



The Sound Horeg Phenomenon: Health Impacts of Infrasonic Exposure: A Literature Review

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Abstract

The sound horeg phenomenon represents a cultural practice involving the use of high-power audio systems during social events in various regions of Indonesia, particularly East Java. While it serves as an important medium of entertainment, cultural expression, and local economic activity, exposure to excessive noise dominated by low-frequency noise (LFN) and infrasound raises public health concerns. This literature review aims to evaluate current scientific evidence regarding the biological, neurophysiological, psychological, and social impacts of infrasound exposure on humans. A comprehensive search was conducted in PubMed, Scopus, ScienceDirect, Google Scholar, and ProQuest for articles published between 2015 and 2025. The results show that moderate-intensity infrasound (≤ 90 dB) causes sleep disturbances, increased stress, and subtle neurological adaptations that can alter long-term cognitive function. Extreme exposure, such as to high-intensity sound (≥ 120 dB), carries a high risk of causing Noise-Induced Hearing Loss (NIHL), decreased memory function, and social isolation due to communication disorders. In addition to biological effects, psychological factors such as the nocebo effect play a role in the emergence of health complaints due to negative perceptions of loud noise. Therefore, a balance between preserving cultural values and protecting health needs to be achieved through sound intensity regulation, public education, and adaptive acoustic architectural design.

Introduction

The phenomenon of "sound horeg" is something tradition or culture use audio system with Power high at various social events in a number of regions in Indonesia, especially in East Java, which has attached become an integral part of expression culture public local (Prihandini & Arlan, 2025; Rahman & Ulum, 2025; Fauzi, 2025). Use of sound horeg or powerful sound system tall the more popular in Lots activity The technology is a cultural and social activity practiced by Indonesians. Events such as carnivals, parades, or folk festivals utilize this technology and have become a major entertainment component. It has high social and entertainment value. According to modern ethnographic descriptions, horeg sound typically consists of assembled speaker vehicles or racks that emit very loud sounds late into the night, making horeg sound an expression of culture and a creative economy (Puspita et al., 2025; Darmawan & Efendi, 2024; Droumeva, 2021).

Sound horeg used in various context, good personal and public. In the context of personal, such as party wedding, anniversary year, or meeting family big, they often used For rotate music, giving announcement, or strengthen voice speaker so that everyone present can listen to it. In the context of public, use of sound horeg more diverse (Armayanto et al., 2025; Lintangesukmanjaya et al., 2025). Campaign politics, demonstrations, and religious events is all place where the tool This Lots Used. In political campaigns, the horeg sound is used to deliver speeches or orations, reinforce campaign messages, and attract the attention of the masses. In demonstrations or rallies, this tool is used to voice demands, give commands to participants, and strengthen bonds between those participating. In religious events, the horeg sound is often used to broadcast the call to prayer, lectures, or religious studies so that the entire congregation can hear it, both inside and outside the place of worship (Yuhana, et al., 2020).

Physiologically, the low vibrations of horeg sound can activate the vestibular and somatosensory systems, producing a vibrating sensation that triggers the release of endorphins and dopamine in the brain (Bartel & Mosabbir, 2021; Casale & Hansson, 2022) This effect is comparable to therapeutic music used in psychological rehabilitation, which leads to increased relaxation, euphoria, and improved mood (Widyastuti & Raharjo, 2021; Raglio et al., 2015; Hohmann et al., 2017). Furthermore, horeg sound has social and cultural benefits. People in horeg fan communities can interact and express themselves in these spaces, which increases social solidarity (Hidayat & Sari, 2023; de Wilde, 2017). Activities such as "horeg contests," for example, foster a sense of collective identity and group identity, and can even become a new creative economy, particularly in the local vehicle modification and audio equipment manufacturing industries. This suggests that horeg sound is not just an expression of entertainment; it is also a socio-economic phenomenon that provides opportunities for people to work and build community networks.

