

People-centred offices

A psychological approach to resolving office noise distraction



Psychoacoustics in practice

Hodsman and Oseland's analysis of the research literature identifies four key, non-physical factors that affect stimulation and noise perception, and therefore performance:

1. Task and work activity

Individuals and teams typically conduct a range of work activities throughout the day, but are generally provided with only one work environment. Following the principles of activity-based (agile) working environments, a range of settings may be provided, tailored to meet the needs of the tasks and the team. Consider:

- the nature of the task or work activity
- whether the task involves cognition or memory
- the complexity of the task
- whether multi-tasking is required
- whether the task requires quiet (i.e. concentration).

2. Context and attitude

Perception of noise is affected by attitudes towards the source of the noise. If people feel that a sound source is justified (e.g. an important announcement) or they are more familiar with those generating the sound (such as close teammates) they will be more tolerant of the distraction. Consider:

- attitudes towards those creating the noise
- the perceived necessity of the noise
- the meaning attached to the noise.

3. Perceived control and predictability

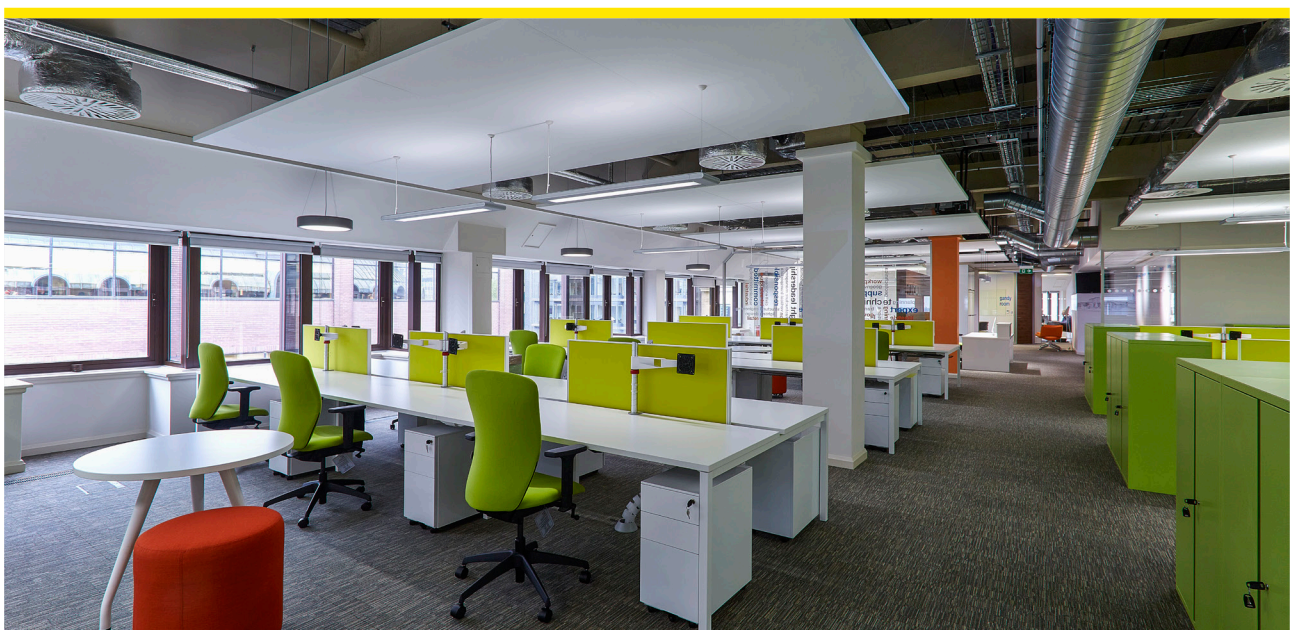
Although research indicates that it is perceived control rather than actual control of noise that has alleviating effects, it is not always practical to give full control over noise, particularly in open-plan environments. Moreover, the people who find noise distracting tend to be the personality types that avoid unnecessary confrontation. In these circumstances, an "office etiquette" policy document setting out agreed acceptable behaviour can be beneficial, as can agreed methods for controlling interruptions from colleagues (e.g. visual cues such as small "busy" flags on the desk, or the use of headphones). Consider:

- whether the noise source is intermittent or steady
- whether the noise is predictable
- whether those exposed to the noise have control of it.

4. Personality and mood

There is plenty of evidence that the most productive teams are those with a rich mix of personality types, but the design of many workplaces is often more suited to extroverts. Psychological profiling is often used to determine if a person has the relevant personality and attitude for joining an organisation or team, but it could also be used to cluster people who prefer and function better in similar acoustic environments. Better still, the different personality types would be offered choice over where they wish to work and select their preferred location. Consider:

- differences in people who are more sensitive to noise
- differences in people who seek stimulation versus those that prefer solitude
- the effect of moods such as anger.



