



CREATING POSITIVE SPACES

BY DESIGNING FOR COGNITIVE
& SENSORY WELLBEING

An accessible practitioner's guide to inspire Architects & Designers
to use Biophilic Design to support focused work



Interface[®]





Focus.

Focus is a skill that we have developed throughout evolution for our basic survival, but it's never been easy to sustain for long periods of time – it's tiring, both mentally and physically.

Perhaps now more than ever, what with digitalisation and the many challenges brought to our workplace settings by COVID-19, our ability to focus has been exacerbated by the requirement to focus 'all day' alongside a decrease in opportunity to do so. We are surrounded by distraction and unnatural, urban environments, with little time or space to recuperate. This can have significant consequences to our health and wellbeing in many of the spaces that matter to us, be that where we live, learn or work.

In an era where communal workplace stress will inevitably be higher than in the past, as Architects and Designers, we should be striving to create spaces to support cognitive and sensory wellbeing, so that people can feel comfortable within their environments and subsequently feel more satisfied in work and life.

With the growing awareness and adoption of Mindfulness as a practice, the recognition that our lives are filled with overwhelming activity and noise is evident. Whilst this meditative experience is often viewed as a physically calming and mental internal process, how do we create spaces that support these states of mind, and what benefits could design for cognitive and sensory wellbeing deliver post-COVID, wherever the place of work might be?

Through the cutting-edge work of occupational therapists and evidence of the costs of distraction, the case for creating spaces that nurture the senses and aid focus is clear. Whilst we all have different thresholds and tolerances for dealing with sensory input from our environments, this Design Guide investigates how we can design spaces to support diverse groups of people to work and feel better – something that is ultimately going to be good for us and good for business.”

OLIVER HEATH, Director of Oliver Heath Design, co-author of this Design Guide



OLIVER HEATH
DESIGN



Allegro, Warsaw

WHY IS INTERFACE SUPPORTING THIS SUBJECT?

Creating positive spaces where we work, rest and play involves design that incorporates visual appeal, purpose, sustainable elements and an understanding of human behaviour. Bold thinking is required to strike the balance between reflecting each person's needs whilst adhering to regulatory standards, without compromising on the design aesthetic.

The building industry is increasingly recognising companies who prioritise supporting the wellbeing of their people. Certification systems like the WELL Building Standard™ and measurement processes like Pre- and Post-Occupancy Evaluations (POE) are gaining traction and the increasing interest in them demonstrates that the creation of positive spaces requires further investigation.

To capture insights from industry and thought leaders, Interface have co-authored a series of papers (interface.com/whitepapers) to **explore the value of human-centred design, understand how nature can inspire the creation of positive spaces and examine the future of sustainable buildings.**

Interface®

A GUIDE TO DESIGNING FOR INDIVIDUAL FOCUS – WHAT'S IN IT FOR YOU?

In our previous guide to Creating Positive Spaces by Designing for Community (interface.com/whitepapers), we demonstrated how design can support the communication and relationships between those within a workplace, so that collaboration and innovation can take place. To compliment these ideas, we will now zoom in to look at the individuals within these communities, each with their own needs and preferences, and show you how workplace design can support these differences to allow everyone to work effectively. After all, it is essential in a human-centred approach to consider the parts, as well as the whole, when creating +Positive Spaces.

By reading this guide we hope you will come away with:

- **Insights** into – and the ability to explain – the benefits of designing for a range of sensory thresholds to improve cognitive wellbeing.
- An **understanding** of how to use Biophilic Design features to support sensory and cognitive wellbeing in the workplace.
- **Inspiration** and confidence to put these ideas into practice.



