ORIGINAL ARTICLE

Parental perception and knowledge of sound and noise pollution in learning environment at home.

Anis Syuhada Mohd Sabidi[1], Noraidah Ismail[1,*]

[1]Department of Audiology and Speech-Language Pathology, Kulliyyah of Allied Health Sciences, International Islamic University Malaysia, Pahang, Malaysia

Keywords:
noise pollution; parental awareness; home learning environment; noise at home; educational intervention.

ABSTRACT

Background: Noise pollution poses increasing concerns for health and learning, with parental knowledge playing a critical role in managing noise levels in children's home learning environments. **Objective**: This study evaluates parents' perceptions and knowledge of noise pollution in their children's study spaces. **Method**: A cross-sectional design was employed, and convenience sampling was used to select 144 Malaysian parents of school-aged children. A questionnaire was administered to assess their views on noise sources and management practices in home learning environments. All data were analysed via SPSS (Version 20). **Results**: While 87.5% of parents enforced sound-level rules, only 44.4% recognised noise as a health risk, indicating limited awareness. Mann-Whitney U test showed no significant difference in noise awareness between parents of different educational levels (p=0.247). **Conclusion**: The findings reveal critical gaps in parental awareness regarding noise's health impacts, highlighting the need for educational programs to help parents create quieter, more supportive learning environments for children.

INTRODUCTION

Noise pollution refers to any unwanted or intrusive sounds within communities, including disturbances caused by loud music or television from neighbours, nighttime traffic, and outdated household appliances, while excluding workplace-related or occupational noise exposure (Petric, 2022; Rusticus et al, 2023). It has emerged as a pressing concern due to the profound impacts on human health and overall well-being.

Noise pollution can significantly impair the learning environment, whether in schools or at home (Abdullah et al., 2021). It can be highly distracting, making it difficult for students to focus on their studies (Bulunuz & Özgür, 2021). This distraction can reduce concentration, lower productivity, and ultimately hinder the learning process (Shield & Dockrell, 2003; Diaco, 2014). The learning environment encompasses physical, social, psychological, and emotional factors that contribute to the educational experience, whether in formal or informal settings (Rusticus et al., 2023). A well-designed, positive learning environment is crucial for promoting effective learning and fostering personal development (Tavşanlı et al., 2017).

In Malaysia, traffic noise is the predominant source of noise pollution, largely driven by the increasing number of vehicles on the road (Isa et al., 2018). The persistent noise from road traffic has had a considerable impact on residential areas and their surroundings. Previous studies found that none of the surveyed schools complied with the World Health Organization's (WHO) recommended noise levels, which specify a maximum of 35 dB(A) for unoccupied classrooms and 55 dB(A) for occupied classrooms (Ismail et al., 2020; Nayan et al., 2022). These findings underline the widespread issue of elevated noise levels in educational settings across Malaysia, which may negatively affect the learning environment.

Despite growing awareness of noise pollution as a critical issue in home learning, many parents remain unaware of its impact on children's cognitive, emotional development concentration, academic performance, and well-being (Klate et al., 2013; Buchari & Matondang, 2017). Past studies indicate that chronic exposure to household and environmental noise disrupts memory and attention processes, which are foundational to effective learning (Chere & Kirkham, 2021; Dohmen et al., 2022). Though parents may value noise reduction, few consistently apply noise control measures at home (Bulunuz & Özgür (2021).

* *Corresponding author.*
E-mail address: noraidah@iium.edu.my

Journal homepage: https://journals.iium.edu.my/ijahs/index.php/IJAHS
EISSN NO 2600-8491

Socioeconomic status, education, and cultural views shape parents' perceptions and actions regarding noise pollution. Studies showed that higher-educated parents tend to limit noise more effectively, thus reducing children's exposure to loud sounds (Knobel & Lima, 2014; Đurišić & Bunijevac, 2017). This indicates that parents have a significant influence on their children's environment whether at home or outside the home. Understanding this dynamic is essential for addressing parental behaviours and increasing awareness about noise pollution and its effects.