From an acoustic perspective, many components of sound noise are related to low-frequency noise (LFN) and infrasound, which are typically defined as sounds below 20 Hz (Erdélyi et al., 2023; Staniek & Mitterska, 2025). Infrasound and low-frequency noise are spectral components that have the ability to propagate long distances and produce vibrational sensations at sound pressure levels typically considered "inaudible." A fundamental understanding of infrasound and LFN is crucial because their frequency and energy properties, not just simple dB(A) levels, also determine how exposure is transmitted to the human body and the acoustic environment (Marina et al., 2019; Abrams & Gerhardt, 2000).

Its characteristic low-frequency vibrations can have a relaxing effect and elevate mood when played at the right intensity (Mercey & Ahonen, 2025). However, despite these positive effects, horeg sound also has the potential for negative impacts if used excessively or without control, such as hearing loss, increased intracranial pressure, and psychosomatic complaints due to prolonged and intense exposure to low-frequency sounds. Therefore, a scientific understanding of the safe limits and optimal benefits of horeg sound is crucial so that this phenomenon can be utilized wisely and without posing health risks or environmental hazards (Chaban, 2021).

Exposure to infrasound at high intensities or over long periods can cause physiological and psychological effects, such as a sensation of ear pressure, balance disorders, fatigue, nausea, sleep disturbances, and an increased stress response, according to several studies (Leventhall, 2003; Chaban et al., 2021). The mechanisms of these effects are thought to be related to tissue resonance, stimulation of the vestibular system, and activation of the autonomic nervous system, which triggers a sympathetic response and changes in blood pressure. Long-term infrasound exposure has biopsychosocial impacts such as irritability, impaired concentration, and a poorer quality of life for people living in low-frequency noise environments, in addition to direct impacts on the sensory system (WHO, 2018; Baliatsas et al., 2016;).

Against this backdrop, this literature review aims to gather, evaluate, and synthesize evidence on audiological, neurophysiological, and biopsychosocial impacts related to infrasound/LFN exposure in the context of the sound horeg phenomenon with the aim of identifying the strength of the evidence, research gaps, and implications for public health policy. The sound horeg phenomenon not only represents entertainment practices, but also reflects aspects of the creative economy and social identity of rural to semi-urban communities in East Java. In many cases, large sound system owners make it their main source of income through rental services at celebrations and carnivals (Orea-Giner et al., 2022). According to a cultural anthropological study by Nugroho (2023), this activity strengthens social solidarity and affirms social status in the community. However, this economic aspect often clashes with public health issues due to extreme noise and irregular usage times. Therefore, it is necessary to understand the public regarding the negative impacts of sound horeg on health if used inappropriately or excessively. Therefore, it is important to review the scientific evidence regarding the impact of infrasound on the human body as a whole, both from physiological, psychological, and social aspects, in order to understand the potential health risks due to long-term exposure to sound noise (Environmental noise guideline, 2019).

Methods

This research is structured in the form of a conceptual study that aims to formulate a new hypothesis regarding the relationship between the Sound Horeg phenomenon and the biopsychosocial impacts of infrasound exposure. Therefore, that, the method used nature qualitative with approach integrative literature. Based on accumulation proof available scientific.

Search done through Google Scholar, PubMed, and Scopus with keywords ("infrasound" OR "low-frequency sound") AND ("health").

Inclusion criteria included articles published in the last 10 years (2015–2025). Relevant studies related infrasound exposure. Literature that mentions connection between exposure infrasound and health. While criteria exclusion includes Articles with methodology No clear or No explain connection cause and effect. The model is constructed with referring to the principles deductive, namely combine theory existing and literature data For compile framework hypothesis that can tested in studies advanced