CHAPTER 1	WHAT DO WE MEAN BY COGNITIVE & SENSORY WELLBEING? <ul style="list-style-type: none">▪ Workplace distraction▪ Digital distraction	<i>pg. 08</i>
CHAPTER 2	THE BUSINESS CASE FOR COGNITIVE & SENSORY WELLBEING IN THE WORKPLACE <ul style="list-style-type: none">▪ The cost of distraction▪ What can we do about it?	<i>pg. 14</i>
CHAPTER 3	THE WORKPLACE: PAST & PRESENT <ul style="list-style-type: none">▪ The contemporary workplace and how we got here▪ Which workplace is best for focused work?	<i>pg. 18</i>
CHAPTER 4	CONSIDERING THE INDIVIDUAL <ul style="list-style-type: none">▪ Sensory thresholds▪ Neurodiversity▪ The importance of choice	<i>pg. 24</i>
CHAPTER 5	BRINGING IN BIOPHILIC DESIGN <ul style="list-style-type: none">▪ The evolution of the senses in nature▪ The biophilic perspective	<i>pg. 30</i>
CHAPTER 6	DESIGNING WITH THE SENSES IN MIND <ul style="list-style-type: none">▪ Basic principles▪ Zoning by sensory threshold▪ Diversity of spaces for sensory thresholds	<i>pg. 34</i>
CHAPTER 7	WHO IS DESIGNING FOR COGNITIVE & SENSORY WELLBEING? <ul style="list-style-type: none">▪ Allegro, Warsaw (Workplace)▪ LinkedIn, Paris (Il Prisma)	<i>pg. 46</i>
CHAPTER 8	WHAT NEXT?	<i>pg. 58</i>

CHAPTER 1

WHAT DO WE MEAN BY COGNITIVE & SENSORY WELLBEING?



Humans are sensory beings, constantly receiving sensory input. In fact, **we receive 11 million bits of sensory information every second** (only 50 of which we can process consciously).¹ Thus, there are seven recognised sensory systems that are continually transmitting or receiving sensory information. These are:

1. Visual (sight)
2. Auditory (hearing)
3. Tactile (touch)
4. Olfactory (smell)
5. Gustatory (taste)
6. Vestibular (balance and sense of gravity)
7. Proprioception (position of the body in space derived from muscle and joint feedback)

Different areas of the brain combine this sensory information to help us make sense of our surroundings cognitively.²⁻³ So, there's a lot going on in our brains at any given time and sometimes this can cause problems for our comfort, wellbeing and our ability to focus.



70%

of workers say they feel distracted
at work.¹⁰

50%

of employees don't feel supported
by their workplace.¹¹

57%

agree that their workplace enables
them to work productively.¹¹

WORKPLACE DISTRACTION

We are distracted! Both by our **internal thoughts** - our **cognitive** activity - and our **external environments** - experienced through our **senses**. What's more, **sensory distraction can lead to cognitive distraction**; when we feel the vibration of a message on our phones, see something happening across the room, hear the roadworks outside or smell our colleagues' lunch being eaten at their desk, this sensory input triggers a cognitive response such as **mind-wandering**. In fact, when working, **it can take 23 minutes and 15 seconds to return to a task after being distracted**.⁴

Apparently, we spend an average of **46.9% of our waking hours** thinking about something unrelated to what we're doing, such as focusing on the past or future, and this generally causes **unhappiness**.⁵ Further, our brains are constantly **multi-tasking** – quickly switching from one task to another – a behaviour that our brain has started to reward us for, through an increase in dopamine. However, this comes at a **cognitive cost**; a higher level of cortisol (**stress hormone**) and adrenaline (**fight-or-flight hormone**) can also be found when multi-tasking.⁶ In addition, **neuroscientific research** has shown that new information is stored in the **wrong part of the brain** if we are multi-tasking whilst learning, making it **harder to remember** later on.⁷

Distraction can also cause **Continuous Partial Attention**⁸ – continuously paying incomplete attention to many things all at once and, as a result, only on a **superficial** level. So not only is **distraction bad for our wellbeing** but it also affects our ability to **focus and our productivity at work**.