This study examines parents' awareness, perspectives, and behaviours regarding household noise, highlighting their critical role in fostering optimal learning conditions. By assessing parents' knowledge of noise pollution within Malaysian home learning environments, the study explores sources of noise, parents' views on its impact on children's learning and well-being, and attitudes toward noise management practices. It also compares noise awareness among parents with different educational backgrounds.

METHODOLOGY

This cross-sectional study assessed parents' knowledge and opinions on noise in home learning environments. Convenience sampling was used to select the participants based on accessibility and proximity while adhering to several inclusion and exclusion criteria. The inclusion and exclusion criteria are designed to focus the study on a specific population that is most relevant to the research objectives. By selecting only parents of school-aged children (7–17 years old) and requiring proficiency in Malay, the study ensures it captures the experiences of a demographic that reflects the cultural and linguistic context of the research. Using the Malay language for the questionnaire avoids issues of misinterpretation or translation errors, ensuring the responses are accurate and meaningful.

Excluding non-primary caregivers further strengthens the study's validity by ensuring that responses come from individuals who are directly involved in the child's home learning environment and responsible for managing noise. Primary caregivers are more likely to have detailed knowledge of and influence over the child's surroundings, making their input particularly valuable to the research.

A total of 144 parents meeting these criteria participated in the study. The sample size was determined through power calculations for adequate representation. The data were collected using the translated version of the "*Pandangan ibu bapa mengenai bunyi dan pencemaran bunyi dalam persekitaran belajar*" questionnaire by Hazaha and Ismail (2022). The questionnaire consists of 36 questions across four sections: demographics information, domestic noise (5 questions), external noise sources (4 questions), and parents' knowledge of noise management at home (15 questions).

Procedures

The data collection process spanned a two-month period. All participants voluntarily completed the questionnaire via a Google Form, which was distributed through social media platforms including email, Facebook, and WhatsApp. The first page of the form contained an informed consent section, providing participants with detailed information about the study. The participants were required to read and electronically sign the consent form before proceeding to the questionnaire. Clear instructions were provided to guide them in accurately completing the form. All data were analysed using the SPSS software (Version 20).

RESULTS

Parents' Demographic Characteristics

Table 1 summarises the demographic characteristics of the parents who participated in this study. It provides a clear breakdown of the demographic variables, specifically focusing on gender, age, number of children, educational background, and employment status. A vast majority of the participants were female, accounting for 86.8% of the sample while only 13.2% were male. Most parents fell into the 46-55 age group (52.8%), followed by those aged 36-45 (33.3%). Regarding the number of children, 34.7% of parents had three children while 28.5% had five or more. The educational background showed that 59.7% of parents completed tertiary education while only 1.4% had primary school education. Regarding employment, more than half (51.4%) of the parents were employed in the government sector, followed by those in the private sector (15.3%) and self-employed (11.8%).

Table 1: *Demographic Variables Regarding Parents*

Variables	Options	n	%
Gender	Female	125	86.8
	Male	19	13.2
Age (Year)	26-35	9	6.30
	36-45	48	33.3

	46-55	76	52.8
	56-65	11	7.60
Number of children	1	13	9.00
	2	12	8.30
	3	50	34.7
	4	28	19.4
	≥ 5	41	28.5
Educational status	Primary school	2	1.40
	Secondary school	26	18.1
	Diploma	30	20.8
	Tertiary education	86	59.7
Working status	Self-employment	17	11.8
	Government sector	74	51.4
	Private sector	22	15.3
	Housewife	23	16.0
	Other	8	5.60

Household Noise Management and Parental Perception of Noise

Table 2 shows the participants' responses to the general information questions regarding household noise management and parents' perception of noise.