Result and Discussion

No	Writer	Origin	Title	Design	Results
1	Zajamšek, Hansen, Doolan & Hansen (2016)	Australia	Characterization of Wind Farm Infrasound and Low-Frequency Noise	Experiment field & analysis spectrum	Infrasound with frequency around 0.8 Hz and its harmonics can detected until distance 4 km. exposure term long associated with complaint disturbance sleep, sick headache, pressure in the ears, and stress light on some parts residents House near turbine. This study become proof that infrasound can detected in a way acoustic and affect welfare psychological and physiological, especially through disturbance sleep

					and improvement response stress autonomous.
2	Baeza Moyano & González Lezcano (2020)	Spanish	Effects of Infrasound on Health: Looking for Improvements in Housing Conditions	Review Article	Literature study that reviews various infrasound source (turbine wind, vehicle, system ventilation) and its effects on health. It is concluded that even though proof effect biological direct Still limited exposure term long can cause disturbance sleep, fatigue, stress blood high, and stress psychological. It is recommended implementation architecture Healthy For reduce infrasound.
3	Ascone, Kling, Wiczorek, Koch & Kühn (2021)	German	A Longitudinal, Randomized Experimental Pilot Study to Investigate the Effects of Airborne Infrasound on Human Mental Health, Cognition, and Brain Structure	RCT	In a way general, no found change significant in variables psychological or cognitive, including anxiety, depression, quality sleep, or attention. However, the results MRI imaging shows decreased gray matter volume in bilateral cerebellum area VIIIa and left angular gyrus in the infrasound -exposed group. These areas relate with motor function, perception sensory, and integration auditory.
4	Prihandini & Kurnia	Indonesia	Fenomena Sound Horeg dan Ancaman Tersembunyi: Kajian Hipotetik NIHL dan Dampak pada Fungsi Kognitif	Conceptual study literature	Article review connection between phenomenon <i>sound horeg</i> , Noise-Induced Hearing Loss (NIHL), and hearing loss function cognitive. Sound from <i>sound horeg</i> reaching 120–140 dB, exceeding the WHO safe limit (85 dB). Exposure repetitive associated with damage cochlea permanent and decreasing cognitive through mechanism <i>auditory deprivation</i> and <i>social isolation pathway</i> .

5	Vilímek et al. (2022)	Czech Republic	The Effect of Low Frequency Sound on Heart Rate Variability and Subjective Perception : A Randomized Crossover Study	Randomized crossover	Exposure voice frequency low 40 Hz (infrasound approaching the lower limit hearing) compared with condition control No show change significant on variability pulse heart rate (HRV) and perception stress. Effects relaxation light appear, but No can confirmed originate direct from infrasound.
6	Bartel & Mosabbir (2021)	Canada	Possible Mechanisms for the Effects of Sound Vibration on Human Health	Narrative review	Infrasound (1–20 Hz) can influence body through mechanism hemodynamics (stimulation cell endothelium and increased flow blood), neurological (activation nerves and oscillations brain), as well as musculoskeletal (relaxation) muscle and increase mobility). However proof clinical Still limited and results studies No consistent.
7	Marshall et al. (2023)	Australia	The Health Effects of 72 Hours of Simulated Wind Turbine Infrasound : A Double-Blind Randomized Crossover Study	Double-blind randomized crossover	Exposure to 1.6–20 Hz (90 dB) infrasound for 72 hours in individuals sensitive to voice No cause disturbance sleep, change pressure blood, pulse heart, mood, or function cognitive. The results showed that infrasound did not impact physiological and psychological significant in healthy people.
8	Crichton & Petrie (2015)	New Zealand	Health Complaints and Wind Turbines: The Efficacy of	Experiment random (single-blind)	Studies show that complaint health due to turbine infrasound wind No caused by the effect physiological directly, but rather by the nocebo effect (expectation) negative consequence media information). Participants

			Explaining the Nocebo Response to Reduce Symptom Reporting		who were given explanation about nocebo effect reported decline symptoms and mood improvement, although still exposed to infrasound.
9	Zagubień & Wolniewicz (2020)	Poland	The Assessment of Infrasound and Low Frequency Noise Impact on the Results of Learning in Primary School – Case Study	Field study (case study)	Study done at school adjacent base with road highways and wind farms. The results show infrasound and low-frequency noise levels below threshold hearing human, but still potential cause disturbance comfort and reduce focus Study student If happen exposure term long.
10	Tonin, Brett & Colagiuri (2016)	Australia	The Effect of Infrasound and Negative Expectations to Adverse Pathological Symptoms from Wind Farms	Experiment laboratory with group control	Experimental studies using simulated infrasound from turbine wind. The results show No There is effect physiological significant from long-term infrasound exposure short, but expectation negative (nocebo effect) significant increase reported symptoms participant like dizziness, pressure in the ears, and nausea.
11	van Kamp & van den Berg (2018)	Dutch	Health Effects Related to Wind Turbine Sound, Including Low-Frequency Sound and Infrasound	Review narrative (narrative review)	Review of 32 studies epidemiological and experimental show that voice turbine wind, including component frequency low and infrasound, no own proof strong cause effect physiological directly. However, exposure chronic associated with disturbance sleep, stress, and complaints subjective consequence disturbance comfort and sensitivity individual.