People feel **sensory wellbeing** when they are comfortable within their environments (when they aren't over or under stimulated), and they subsequently experience **cognitive**

wellbeing – feeling more satisfied and able to function well in their work and life. However, globally, roughly **25% of workplaces are failing to support employees' sense of personal productivity**.

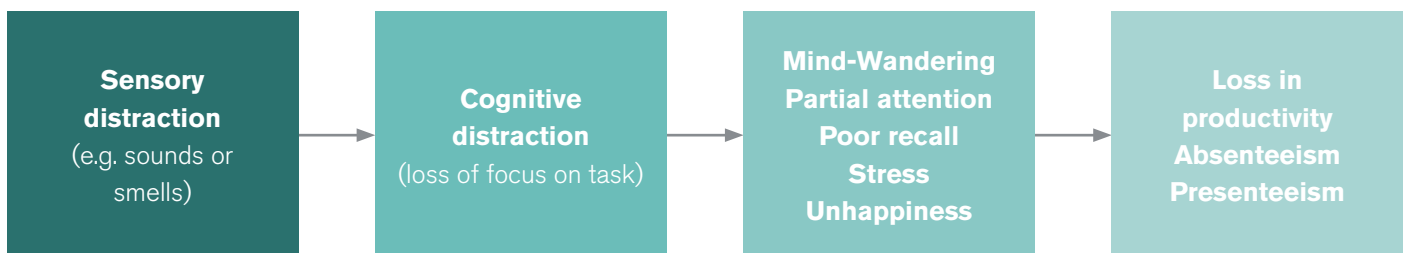
A 2015 study found that almost **three quarters of workers (70%) say they feel distracted at work**,⁹ whilst other research shows that more than **50% of employees don't feel supported by their workplace**, and only **57% agree that their workplace enables them to work productively**. Examples of these distractions include inappropriate lighting, background noise and desk space. These are all things that can either be helped or hindered by workplace design, architecture, and organisational policies.¹⁰

What's more, research found that intelligible low-level background speech had a **significant negative impact on short-term memory, reasoning ability and wellbeing**. The same study also found significant complaints of **visual distraction** with dynamic lighting.¹¹

“

We are doing the jobs of 10 different people while still trying to keep up with our lives, our children and parents, our friends, our careers, our hobbies, and our favourite TV shows... We text while we're walking across the street, catch up on email while standing in a queue – and while having lunch with friends, we surreptitiously check to see what our other friends are doing.”¹²

Daniel J. Levitin, FRSC, cognitive psychologist and neuroscientist.



DIGITAL DISTRACTION

The issue of distraction has been intensified by the proliferation of **mobile digital technology**, which means that our 'Continuous Partial Attention' is happening "anywhere, anytime, anyplace."¹³ We have so many different media platforms sending us notifications, and the worst thing – we've signed up for them! Whilst there are obviously amazing benefits of having technology at our fingertips, we seem to find it difficult to switch it off or ignore it.

Neuroscientists, such as Daniel J. Levitin, have taken an interest in this constant **digital distraction** and what it means for our brains, unsurprisingly claiming that it is bad for us.¹⁵ In fact, studies have shown that:

“

All we do now is interrupt each other or ourselves with instant messages, e-mail, spam or cell phone rings. Who can think or write or innovate under such conditions? One wonders whether the Age of Interruption will lead to a decline in civilization... I know that connectivity means productivity. But it is possible to overdose. There is such a thing as "too connected," and modern society is heading in that direction..."¹⁴

Thomas L. Friedman, political commentator and author.