Table 2: Household Noise and Parental Perception

Variables	Options	n	%
Rule on sound level in the family	Yes	121	84.0
	No	23	16.0
Who sets the rules at home	None	23	16.0
	I	22	15.3
	My partner	19	13.2
	My partner and I	61	42.3
	Kids, partner, and I	18	12.5
	Other individuals	1	0.7
Obedience to household rules	Yes	117	81.3
	No	27	18.8
Child has own room	Yes	131	91.0
	No	13	9.0
Suitable study environment at home	Yes	129	89.6
	No	15	10.4
"Noise disturbs but does not harm health"	Agree	64	44.4
	Undecided	16	11.1
	Disagree	64	44.4

Table 2 outlines the household noise rules and parents' awareness of noise impacts, pointing towards possible gaps in understanding the health effects of noise pollution. Most parents (84.0%) reported having sound-level rules for family interactions while the others (16.0%) did not. Nearly half of them (42.3%) established these rules jointly with their partners and a vast majority (81.3%) indicated that all family members adhered to these rules. Additionally, 91.0% of parents said that their children had a dedicated room and 89.6% ensured a suitable study environment at home. However, the parents' opinions on the health impact of noise were mixed: 44.4% believed noise "disturbs but does not harm", an equal 44.4% disagreed, while 11.1% were undecided. This highlights a possible knowledge gap on noise's health risks.

Parents' Views on the Level and Causes of Noise at Home

Table 3 summarises the parents' perspectives on household noise sources. Nearly half of them (46.5%) reported noise issues while 53.5% did not. Children were noted as occasional noise sources by 70.1% of parents, with 6.9% indicating frequent disruptions. The most bothersome noise was attributed to children (42.4%), followed by televisions (TVs), computers, and other devices (34.7%) and domestic appliances (20.2%). Only 2.8% of parents reported no disruptive noises. Additionally, 36.8% of parents found household noise somewhat distracting during activities like reading or studying while 7.6% reported it as highly disruptive.

Table 3: Parents' Views on the Causes of Noise at Home

Variables	Options	n	%
Problems caused by noise in the house	Yes	67	46.5
	No	77	53.5
Proportion of noise made by children	Never	5	3.5
	Rarely	28	19.4
	Sometimes	101	70.1

	Often		10	6.9
Most annoying noise	Noise made by children		61	42.4
	Refrigerator/air conditioner		6	4.2
	Washing machine/ dishwasher		23	16.0
	TV/computer/ aquarium/clock		50	34.7
	None		4	2.8
The extent to which noises at home distract someone reading or studying	Not at all	1	26	18.1
	Rarely	2	30	20.8
	Sometimes	3	53	36.8
	Often	4	24	16.7
	A lot	5	11	7.6

Table 3 provides a clear overview of the sources of household noise and its impact on daily activities, underscoring the prevalence of child-related and domestic appliance noise in the home environment.

Parents' Views on External Noise Sources

Table 4 summarises the parents' views on external noise sources affecting their homes. Approximately half of them (52.8%) reported issues with external noise, with traffic noise being the most common source, impacting 66.7% of parents. Neighbour noise (34.7%) and playground sounds (15.3%) also contributed to external noise sources while only 4.9% of parents noted no issues. When asked about the most bothersome noise, 64.6% cited traffic, followed by neighbour noise (22.9%) and playground noise (7.6%). Regarding its effect on activities like reading or studying, 35.4% reported some distraction and 7.6% experienced significant disruption.

Table 4: Parents' Views on External Noise Sources

Variables	Options	n	%
Problems with outside noise	Yes	76	52.8
	No	68	47.2
Sources of external noise	Traffic noise	96	66.7
	Noise from neighbours	50	34.7
	Noise of children in the playground	22	15.3
	None	7	4.90
Most annoying external noise	Traffic noise	93	64.6
	Noise from neighbours	33	22.9
	Noise of children in the playground	11	7.60
	None	7	4.9
The extent to which noises from outside home distract someone reading or studying	Not at all 1	22	15.3
	Rarely 2	22	15.3
	Sometimes 3	52	35.4
	Often 4	38	26.4
	A lot 5	11	7.6

These findings highlight the significant impact of traffic noise on families and the effect of neighbourhood activities on the home environment, particularly in terms of disrupting focus and concentration for activities like reading and studying.

