

A man with a beard and short hair, wearing a grey t-shirt and orange work gloves, is looking intently at a car engine. The background is a workshop with a spray can and other mechanical parts. The scene is lit with warm, golden light, suggesting a sunset or sunrise.

# THE ART OF PERSUASION

How nudge theory can lead to  
behaviour-based safety that  
protects against hearing loss



Occupational noise-induced hearing loss is a significant health issue in manufacturing and construction environments. A growing number of companies are looking to introduce behaviour-based safety strategies that encourage workers to engage and take ownership of their well-being to combat the problem. Up until now, a central part of the approach has been the regular use of visual and auditory cues that encourage behaviour change. Increasingly, though, cloud-based digital technologies are being deployed to support the application of nudge theory through the delivery of more innovative, data-driven cues. These 'nudges' can gently coax or encourage workers into altering their decision-making to realise more positive behaviour-based outcomes. This whitepaper looks at how a data-driven digital system can use nudge techniques to warn end-users when they risk damaging their hearing – leading to healthier working environments.

# Introduction – Hearing loss ruins lives

Hearing loss is often referred to as the world's most prevalent 'invisible disability', yet it affects people of all ages across all social strata. Severity levels include mild, moderate, severe and profound – with the latter rendering sufferers unable to hear loud noises such as car engines and fire alarms at close range without using a hearing aid.

According to the World Health Association, more than 1.5 billion people experience some degree of hearing loss, which could rise to 2.5 billion by 2050. In each case, health and well-being will be affected through isolation and fewer social activities, while financial costs will be associated with exclusion from communication, education and employment. In short, hearing loss can devastate an individual's quality of life and can often lead to other mental and physical health issues.

Hearing loss is also a significant concern for employers, and it can be difficult to determine the source of harm. Research shows that around a quarter of all hearing impairment is caused by occupational exposure, and it is a particularly severe problem in the manufacturing, construction, agriculture and mining sectors. Exposure to many different noise sources – such as powered hand tools, rotating equipment, chainsaws, harvesters and cutters – has a cumulative effect and can cause damage, even if a worker is only exposed to a single source for short periods.

Crucially, every case of noise-induced hearing loss is preventable, and all employers must protect workers and take steps to reduce the risk.





# Why existing hearing loss prevention approaches are set up to fail

So, with mandatory prevention programs in many countries, why does noise-induced hearing loss remain a common affliction worldwide? It comes down to a complex convergence of implementation and compliance factors. Companies often adopt the wrong strategies and tools and then fail to measure performance.

Subsequently, individuals on the shopfloor or building sites frequently adopt automatic behaviours and continue to act in unsafe ways. These actions might involve not wearing personal protective equipment, over-riding safety devices, or continuing to work in noisy environments despite prior warnings.

Safety managers are also typically rushed off their feet. They oversee multiple health and safety projects across numerous business areas while having to adapt and evolve processes over time. This constant state of flux can result in a lack of process or reinforcement of messaging, making it hard to track performance and deliver meaningful change.

Time-pressed safety managers cannot be in all places at once and so cannot monitor daily activity. As a result, insufficient attention is given to the underlying employee mindsets that shape personal-safety behaviours and interactions. These behaviour trends are often unconscious and set in habit, making intervention and change challenging to enact. Failure to gain buy-in for safety initiatives on the shopfloor can also lead to inconsistent uptake levels, as behaviour is often socially determined, and people are highly driven by the actions of those around them. It is, perhaps, little wonder that safety performance often plateaus after an initial phase of improvement.



# The emergence of behaviour-based safety

Increasingly, many companies in the industrial and construction sectors are looking to move away from traditional top-down approaches to health and safety-related issues such as noise-induced hearing loss. There is a feeling that the 'carrot and stick' needs to be replaced by more collaborative methodologies that resonate at all hierarchical levels.