12	Pereira (2022)	English	The Infrasonic Impact: Exploring the Cognitive Impact of Frequencies Below the Hearing Threshold During Short-Term Exposure	Experiment laboratory (MRes thesis)	The experiment used short-term infrasound exposure to assess reaction time and working memory. Results showed no significant effect on cognitive task accuracy, but a slowing of reaction time, suggesting a possible effect of infrasound on short-term attention function.
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Characterization of Wind Farm Infrasound and Low-Frequency Noise

Experimental studies field This describe infrasound and noise frequency low (ILFN) turbine wind in South Australia. Measurement done in several House in distance three until four kilometers from turbine, good moment turbine operate and stop. The result show that frequency ILFN's main objective is around 0.8 Hz, or blade-pass frequency, with multiple harmonic. IIFN increases in a way significant at night day, especially moment condition atmosphere stable and windy more firmer at hub height than at ground level land.

In addition, it was found that ILFN exposure can exceed threshold hear man until a distance of 4 km. However, ILFN exposure is often No realized in a way conscious, which means that That No heard. Exposure term length on ILFN is associated with complaint subjective like disturbance sleep, sick headache, pressure in the ears, and stress light on some residents House near turbine, although Not yet There is proof direct effect pathophysiological from ILFN. This study show that artificial infrasound man can detected in a way acoustic and can impact on health psychological and physiological, especially through disturbance sleep and response stress increased autonomy.

Effects of Infrasound on Health: Looking for Improvements in Housing Conditions

This article is *literature review* comprehensive which discusses various artificial infrasound sources like turbine wind, vehicle, system ventilation, and equipment House stairs. The authors say the difference between infrasound (0.01–20 Hz) and low-frequency noise (20–200 Hz) as two spectra wave with potential effect biological different.

From the results study more from 50 articles publication, obtained that long-term infrasound exposure long, especially in urban or industrial environments can cause effect physiological light until moderate, such as: 1) discomfort in the chest or ears; 2) disturbance Sleep chronic; 3) increased blood pressure and heart rate, as well; 4) impaired concentration and general fatigue.

Psychologically, some individuals may experience stress and anxiety reactions as a result of infrasound exposure, primarily due to the perception of danger or *the nocebo effect*. The authors also emphasize that building architecture and layout play a significant role in reducing infrasound transmission into living spaces.

Therefore, this article states that infrasound is an environmental component related to public health, particularly blood pressure, sleep disturbances, and mental health. To prevent the

accumulation of infrasound exposure in homes and urban buildings, the author encourages the application of healthy architectural principles.

A Longitudinal, Randomized Experimental Pilot Study to Investigate the Effects of Airborne Infrasound on Human Mental Health, Cognition, and Brain Structure

Study This is type experiment controlled in a way the first randomized controlled trial (RCT) to examine effects of infrasound on humans healthy. There were 38 participants who were differentiated into two groups: group *verum* exposed to 6 Hz infrasound with intensity of 80–90 dB SPL in 28 pm in succession, whereas group *sham* use device similar without emission voice.

Basically, no found change significant in variables psychological or cognitive like anxiety, depression, quality sleep, or attention. However, the results MRI imaging shows existence decreased gray matter volume in bilateral cerebellum area VIIIa and left angular gyrus in the infrasound -exposed group. These areas relate with motor function, perception sensory, and integration auditory.