Parents' Views on Noise Management at Home

Table 5 highlights the parents' perspectives on noise management for supporting children's learning at home. Nearly a quarter (23.6%) of parents considered reducing noise critically important while 42.4% deemed it important. In reducing noise at home, 43.8% of parents limit loud TVs and music, and 32.6% enforce speaking in low tones. Although 71.5% noted that appliance sounds like vacuums are "a little audible" during study time, 72.2% said they "rarely" use them, indicating the awareness of noise as a distraction to some extent. Additionally, 36.8% of parents occasionally lower their voices when conversing during study time, though most do not do this regularly. Nevertheless, 73.6% enforced a no-loud-talking rule and 62.5% required others to stay quiet or whisper. Most parents (59.7%) rarely permitted study sessions with music or TVs while others (28.5%) perceived music to negatively impact learning. 51.4% of parents believed that sounds like TVs, radios, or appliances are considered noise that could interfere with learning.

Table 5: Parents' Views on Noise Management at Home

Variables	Options	n	%
Importance of reducing noise for children	A little important	42	29.2
	Important	61	42.4
	Very important	34	23.6
	Insignificant	7	4.9
Most disturbing noise	Noises in the house	35	24.3
	Noises from outside the house	94	65.3
	Noise is not a problem	15	10.4

What do you do to deal with or reduce noise at home?	Speak loudly to be heard	4	2.8
	Prefer low-noise appliances	6	4.2
	Limit listening to loud TV/music	63	43.8
	Speak in low tone	47	32.6
	Do not do much	19	13.2
	Other	5	3.5
How audible are household appliances from child's room?	It is never heard	16	11.1
	A little audible	103	71.5
	It can be heard easily	25	17.4
Frequency of using appliances during study time	Never	26	18.1
	Rarely	104	72.2
	Sometimes	14	9.70
	Often	0	0.00
How often are conversations/phone calls heard in child's room?	It is never heard	43	29.9
	A little audible	96	66.7
	It can be heard easily	5	3.50
Do you lower your tone when talking in child's room?	Never	24	16.7
	Rarely	51	35.4
	Sometimes	53	36.8
	Often	16	11.1
Rule against loud speaking in family communication	Yes	106	73.6
	No	38	26.4
Rule for maintaining quiet while child studies	Yes	90	62.5
	No	54	37.5
Allow child to study with music or TV on	Never	31	21.5
	Rarely	86	59.7
	Sometimes	25	17.4
	Often	2	1.40
Studying at home with music negatively affects learning	I strongly disagree	4	2.80
	I disagree	51	35.4
	I'm undecided	34	23.6
	I agree	41	28.5
	I strongly agree	14	9.7
All kind of sounds from appliances and conversations that can be heard from the room while children are studying are considered noise	I strongly disagree	3	2.1
	I disagree	36	25.0
	I'm undecided	14	9.7
	I agree	74	51.4
	I strongly agree	17	11.8

These findings suggest that parents are generally aware of the importance of managing household noise, although the level of action taken varies. While most parents recognise the disruptive nature of both internal and external noise, there are differing opinions on how significantly these noises affect learning, reflecting a need for greater awareness and possibly stricter household noise management strategies. A Spearman correlation analysis was conducted to examine the relationship between parental awareness of noise pollution and noise mitigation behaviors. The results indicated no significant relationship ($p = 0.095$, $r = -0.140$), with a weak negative correlation suggesting that increased awareness does not consistently translate into noise mitigation actions at home.