The average phone user touches their phone **2,617 times a day**, made up predominantly of lots of frequent and quick phone checks which total at 145 minutes.¹⁶

64% of respondents **felt distracted by their smartphone** usage at work, and 45% felt the need to constantly check their phone.¹⁷

When answering the question, 'Overall, do you think you use your mobile phone too much, or not?', 60% of 16-24-year olds stated that they did, compared to an average of 36% across all age groups, meaning this is set to be a growing issue in the workplace.¹⁸

Just the presence of a mobile phone on the desk **slows down performance**.¹⁹

Having an unread email in your inbox whilst you are trying to concentrate on a task can **reduce your effective IQ** by 10 points.²⁰

Simply receiving a notification on your mobile is enough to **impair your ability to focus** on a task, with those who received a notification making **three times more mistakes** than those who did not.²¹



Australian employees cite environmental distractions (noise and office chatter) and the high use of technology as the reason why they are distracted at work. 55% rated loud conversations as the top distraction, 43% blamed personal phones, and 35% believe emails to be the problem. In fact, 97% admitted to looking at their mobiles for personal reasons during the working day - 64% of this is social media use.²²

It is important that we do not think of digital distraction as separate from environmental distractions, as our interactions with digital technology are a part of our interactions within physical spaces. Digital devices are simply a part of the **myriad of stimuli competing for our attention** within the workplace.

It comes as no surprise that projects practicing **human-centred design** (by placing their people's needs first) have been found to **score highest** on overall performance.²³ As Architects and Designers, we can **limit unwanted external distractions by considering the human senses** in the workplaces we design, in order to help individuals to focus on the task at hand. This could be in the form of extra acoustic considerations in certain areas to cater for people who are easily distracted, or controlling the level of visual stimulation in any given place according to the activity it is designed for. Whatever you decide, it is good to note how these things can benefit your client's business, which is why the next thing on the agenda is arming you with a business case to demonstrate to clients that this is a necessary step in the right direction.

CHAPTER 2

THE BUSINESS CASE FOR COGNITIVE & SENSORY WELLBEING IN THE WORKPLACE





**This is not the Age of Information.
This is the Age of Distraction.**²⁴

Michael Bugeja, Professor, Author and Journalist

THE COST OF DISTRACTION

So, what does all this distraction mean in terms of the bottom line?

- A 2005 study found US workers were losing **2.1 hours every day** due to distraction.²⁵ This was calculated as 28 billion hours and **\$588 billion (€495 billion) lost annually**. In 2015, further research found that this had **gone up to 3 hours per day** per employee, which totals as 60 hours per month, or 759 hours per year.²⁶ The study revealed that we have **noisy workplaces and mobile phones** to blame for most of that.
- **34%** of employees are **less satisfied** with their jobs when they work in a **distracting environment**.²⁷ These distractions at work can eventually lead to higher staff turnover, which isn't great for a business either considering it costs an average of **£11,000 (€12.160) to replace an employee** on an average UK salary.²⁸
- Even momentary interruptions can double an employee's error rates on a task.²⁹ Errors in data can lead directly to increased cost (**8-12% of revenue spent on correcting errors**), customer dissatisfaction, and lowered job satisfaction.³⁰
- **Interruptions result in stress**, not because we find the interruptions themselves stressful, but because we then overcompensate to make up lost time. This rushed working causes strain, time pressure, perceived effort and frustration.³¹
- **18% of EU workers feel stress at work every day**.³² **Days taken off due to stress cost the UK £6.5 billion (€7.2 billion) in 2012**,³³ (just imagine what this figure could have gone up to by now) and presenteeism (coming in and not working effectively) could cost even more, calculated as 1.8 times costlier than absenteeism.³⁴
- In 2017/18, **work-related stress, depression and anxiety** accounted for 44% of all work-related ill health cases and **57% of all working days lost**.³⁵

\$588 billion

lost annually due to distraction.²⁵

34%

of employees are less satisfied with their jobs when they work in a distracting environment.²⁷

£6.5 billion

cost to the UK of days taken off due to stress.³³

18%

of EU workers feel stress at work every day.³²



WHAT CAN WE DO ABOUT IT?

We aren't here to change employees' cognitive behaviour (the complex mental processes such as reason and thought). However, through design, we can **reduce distractions** within the environment – experienced through the senses – in order to **support cognitive wellbeing**.

