and outcomes for both educators and learners. Prioritizing acoustic considerations in the design and maintenance of educational facilities is crucial for fostering optimal teaching and learning conditions. Despite the valuable insights gained, this study has some limitations. The sample was limited to teachers from various types of schools in the UK, which may not fully represent educators in different countries or educational contexts. Additionally, while self-reported measures of well-being and acoustic comfort provide important perspectives, they may be subject to biases and inaccuracies. The cross-sectional nature of the study also means that causal relationships between acoustic conditions and wellbeing cannot be definitively established. Future research could benefit from longitudinal studies and broader samples to further validate these findings and explore the long-term effects of acoustic environments on teacher wellbeing.

# 5 CONCLUSIONS

An online questionnaire asking teachers about job-specific wellbeing and acoustic comfort was administered to 452 UK teachers. After statistical analysis, it was revealed that there was a moderate positive correlation between acoustic comfort and teacher wellbeing, which was statistically significant. This study suggested that as acoustic comfort improved, teacher wellbeing tended to increase. The strong significance ($p < 0.001$) underscored the reliability of this relationship, indicating that improving acoustic conditions could be an important factor in enhancing teacher wellbeing. The TSWQ composite score of 24.5 shows that teachers generally experience high wellbeing in UK schools. The teaching efficacy score of 12.7 suggests moderate confidence and effectiveness, while the school connectedness score of 11.8 indicates a moderate sense of belonging.

# 6 ACKNOWLEDGEMENTS

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