Parents' Noise Awareness Based on Education Level

A Shapiro-Wilk test was performed to evaluate data normality, revealing a non-normal distribution ($p< 0.05$). Thus, the Mann-Whitney U test was applied to compare the groups based on education level (low vs. high). "Low education" includes primary through secondary schooling while "high education" encompasses diploma and tertiary levels. The Mann-Whitney U test results indicate no significant difference in awareness regarding the negative effects of noise between parents with low and high education levels ($U=1832$, $p=0.247$). Despite a slightly higher mean rank in the high-education group (74.29) compared to the low-education group (65.07), the p-value (0.247) exceeds the conventional threshold of 0.05. This suggests that the difference in awareness levels between the two groups is not statistically significant, indicating that parents across education levels may have similar awareness of noise's negative effects.

DISCUSSION

This study assesses parents' knowledge and perceptions of noise pollution in the home learning environment. The findings reveal that while most parents recognise the importance of reducing noise, many are unaware of specific sources and effects of noise pollution. Some parents admitted to behaviours that contribute to noise pollution, such as using household appliances or allowing background noise from TVs or radios while their children are studying as shown in Table 5. This result is consistent with the findings of Bulunuz and Özgür (2021) who noted that parents often exhibit noisy behaviours like loud chatting or making phone calls even when their children

are studying. However, many parents also reported taking steps to create a quieter environment, indicating an overall awareness of the need for noise reduction.

Despite awareness of the negative impacts of noise, a noticeable gap persists between parental understanding and the consistent implementation of noise reduction strategies. Many parents acknowledge the harmful effects of noise but rarely take consistent actions, such as lowering their voices or avoiding noisy appliances during study times. This disconnect between awareness and behavior suggests that factors such as limited resources or environmental constraints may hinder parents from effectively managing noise. These findings emphasize the need for further research to explore the barriers influencing parental noise management behaviors. Future studies involving larger and more diverse samples could provide valuable insights and inform the development of targeted interventions to bridge this gap. Addressing this disconnect remains a critical area for future attention.

This study highlights that nearly half of parents experience significant external noise disruptions, particularly from traffic, neighbours, and playgrounds, which interfere with home learning. To effectively mitigate external noise in home learning environments, various acoustic strategies should be recommended to parents such as soundproofing windows and doors by installing double-glazed glass and adding weather stripping, which can significantly reduce incoming noise levels (Scannell et al., 2016; Gheller et al., 2020). Noise levels could be reduced by approximately 4 dB(A), translating to a 40% decrease in acoustic energy by installing sound barriers and planting dense vegetation along roadsides (Sonnadara et al. (2009). Apart from that, installing carpets and heavy curtains could provide further noise reduction as these materials absorb and dampen sound while curtains serve as barriers to outside noise (Shield & Dockrell, 2003; Mealings, 2023). These measures will foster an optimal acoustic environment, which is beneficial for both homes and educational settings while supporting a quieter, more focused learning atmosphere. Parents can also establish dedicated study spaces in quieter parts of the home, ideally away from external noise sources.

Enhancing parental knowledge and offering practical solutions can help create a more conducive learning environment at home. This may include community workshops, informational campaigns, and collaboration with schools to ensure that parents are well-equipped to support their children's educational needs effectively (Đurišić & Bunijevac, 2017). The survey revealed an equal split on the statement "Noise disturbs but does not harm human health", with 64 parents (44.4%) agreeing, 64 (44.4%) disagreeing, and 16 parents (11.1%) undecided. The findings suggest a common misconception that while noise can be annoying or disruptive, it does not have lasting or serious health consequences. It reflects a limited awareness of the noise risks which highlights the need for broader public education on how "harmless" noise levels can impact health and well-being over time (Klatte et al., 2013; Tavsanli et al., 2017; Dohmen et al., 2022).