As we have discussed in our previous design guides (on the WELL Building Standard, Biophilic Design and Designing for Community), there are many business benefits of taking into consideration the wellbeing of staff. Making sure employees have a **diverse indoor landscape with a range of spaces that meet their needs throughout the day** is crucial in ensuring they are healthy, happy and, as a result, can work effectively. Just as we need spaces for coming together and collaborating, we also need spaces where we can take a step back, breathe and focus.

“

Not only does office design determine whether people's backs ache, it has the potential to affect how much they accomplish, how much initiative they take, and their overall professional satisfaction. Further research that we and others have carried out also highlights strong links between a lack of control over workspace and sickness in the office... All this could have a huge impact for firms of any size, yet employers rarely consider the psychological ramifications of the way they manage space. By paying more attention to employees' needs they can boost wellbeing and productivity at minimal cost.”

Alex Haslam³⁶, Professor of Psychology at the University of Queensland

Providing areas for focused work such as 'no phone zones', for example, can have tremendous economic benefits for a company. For example, Sapience³⁷ (a 'People Analytics' company) have calculated that by simply adding an hour of fully focused work (a '**golden hour**') to each employee's working day, a company with more than 5,000 employees can **add \$400 million (€336 million) a year to their bottom line.**³⁸

Further, creating spaces that allow for moments of mindfulness (and encourage the optional practice) can make a real difference. **Mindfulness** is the method of being aware of the **present moment and bringing our attention** to what we are experiencing now, such as our **body, breath and sensations**, and has become a therapeutic activity for **reducing symptoms of depression, stress, anxiety and addiction, as well improving job performance.**³⁹

Mindfulness has fast gained popularity across the world, with an **estimated 22% of organisations** (such as **Google, Apple and Nike**) offering mindfulness training programs in 2016.⁴⁰ And we can see why, with mindfulness practice being found to:

- **Improve** working **memory** and **cognitive capacity**⁴¹
- **Improve** reading **comprehension** scores by **16%**⁴²
- **Reduce mind-wandering and distracting thoughts**⁴³
- Enable employees to **stay on tasks for longer** and make fewer task switches⁴⁴
- **Increase immune system** functioning⁴⁵
- Significantly **decrease stress**, as well as **improve resilience, engagement**, and thus **overall wellbeing**⁴⁶
- Increase **resilience** to stressful situations,⁴⁷ which can protect us from burnout
- **Add 62 minutes of productive work per week**, calculated to be worth **\$3,000 (€2,500) per year per team member**⁴⁸
- **Decrease health care costs per employee by 7.3%** amounting to a saving of **\$9 million (€7.57 million).**⁴⁹

So, we know that mindfulness techniques have the potential to improve **focus** and **wellbeing**, and that they are already being used by big businesses to address the issues of **distraction** in the workplace. Considering the **overall cost of stress, anxiety and depression to British employers amounts to £1,035 (€1.178) per employee per year, and in Europe the cost of work-related depression was estimated to be €617 billion (£540 billion) annually,**⁵⁰ it's no surprise that they are becoming increasingly popular tools in the workplace. However, "external environments" (outside of the body) are "rarely discussed in relation to mindfulness."⁵¹

With all this in mind, what can we do to create workplaces that improve wellbeing, focus and restoration in a similar way to practicing mindfulness? **Workplace design can either help or hinder us in paying attention** to the right thing at the right time. This is a **call to action** to move away from designing for 'efficiency' and towards creating **supportive sensory** (and therefore **cognitive**) **experiences** in the spaces we spend so much of our day to day lives.

CHAPTER 3

THE WORKPLACE - PAST & PRESENT



“

It would appear that some organisations may be investing a disproportionate amount of focus on supporting creativity and collaboration, at the expense of the spaces needed to commit these collaborative thoughts in an individual concentrative way to paper. It could also be that for many employees in more concentrative analytic roles, the impact of key infrastructure elements and planning have been overlooked – like occupant density and noise control. Clearly, that is not to say that the importance attached to collaboration should be downgraded. Far from it. But it does reaffirm that to create a high performing workplace, all phases and activities that underpin knowledge work need to be deeply understood and well provided for – both individual / concentrative and interactive / collaborative.”