Background

From the distant rumble of thunder to the cry of a newborn baby, sound waves are known to induce a range of physical, physiological and psychological effects in humans. It is widely accepted that unwanted sound – noise – affects people's health and wellbeing, mental state and performance in many ways.

Problems with noise are not new. Indeed, texts written on clay tablets at around the time of the Sumerians (3500–1750 BC) mention how the god Enlil was angered by the noise of an overpopulated city, so flooded the city to remove the noise problem! Thankfully, since the Industrial Revolution we have relied on empirical research to identify more satisfactory ways to combat noise in the workplace. Yet noise remains one of the top causes of dissatisfaction and loss of productivity in the workplace; and the psychological impact of noise is felt more often in office environments than in other workplaces.

In office buildings, noise can result in annoyance, heightened stress levels and reduced performance. There is also evidence that stress from noise continues to affect performance for some time after exposure to the noise.

Noise is a business issue. A recent meta-analysis of 21 published studies into the impact on productivity from environmental conditions, including noise (acoustics), found that – after accounting for other factors in the studies to do with the buildings and work activities – removing unwanted and distracting sounds (noise) can increase productivity by almost 2 per cent. That might seem low, but some office experts suggest that a 1 per cent improvement in productivity may represent a saving of as much as £50 per square metre per year.

In the past, efforts to control noise in buildings have centred on physical solutions such as acoustic ceilings and vertical barriers. But the demands of 21st-century workplaces – particularly given the prevalence of open-plan offices – call for a more rounded approach, encompassing psychological, physiological and physical solutions.

In order to develop such an approach, Paige Hodsman of Saint-Gobain Ecophon and Dr Nigel Oseland of Workplace Unlimited conducted a comprehensive review of the published literature on noise distraction in the workplace. They assessed over 100 research reports, dating from the 1950s to the present, with the objective of enabling construction professionals (including acousticians, architects, interior designers and property developers) to work in harmony with facilities managers, business leaders and, crucially, office staff to deliver healthier, happier and more productive working environments for all.

Their analysis and recommendations have been published in the report, *Planning for Psychoacoustics: A Psychological Approach to Resolving Office Noise Distraction*, which provides information on the theoretical aspects of noise, relating to acoustics, psychoacoustics and psychology, then discusses how this knowledge can be used to create people-centred work environments based around four key factors: task and work activity; context and attitude; perceived control and predictability; and personality and mood.

This document summarises their findings



The trouble with noise

Sound perception begins when sound (pressure) waves hit the eardrum and structures within the ear convert the vibrations into a meaningful signal that is sent to the brain. Perception continues with the brain organising and interpreting the sound and applying meaning to it (cognition).

Whether the signal generated by these vibrations is evaluated as a useful sound or as "noise" (unwanted sound) is entirely subjective, and is based on a range of factors including the person's assessment of the need for the sound, the meaning attached to it, whether it can be controlled, and the context (e.g. a dripping tap in the home at sound levels of 30 dB¹ may be annoying at night, whereas an ambulance siren (120 dB) may be acceptable).

Sound can affect people in many ways:

- **Physically** – a continuous level of sound above 140 dB can cause pain and induce immediate physical changes such as heating of the skin or vibrations of internal organs
- **Physiologically** – raised sound levels for prolonged periods can cause biological changes such as elevation of blood pressure, increased heart rate and hearing loss
- **Psychologically** – exposure to noise at any level can trigger changes in mental state, manifested by annoyance, heightened stress levels or reduced performance.



Physical strategies for reducing noise

Utilising materials to control sound is a crucial element in managing office acoustics. Hodsmann and Oseland found that sound-absorbent (acoustic) ceilings and vertical barriers (screens) dominate the research literature as physical ways to minimise sound propagation. Ceilings are thought to have the largest impact on the acoustic quality of open-plan offices.

In the UK, the Building Regulations Part E (Resistance to the passage of sound), addresses residential premises and schools, but does not include specific information on the acoustics of open-plan offices. However, there are standards in place that cover office acoustics – primarily BSEN ISO 3382-3 and BS 8233:2014. ISO 3382-3: is the most comprehensive standard for measuring open plan offices. Giving four descriptors for reducing sound propagation.

The BS 8233:2014 mentions the need to reduce "speech intelligibility". For example, in open-plan offices the expectations for the reduction of sound levels between screened workstations are in the range 15–25 dB (at a distance of 2.5–3.0 m). Two experiments reported in the journal Ergonomics in 2008 reinforce the importance of reducing the intelligibility of background speech, because intelligible speech has been found to be one of the most distracting forms of office noise.

However, although physical solutions can help to reduce noise, a psychoacoustic analysis of noise distraction indicates that people-centred solutions – behavioural, educational, managerial and organisational – are also necessary.