The Mann-Whitney U test revealed no significant differences in noise-related health awareness between parents with low and high education levels. Although parents with higher education showed a slightly higher mean rank in awareness, this difference is not statistically significant. These findings contrast with earlier research by Knobel and Lima (2014), which suggested that parents with lower educational attainment were less concerned about their children’s exposure to noise than those with higher education levels. This discrepancy may indicate that awareness of noise pollution’s health effects transcends formal education, possibly influenced by community awareness campaigns or media initiatives. However, it is noteworthy to highlight that the sample size disparity between the groups could influence the study's statistical power and affect the generalisability of these findings. This could affect the reliability and generalisability of the findings, leading to greater variability and possibly not representing the broader population of parents with lower education levels (Slavin & Smith, 2009). Therefore, the observed difference might reflect the specific sample rather than a true population-wide phenomenon.

Based on the findings, several avenues for future research are recommended. First, it is crucial to investigate the unexpected result that parents with lower education levels exhibit greater awareness regarding the negative effects of noise. Qualitative studies could offer valuable insights into the underlying factors driving this awareness. Additionally, larger and more diverse studies are needed to validate and further explore this phenomenon, ensuring that the findings are representative of the broader population. Our data did not capture the extent of joint decision-making within households, which limits our ability to analyze this relationship. Future research could explore this aspect, as it may influence noise awareness and management behaviors. Furthermore, future studies should examine the long-term impact of noise pollution on children's academic performance, considering demographic variables such as socioeconomic status, urban versus rural environments, and age groups. This would provide a more comprehensive understanding of how noise pollution affects children's learning and development over time.

CONCLUSION

The findings of the current study highlight significant gaps in parental awareness of the health risks and cognitive impacts of noise pollution. Many parents underestimate noise's harmful effects, as reflected in mixed perceptions of its health impact and inconsistencies in noise management practices. Efforts should prioritize educating parents on the long-term effects of noise on cognitive and emotional health, particularly in households without noise management rules. Educational programs addressing these gaps can equip parents with effective strategies for managing household and external noise. Public policies and collaborative efforts with authorities, such as the Department of Environment should focus on implementing noise reduction measures like soundproofing and improving room acoustics. By addressing these issues, parents can create quieter, more supportive environments that enhance their children's focus and academic performance.

ACKNOWLEDGMENTS

This research was conducted after being approved by the IIUM Research Ethics Committee (IREC 2023 - KAHS DASLP7) and was not funded by any grant.

REFERENCES

Abdullah, S., Firdaus, M., Fuad, A., Dom, N. C., Ahmed, A. N., Mohd Kalkausar, K., Yusof, K., Fakhratul, M., Zulkifli, R., Mansor, A. A., Liyana, N., Napi, M., & Ismail, M. (2021). Effects of Environmental Noise Pollution Towards School Children. In *Malaysian J of Medicine and Health Sciences* (Vol. 17, Issue SUPP3).

Buchari, M., & Matondang, M. (2017). The influence of noise levels on learning performance of students at a state elementary school in Medan. AIP Conference Proceedings, 1903(1), 040002. https://doi.org/10.1063/1.5013238

Bulunuz, M., & Özgür, K. (2021). Analysis of Parental Opinions on Sound and Noise Pollution in Learning Environments. In *Journal of Family, Counseling and Education* (Vol. 6, Issue 2). https://doi.org/10.32568/jfce.958595

Chere, B., & Kirkham, N. (2021). The negative impact of noise on adolescents' executive function: An online study in the context of home-learning during a pandemic. *Frontiers in Psychology*, 12. https://doi.org/10.3389/fpsyg.2021.715301

Diaco, S. B. (2014). Effects of Noise Pollution in the Learning Environment on Cognitive Performances. *Liceo Journal of Higher Education Research*, *10*(1). https://doi.org/10.7828/ljher.v10i1.655

Dohmen, M., Braat-Eggen, E., Kemperman, A., & Hornikx, M. (2022). The Effects of Noise on Cognitive Performance and Helplessness in Childhood: A Review. *International Journal of environmental research and public health*, *20*(1), 288. https://doi.org/10.3390/ijerph20010288

Đurišić, M., & Bunijevac, M. (2017). *Parental Involvement as an Important Factor for Successful Education* (Vol. 7).