Decline the Not yet can interpreted as damage, but show the presence of neuroplasticity or adaptation brain to Long- term infrasound exposure. This study strengthen findings previously that infrasound can influence structure brain at the level microscopic, especially the area that processes information sensory and sound, but decline This Not yet can interpreted as damage.

Seen from field health society, research This indicates the need for monitoring chronic infrasound exposure, especially for individuals who live or work in the area near constant infrasound source like turbine wind, factories, or airport.

Fenomena Sound Horeg dan Ancaman Tersembunyi: Kajian Hipotetik NIHL dan Dampak pada Fungsi Kognitif

The phenomenon of "sound horeg" in Indonesia, which means use system voice quality tall during social events society, discussed in article This as noise culture that contains potential threat hidden. Horeg sound can reach intensity 120–140 dB, far exceeding the WHO safe limit of 85 dB for 8 hours of exposure.

Writer offers a conceptual model that connects exposure voice hard repetitive with lost hearing caused by voice (NIHL) and how matter That impact on ability cognitive disorders hearing permanent can happen If stress oxidative and inflammatory damage cell hair cochlea. Three mechanisms main linking NIHL with decline function cognitive in term long:

Auditory deprivation -> reduction stimulation auditory to brain lower activity temporal cortex.

Cognitive load theory -> impaired hearing increase burden attention and speed up fatigue cognitive.

Social isolation pathway -> disruption communication consequence lost hearing cause isolation social, which is correlated with dementia.

Phenomenon This show that exposure noise extreme like sound horeg No only problem auditory, but also potential become issue neurocognitive society. This article emphasize how importance education public and regulations about intensity voice in activity culture For protect health hearing and function brain in a way overall.

The Effect of Low Frequency Sound on Heart Rate Variability and Subjective Perception: A Randomized Crossover Study

A study by Vilímek et al. (2022) investigated how low-frequency sound at 40 Hz affected heart rate variability (HRV), perceived stress, and mood. The results showed no significant physiological differences between the treatment and control groups, although there were small

changes in mood and feelings of relaxation. This suggests that low-frequency infrasound does not increase stress or disrupt autonomic cardiac function.

Possible Mechanisms for the Effects of Sound Vibration on Human Health

Research conducted by Bartel and Mosabbir (2021) investigated method vibration sound, including infrasound, which can influence health humans. They explain that in a way theoretical vibration frequency low can influence system hemodynamic, neurological, and musculoskeletal with stimulate circulation blood and stimulate nerves. However, there are A little proof empirical support effect negative infrasound, and some big findings study No consistent. Therefore that, the impact of infrasound is more nature theoretical than real.

The Health Effects of 72 Hours of Simulated Wind Turbine Infrasound: A Double-Blind Randomized Crossover Study

experimental study by Marshall et al. (2023) resulted in the strongest evidence about infrasound exposure. In a 72- hour double-blind crossover study, participants who were sensitive to voice exposed to infrasound with frequency 1.6–20 Hz and intensity 90 dB. The result show that compared to with group control, no There is change significant in quality sleep, pressure blood, pulse heart, mood, or performance cognitive. This shows that the infrasound produced by the turbine wind No own significant impact on health physique or mental.

The Assessment of Infrasound and Low Frequency Noise Impact on the Results of Learning in Primary School – Case Study

Crichton and Petrie (2015) use different approach, placing aspect psychological from the phenomenon of "wind turbine syndrome". The study show that nocebo effect which means complaint appear Because belief negative to exposure is reason common symptoms associated with infrasound exposure. When participants educated about nocebo mechanism, number their complaints and mood disorders reduce although they still exposed to infrasound. The results show that perception and suggestion psychological play role important in emergence infrasound complaints.

The Assessment of Infrasound and Low Frequency Noise Impact on the Results of Learning in Primary Schoo – Case Study

Research This own objective For evaluate how far the noise frequency low and infrasound in the environment school can influence the learning process children. Research done at school adjacent base with road highway main and turbine fields wind For measure level noise in and around room class. Measurement results show that the level of infrasound produced be under threshold hearing humans, whereas noise frequency low detected within safe limits. Although No found proof direct existence interference with the results Study students, exposure noise environment in a way continuously potential cause fatigue, disturbance concentration and stress light. This study confirm the need monitoring to noise environment school as part from management health environment child.