¹ The loudness of sound (sound pressure level) is measured in decibels (dB), and the human ear perceives loudness to be doubled when the intensity increases by a factor of 10 (i.e. a 10 dB increase). The human ear is generally comfortable within the range 0–120 dB.

A psychoacoustic approach of noise minimisation

Psychologists have demonstrated that people perform better if they are stimulated or motivated (which increases their level of arousal), but there is a limit because too much stimulation can lead to stress and thus reduce performance.

The implication is that office design should be stimulating, but not over-stimulating, in order to maximise the performance of office workers. However, individuals have different base levels of arousal and therefore need different magnitudes of stimulation for optimal performance. A one-office-suits-all approach is no longer appropriate.









Psychoacoustic theories

Psychoacoustic researchers theorise that our ears are “always on” and we continuously listen to and analyse background sounds unconsciously. In the workplace, this natural reflex action of the ear and brain means that short bursts of noise can be distracting and counter-productive. In contrast, under conditions of continuous noise of longer duration, individuals can develop more effective coping strategies.

Background conversation may not be regarded as noise if it contains useful information (“relevant speech”), but irrelevant conversation may be perceived as noise and be annoying and distracting, possibly leading to loss of performance.

The literature review identified four main theories that are linked with satisfaction and productivity among office workers:

- **Personality and arousal** – Different personality types require different levels of stimulation. For example, noisy environments may be fine for people who are predominantly extroverts, or for people who are doing repetitive or menial work, because the noise is stimulating. But difficult and complex tasks are demanding in themselves and therefore increase arousal, so subdued environments are preferable. Also, people who are generally more open to new experiences may accept more noise, while people categorised as more conscientious are less comfortable with background noise.
- **Behavioural setting** – Preconceptions of the working environment affect people’s perception of noise in that environment (e.g. libraries are generally quiet; call centres may be noisy). If workers expect the office to be quiet, based on previous experience, then a situation where this is not the case will lead to dissatisfaction.
- **Biophilia** – Evolutionary psychologists say that biophilia (our affinity for natural environments) could be used to alleviate noise-related stress, on the basis that people innately prefer noise to be at a similar level to that found in the natural world (i.e. a slight background buzz of activity). Sounds from nature, such as birdsong or rippling water, can promote faster recovery from stressful tasks compared with ambient building noise, such as that generated by air-conditioning equipment. Using pleasant sounds from natural environments to mask background workplace noise could decrease employee stress and increase worker productivity.
- **Control** – Having the power to manage noise and interruptions can reduce frustration when interruptions do occur. Significantly, from an office perspective, individuals need not actually prevent interruptions from happening in order to benefit; they simply need to believe that interruptions can be prevented.

Personality	Task	Quiet	Loud
Introvert	simple		
	complex		
Extrovert	simple		
	complex		

People-centred solutions to noise in offices

Minimising noise distraction is as much to do with the management of the space and guidance on behaviour as it is about the design and acoustic properties of offices. The most successful strategies identified in the literature by Hodsman and Oseland can be summarised as follows:

- Displace** Displace the noise distraction by providing easy access to informal meeting areas, breakout and brainstorming rooms. Provide quiet areas, including quiet booths, phone-free desk areas or a library-type space, plus the option to work from home occasionally. Good design and visual cues can be used to indicate how people should behave in a space and the expected noise levels (e.g. consider the layout and design of a library compared with a café).
- Avoid** Avoid generating noise distraction (e.g. do not provide hands-free speakerphones in open-plan offices in the middle of the workstations of those carrying out work requiring concentration). Locate noisy teams together and away from the quieter teams. Co-locate team members, because people are more tolerant of noise from their own team. Consider the personalities of the staff and perhaps separate the extroverts who thrive in noisy environments from the introverts who prefer quiet.
- Reduce** Reduce the noise distraction by controlling the desk size and density (high-density environments generate more noise distraction). Use good acoustic design to reduce speech intelligibility across open-plan areas and noise transference between rooms. If sound masking is to be used, consider using more natural soundscapes rather than white noise.
- Educate** Introduce some form of office etiquette, covering phone use, loud conversations, music, headphones, managing interruptions, how different work-settings are used and appropriate use of "do not disturb" signals. Explain to staff how the office layout works, the facilities available to them and how they can control noise disruption. If required, explain and justify why there is a noisy environment.

To learn more about office acoustics, we would recommend the following resources:



Download the full literature review, for free from

www.ecophon.co.uk/whitepaper



Download Ecophon's infographic discussing office acoustics at

www.scribd.com/ecophonuk



For information about office acoustics, and much more, visit

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If you have an office with an acoustic challenge, or are planning a new project and would like to avoid the issue occurring, please contact Paige Hodsman on paige.hodsman@ecophon.co.uk