Gheller, F., Lovo, E., Arsie, A., & Bovo, R. (2020). Classroom acoustics: Listening problems in children. Building Acoustics, 27(1), 47-59.

Hazaha, H. & Ismail, N. (2022). *Parental Opinions on Sound and Noise Pollution in Learning Environments* (Unpublished undergraduate's thesis). International Islamic University Malaysia, Kuantan.

Ismail, N. B., Karim, K., & Othman, N. A. (2020). Noise levels in Malaysia primary schools: are we meeting the international standards? *International Journal of Allied Health Sciences*, 4(2), 1139-1150.

Isa, I. M., Zaki, Z. M., & Kassim, J. (2018). Traffic noise pollution at residential area. In *International Journal of Engineering & Technology* (Vol. 7, Issue 3). www.sciencepubco.com/index.php/IJET

Klatte, M., Bergström, K., & Lachmann, T. (2013). Does noise affect learning? A short review on noise effects on cognitive performance in children. In *Frontiers in Psychology* (Vol. 4). Frontiers Media S.A. https://doi.org/10.3389/fpsyg.2013.00578

Knobel, K. A. B., & Lima, M. C. M. P. (2014). Influences of age, gender, and parents' educational level in knowledge, behavior and preferences regarding noise, from childhood to adolescence. *Noise and Health*, *16*(73), 350–360. https://doi.org/10.4103/1463-1741.144400

Mealings, K. (2023). The effect of classroom acoustic treatment on listening, learning, and well-being: A scoping review. *Acoustics Australia*, *51*(2), 279-291.

Nayan, N., Hashim, M., Saleh, Y., Mahat, H., Luyan, M. H., Juanis, J., & Khotimah, N. (2022). Schools Traffic Noise Pollution Levels Along Federal Roads in Muallim District, Perak, Malaysia. *IOP Conference Series: Earth and Environmental Science*, *975*(1). https://doi.org/10.1088/1755-1315/975/1/012009

Petric, D. (2022). *Noise pollution and health*. www.rehabilitationjournals.com

Rusticus, S. A., Pashootan, T., & Mah, A. (2023). What are the key elements of a positive learning environment? Perspectives from students and faculty. *Learning Environments Research*, *26*(1), 161–175. https://doi.org/10.1007/s10984-022-09410-4

Scannell, L., Hodgson, M., García Moreno Villarreal, J., & Gifford, R. (2016). The Role of Acoustics in the Perceived Suitability of, and Well-Being in, Informal Learning Spaces. *Environment and Behavior*, 48(6), 769-795. https://doi.org/10.1177/0013916514567127

Shield, B. M., & Dockrell, J. E. (2003). *The Effects of Noise on Children at School: A Review Building Acoustics, 2,* 97-116. https://doi.org/10.1260/135101003768965960

Slavin, R., & Smith, D. (2009). *The Relationship Between Sample Sizes and Effect Sizes in Systematic Reviews in Education*. 31(4), 500–506. https://doi.org/10.3102/0162373709352369

Sonnadara, U., Kalansuriya, C. M., Pannila, A. S., & Sonnadara, D. U. J. (2009). Effect of roadside vegetation on reduction of traffic noise levels Effect of roadside vegetation on the reduction of traffic noise levels. In *Proceedings of the Technical Sessions* (Vol. 25). https://www.researchgate.net/publication/239939497

Tavşanlı, Ö. F., Bulunuz, M., & Bulunuz, N. (2017). *An Evaluation of Primary School Students' Views about Noise Levels in School*. https://www.researchgate.net/publication/317973844