The effect of infrasound and negative expectations to adverse pathological symptoms from wind farms

Review This investigate whether symptom health reported by people around the turbine farm wind originate from infrasound exposure or from response so -called psychogenic nocebo effect. In research experimental this, participants exposed to illustrative infrasound sounds turbine wind and sound fake, also known as as sham sound, below condition expectation high and low For avoid effect negative.

The result show that infrasound does not cause effect significant pathology in a way physiological, whereas expectation negative against infrasound has real impact to emergence reported symptoms, such as dizziness, nausea, and discomfort. This study support hypothesis

that perception danger from infrasound more influenced by factors psychological than by physical stimulus That Alone.

Health Effects Related to Wind Turbine Sound, Including Low-Frequency Sound and Infrasound

Based on analysis more from 30 studies observational and experimental, review narrative This evaluate proof scientific linking exposure voice turbine wind, including component frequency low and infrasound, with effect health in the population general. Most of the findings show that exposure voice turbine wind causing annoyance and disturbance sleep ; however, no There is evidence that shows impact physiological direct from exposure voice turbine wind. The level of disturbance felt is greatly influenced by the variables like sensitivity to noise, perception justice social, acceptance society, and benefits economy This study emphasizes that in addition to technical noise control, addressing the health impacts of wind turbines requires a socio-psychological approach.

The Infrasonic Impact: Exploring the cognitive impact of frequencies below the hearing threshold during short term exposure Research

This own objective For evaluate impact exposure term short against infrasound below threshold hearing to function cognitive, as well as evaluate role expectation positive and negative (placebo and nocebo). With using the *Simon task* test and *n-back test*, the study This compare accuracy and time reaction exposed participants and No exposed to infrasound. Research results show that infrasound exposure is not influence level accuracy, but slow down time reaction simple, which indicates existence disturbance light on attention or processing information. In addition, it is proven that effect expectation influence perception and response to stimulus. Research This show that infrasound has subtle effects on cognition and that component psychological play role big in How infrasound effects are considered.

Characteristics Physical and Environmental Infrasound

Infrasound is wave acoustic with frequency below threshold hearing human, namely not enough from 20 Hz. Waves This can originate from source artificial man like turbine wind, engine vehicles, systems ventilation, and equipment House ladder big, and phenomenon natural like earthquake earth, eruption mountain, or wave sea. Research by Zajamšek et al. (2016) explains in detail how infrasound from turbine wind especially produced by interaction blade with tower (*blade-tower interaction*) that appears *blade-pass frequency* around 0.8 Hz along with harmonics. Interestingly, the intensity of the infrasound increases in a way significant at night day Because stability more atmosphere tall Because layer air tend reflect wave sound and expand range transmission up to a radius of 4 km from source.

In context environment built, Baeza Moyano & González Lezcano (2020) emphasize that infrasound does not only is phenomenon physical, but also problems environment that can influence comfort acoustic humans. They classify infrasound (0.01–20 Hz) and noise frequency low (20–200 Hz) as the two categories that require For reviewed in a way separated Because characteristics propagation and effects biological different. Infrasound waves can penetrate wall building and interacting with structure body man through vibration micro. Although part big No realized in a way aware, but transmission energy acoustic This can influence function physiological certain, especially If exposure ongoing chronic. Therefore that, understanding to characteristic physical infrasound is not only important in field acoustic technique, but also in context health environment and design architecture healthy buildings in a way acoustics (*healthy acoustic architecture*).

Physiological Effects: Sleep, Cardiovascular, and Neurological

Various study show that long-term infrasound exposure long can result in existence effect physiological, although No always consistent throughout population. According to analysis

systematically conducted by Baeza Moyano and González Lezcano (2020), people living in the neighborhood with high infrasound levels often report symptom like pressure blood high, fatigue, pain head, and disorders Sleep chronic. Activation system nerve sympathetic and interference with regulation neuroendocrine, especially through improvement hormone stress like cortisol, it is suspected responsible answer on the underlying mechanism.