This driver has led to the emergence of behaviour-based safety – a bottom-up approach that focuses closely on employees and ensures they are motivated and empowered to recognise and prioritise risks. It acknowledges that, as human beings, employees have a genuine interest in their own well-being and are far more likely to respond and contribute to health and safety initiatives when fully engaged. Behaviour-based safety considers an individual's attitudes, beliefs, feelings and ideas. It is much harder to realise positive safety outcomes without being mindful of these human factors as part of the bigger picture.

Therefore, behaviour-based safety adopts a more proactive focus, encouraging individuals to work with peers in teams to identify safety improvements and always take responsibility for their personal behaviour. It attempts to engender a collective spirit of togetherness that delivers better safety results. Behaviour-based safety can provide positive rewards to change unsafe behaviour – reducing job-related injuries, minimising lost production hours and improving workplace morale. These outcomes are all essential ingredients for creating a strong safety culture.

## Defining behaviour-based safety

In truth, the definition of behaviour-based safety is open to interpretation, as it takes on a slightly different meaning from one organisation to another. However, some guiding principles are common to all.

According to the Health and Safety Authority of Ireland, a behaviour-based safety approach:

- Is based on solid principles about engaging, motivating, assisting, reinforcing, and sustaining safe behaviours.
- Takes a systematic approach, examining the motivation that underlies behaviours to increase safe behaviour.
- Is an ongoing effort, not 'once-off' provisions, which the safety leader must continually promote for sustainable, positive results.
- Is not a substitute for an existing comprehensive H&S programme; it is a supplementary tool that enhances the effect of already existing practices.







# The value of nudge techniques

That is the theory. But what might behaviour-based safety look like in practice at industrial or construction facilities? The approach is based on the belief that the routine application of safe behaviours will reduce accidents and work-related conditions such as occupational hearing loss. A central part of the approach is the regular use of visual and auditory cues that support behaviour change. These 'nudges' can gently coax or encourage workers to alter their decision-making to realise more positive outcomes.

Nudge theory has been reviewed in a broad range of academic studies. For example, recent research carried out at the INSEAD business school in France showed how it could be used to improve driver safety. Telematics was deployed to measure driver performance, and nudges were sent via smartphones indicating how individuals had performed on the latest trip with regards to their personal best, personal average, and latest driving performance. The study showed that personal best and personal average nudges improved driving performance, on average, by 18 per cent – potentially providing a novel and inexpensive way of improving road safety.

But how can nudge theory support behaviour-based safety in industrial and construction environments? Could it be used to offer subtle prompts that lead people into more timely decision-making in the present, helping workers avoid longer-term health impacts such as hearing loss?

Examples of nudge theory in manufacturing and construction have existed for some time. Health and safety signs and markings such as painted lines on a factory floor could be called nudges in the most basic form. Similarly, painted footprints have encouraged construction workers to keep to the right side of gangways when moving around buildings sites.

Ramboll, the global engineering, architecture and consultancy company, has been using nudging to create more sustainable behavioural change for many years. It employs a full-time senior consultant and nudging expert to oversee a broad range of initiatives. One of the approaches it reportedly adopted a few years back was the use of mirrors at the entrances of its offices in Copenhagen with a large sign positioned above asking 'who is responsible for safety today?'. This gentle cue acted as a reminder for individuals to take personal responsibility for their actions.

# Nudging enters the digital age

Now, as cloud-based digital technologies find increasing application in manufacturing and construction, there is an opportunity to deploy more innovative, data-driven nudging techniques. Industrial environments such as manufacturing facilities have been transformed in recent years by applying digital technologies such as sensors to continuously assess the performance of a broad range of equipment – from single components to entire systems. These principles can now be applied to people, with sensors, data collection and analytics being used to develop more intelligent health and safety initiatives.

For example, in the specific area of noise-related hearing loss prevention, the latest technologies from Minuendo use ergonomic earplugs to protect against workplace noise while providing the end-user with natural sound that helps maintain situational awareness and communication with co-workers. Crucially, though, the intelligent earpieces are connected to a collar-mounted unit which contains the digital brain of the earplug. This enables Active Noise Monitoring to be integrated into the hearing protection, delivering in-device alerts that immediately advise workers when they need to act due to unsafe noise levels. These alerts serve as a timely nudge to end-users to change their safety behaviour – such as moving further away from the noise source, inserting the earpieces or adding additional hearing protection until the noise risk abates.

Additionally, such systems continuously collect noise level, wear rate and other usage data, such as when the earplugs were taken out of the dock. At the end of the working day, devices are placed back into a port for recharging. At the same time, the noise data is securely transferred to a cloud platform, where it is analysed, and actionable guidance is created.

As with intelligent machine monitoring, the data insights can be presented and shared in multiple ways and on many devices, enabling employees, safety managers and employers to obtain the information they need to achieve improvements.

Personal guidance is provided for users experiencing high daily noise exposure levels, with automated notifications in the form of emails or text messages. Unlike other digital solutions



that rely on end-users deciphering the data for meaningful outcomes, the latest noise monitoring technologies provide straightforward suggestions that can be adopted to improve personal safety and lower the risk of noise-induced hearing loss, thereby encouraging participation.

For the individual, using such a system enables safer working both in the moment and over time. If the solution is non-intrusive, then the user doesn't feel overloaded with data and reminders, and the alerts become persuasive auditory nudges as they are only issued when action is required. Once the collected data is analysed and refined, the relevant information can be presented to the end user in a simple yet meaningful way – further reinforcing positive behaviour change.

For the safety manager, data-driven technologies help instil processes that can support behaviour-based safety strategies. The systems show when the technology is being used and for how long, eliminating the need to walk around the site to check for compliance. Granular data shows which individuals have been exposed to high noise levels and have subsequently failed to take the necessary action. That information might be symptomatic of other safety behaviour issues and can be used to help support that individual to achieve better outcomes. So, the technology helps safety managers improve immediate behaviour and more ingrained attitudinal problems that have developed over time.

# Technology cross-over from the workplace to everyday life

Well-designed technologies that empower and encourage positive behaviour changes can dramatically impact safety outcomes in manufacturing and construction environments. Also, the value of such wearable technologies can be magnified further if users choose to use them in other settings outside of their working life. Much hearing damage takes place away from work – for example, on public transport – and modern, lightweight, well-designed noise alert solutions could find application in such settings.

Traditional PPE, such as earmuffs, are cumbersome and uncomfortable, resulting in low levels of adoption in workplaces – let alone in everyday life. But if new ergonomic solutions provide a more pleasant user experience, they are more likely to result in better wear rates and adopted behaviour over time. Indeed, the combination of nudges in the workplace and a

product with a good ‘look and feel’ could see users choosing to wear earplugs in a broader range of settings, such as during leisure time.

This step change has been achieved in other industries. For example, professional musicians have been using ergonomically designed, acoustically optimised earplugs in recording studios and during practice sessions for several years, with the earplugs screening out extraneous noise while enabling wearers to hear other sounds clearly. Over time, these devices have started to be used outside of these traditional environments, with some musicians wearing them in different settings such as in bars and clubs as part of the night-time economy. If manufacturing and construction workers followed a similar path, they could maximise the benefits of hearing protection – forging safer behaviour patterns across all aspects of daily life.

## Conclusion – innovative technology delivers better results

It is clear, then that occupational noise-induced hearing loss remains a significant problem in industries such as manufacturing and construction. It can cause enormous distress and contribute to other mental and physical illnesses.

Traditional top-down approaches to workplace hearing loss prevention have proved limited in their success. However, behaviour-based safety that proactively focuses on ensuring that employees are motivated and empowered to recognise and prioritise risks can lead to better outcomes.

Increasingly, behaviour-based safety strategies are supported by the latest data-driven technologies that are designed to provide real-time alerts when workers risk damaging their hearing by being in overly-noisy workplace environments. These auditory nudges delivered via wearables provide practical health benefits by constantly reinforcing better behaviours.

Ultimately, behaviour-based safety shows real potential as a means of combatting hearing loss. And it is the application of data-driven technology that will support these strategies and make a real difference in people's lives.



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