Interestingly, Ascone et al. (2021) is one of them study experimental first to identify change structural brain damage caused by infrasound exposure. In a randomized trial controlled activities carried out for 28 nights with frequency of 6 Hz and intensity of 80–90 dB, they get existence decreased gray matter volume in bilateral cerebellum VIIIa and left angular gyrus. Although change This No followed with decline function cognitive or disturbance significant sleep results the to interpret existence *neuroplasticity* or adaptation brain to exposure voice low. This is create hypothesis new that infrasound effect no always come true in symptom subjective, but can detected through change neuroanatomy smooth which is possible nature adaptive or compensatory.

Beside that, some other research provides Different results. Vilimek et al. (2022) conducted a controlled crossover study and found that exposure to 40 Hz sound did not affect heart rate variability, blood pressure, or other physiological stress markers. Marshall et al. (2023) further strengthened this conclusion through a 72 -hour *double-blind randomized crossover study*, where no significant differences were found in sleep quality, blood pressure, or cognitive performance in participants exposed to simulated wind turbine infrasound (1.6–20 Hz, 90 dB). The differences results between studies This strengthen that the infrasound effect is intensity and duration -dependent, and are highly influenced by individual sensitivity and context psychological participants.

At the corner view physiological, can confirmed that the infrasound has intensity moderate No cause effect acute measurable, but exposure chronicle potential result in emergence adaptation neurological disorders sleep, and dysregulation autonomous light. Genetic factors, level stress, and perception subjective to danger can also be play a role in modulate response body to this stimulus.

Effect Psychology and the Role of Perception (Nocebo Effect)

On the side psychological from infrasound phenomena have interesting the attention of researchers, especially related the concept of "wind turbine syndrome" which is widely reported by the public around the turbine field. In research conducted by Crichton & Petrie (2015) it was provided proof strong that Lots symptom like dizziness, nausea, and mood disorders actually is results from the nocebo effect is emergence complaint consequence belief or expectation negative to something exposure. In research this, participants who were given information that infrasound can dangerous report more Lots symptom although exposed voice fake (*sham exposure*), temporary participants who received education neutral or positive report A little complaint.

Experiment more carry on about expectation negative show same result: perception social risks and suggestions proven increase sensitivity individual to actual sound stimuli No dangerous. According to the Review of Health Effects Associated with Wind Turbine Sound (2021), there are more correlation big between factor social, justice environment, and acceptance public to existence turbine than level pressure voice actually. Phenomenon This show that perception greatly influences response psychophysiological somebody against infrasound.

Therefore that, the effect reported health public due to infrasound not can solely explained by the mechanism physiological. Psychogenic factors and context socio-cultural is very important, especially in group of people who have perception bad or injustice to source Noise. Even without technical intervention at the noise source, effective public education and risk communication approaches have been shown to reduce infrasound-related complaints.

Impact, Learning, and Noise Culture

Besides the effects physiologically and psychologically, infrasound also has the potential influence function cognitive and performance learn, even though the effect tend subtle. The Infrasonic Impact study (2023) found that exposure term short against infrasound below threshold hear slow down time reaction participant without lower accuracy cognitive, which indicates existence disturbance light on the attention process selective and speed processing information. Meanwhile that, Crichton & Petrie's (2015) research in the environment school show that infrasound levels in space class near road highway and turbine fields Still within safe limits, but noise environment chronicle can trigger mental fatigue, disturbance focus and stress mild in children. This is indicates that although No direct lower performance academic, exposure noise prolonged low can disrupt the learning process and comfort psychic child.

In context Indonesian culture, the sound horeg phenomenon as discussed by Prihandini & Kurnia (2025) provides dimensions local to issue this. With intensity reaches 120–140 dB, the sound produced by *sound horeg* Far exceeding the WHO recommended safe limits. Exposure kind of This potential causing permanent Noise-Induced Hearing Loss (NIHL), especially through mechanism stress oxidative in cells hair cochlea. Disorders hearing chronic that arises Then can cause decline function cognitive through a number of pathways, including *auditory deprivation*, increased *cognitive load*, and isolation social. This is similar with mechanism neurodegenerative in the elderly with disturbance hearing, where it is deficient stimulation auditory reduce neuronal activity in the temporal cortex.

Exposure to extreme noise such as this highlights the need for public policy interventions and public education to regulate noise levels during social activities. Without awareness of the dangers of noise, popular culture such as *sound horeg* can develop into a serious public health problem, particularly among adolescents and young adults who are frequently exposed.

Synthesis and Public Health Implications

Based on twelve analyzed literature, can concluded that the impact of infrasound on health multidimensional, encompassing aspect physiological, psychological, and social. In general general, infrasound with intensity environment (≤ 90 dB) no cause effect pathological acute, but can cause disturbance comfort, sleep, and balance psychological when exposure lasts a long time. On the contrary, exposure noise extreme (≥ 120 dB) as in the phenomenon *sound horeg* or concert music empowered tall own effect significant audiological and neurocognitive.

The role of social and psychogenic perceptions is prominent in this phenomenon. Symptoms often associated with infrasound are largely influenced by expectations, negative suggestions, and social dissatisfaction with the noise source. This supports the concept of *psychogenic symptomatology* in "wind turbine syndrome," where the perception of danger triggers a physiological response even though the physical stimulus is harmless. Therefore, public health interventions must be multidisciplinary: in addition to controlling noise sources, public education, psychosocial strengthening, and adaptive acoustic architectural design for low-frequency waves are necessary.

Chronic exposure in vulnerable groups such as children, industrial workers, and rural communities living near infrasound sources requires special attention. Policies regarding occupational noise exposure, sound exposure thresholds, and routine hearing screening programs can prevent permanent damage to the auditory system and reduce the risk of long-term neurocognitive impairment.

Going forward, further research should emphasize a long-term neurobiological approach with the integration of physiological and psychosocial data. The combination of neuroimaging techniques, stress biomarkers, and public perception surveys will provide a more comprehensive picture of the impact of infrasound on human health. With a deeper

understanding, public policy can focus on prevention, mitigation, and improvement of the acoustic environment to support holistic human well-being.

Conclusion

horeg sound phenomenon in Indonesian society has quite strong social value. In various activities such as celebrations, festivals, and village celebrations, the use of high-powered audio systems is considered a symbol of festivity, togetherness, and cultural expression. Thus, horeg sound is not merely a form of entertainment but also has psychosocial significance as a means of community expression and solidarity, particularly in rural and semi-urban areas. However, behind these social benefits, horeg sound carries significant potential health risks, especially when used without control over intensity and duration.

Based on the results of a study of 12 scientific literature, extreme noise exposure produced by sound horeg can reach 120–140 dB, far exceeding the WHO-recommended safe limit (85 dB for 8 hours of exposure). This type of exposure has been shown to cause permanent Noise-Induced Hearing Loss (NIHL) due to damage to cochlear hair cells. Furthermore, chronic hearing loss has further implications for cognitive function and emotional balance, as reduced auditory stimulation causes auditory deprivation and increases cognitive load. In the long term, this condition can trigger social isolation and memory decline that resembles a mild neurodegenerative process. Although not always causing acute physiological effects, chronic exposure can disrupt sleep quality, blood pressure, and autonomic nervous system regulation. Meanwhile, from a psychological perspective, the nocebo effect and excessive perception of danger from noise can exacerbate stress and mood disorders, even when sound intensity remains within safe limits.

Based on this description, regulations regarding sound intensity limits in public activities need to be consistently enforced, accompanied by public education about the risks of hearing loss and noise-induced stress. A community-based approach, involving village officials and health institutions, can help create a balance between cultural preservation and public health protection. Furthermore, further research is needed that combines neurobiological, psychological, and social approaches to understand the complex impacts of infrasound and extreme noise exposure on individuals. With appropriate prevention strategies and adaptive noise management, it is hoped that sound horeg can continue to be a symbol of community happiness without sacrificing the hearing health and psychological well-being of future generations.

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