Leesman's 'The Next 250k' report⁵²

Before we go into how we can design offices to be more effective in supporting and nurturing focused work, let's first think about how our working environments have changed over the years...

THE CONTEMPORARY WORKPLACE & HOW WE GOT HERE

As workplace design has evolved, we have moved away from noisy, space saving open-plan offices towards a more diverse range of home-like spaces in a bid to make them support productivity. However, being categorically 'anti open-plan' may not be the answer, as there are plenty of other office layouts out there that haven't worked in this quest. We will look at how the office has developed over the last century before offering an alternative solution to creating human-centred workplaces that work for everyone.

1980's

THE TRADITIONAL OFFICE

- **Walls and individual cubicles** (known as the 'cubicle farm' layout) – people would call each other instead of talking face-to-face.
- **Group cellular offices** – these both cut employees off from the wider office and disturbed them anyway.
- **'Private offices' for managers** around the perimeter of the space, with an open plan layout in the middle – this was deemed hierarchical and deprived many from daylight.
- **Employees were then moved into private offices** and shared them between 1-10 people, perceived as less hierarchical.

1990's

- **Walls knocked down, promoting cross-fertilisation of ideas** and engagement with managers – but this was deemed noisy, disturbing, and stressful.
- Next, we saw **'hot desking'** for the first time as a money-saving opportunity (fewer desks than employees) and to create a livelier atmosphere – however, some employees realised that they did need their own desk.

OPEN PLAN

2000's

AGILE WORKING

Mix of assigned desks and alternative work settings, giving way to **activity based**, unassigned work settings for a range of tasks (both individual and collective):

- Teams were given **'zones'** and were likely to work within the same area every day.
- In smaller workplaces (less than 150 employees), zones offered maximum **flexibility**, with technology allowing people to work how and where they chose depending on their specific tasks or moods.

- **Combining the traditional office** (dedicated offices that a company can rent) and **agile working** (access to a range of work areas outside of the formal office setting), created opportunities for new relationships and collaborations, in a relaxed setting.
- Huge rise in the number of **co-working spaces** (private offices for small companies and teams, with access to shared space and amenities*), and more recently since the COVID-19 pandemic, **working from home** at least part time has become the new normal.

*see our case study on WeWork in our guide to **designing for community** here: interface.com/whitepapers.

2010's

FLEXIBLE WORKING



LinkedIn, Paris



There are great open-plan offices and awful ones. But there are also failing cellular solutions and successful ones. Both open environments and more enclosed office concepts can be good or bad.”

Leesman's 'The Next 250k' report⁵⁴

WHICH WORKPLACE IS BEST FOR FOCUSED WORK?

Leesman have produced a report titled 'The Next 250k'⁵³ which evaluates results from a seven-year assessment of workplace effectiveness based on their Leesman Index. They have gathered data from 276,422 employees across 2,160 workplaces in 67 countries. Within this report, they go against the 'sensationalist journalists' who 'revel in feeding the public with alarmist headlines' about how poor open plan offices are for our productivity, instead focusing on their finding that **9 out of 10 of the top performing offices are either fully or extensively open plan**. That is not to say that all open-plan offices are great – poorly designed open plan offices exist and do create problems for employee productivity – however, the same goes for cellular offices. The main predictors of whether they are 'good' or 'bad' comes down to whether they have a **variety of different types of work areas** that **cater to all sensory processing capabilities**, fulfilling our innate need for a **diversity of spaces** in order to not only survive, but thrive.

We are going to explore how to design the office to consider the needs of employees on an individual level. Why? Because the issue isn't necessarily the type of office (e.g. 'open plan' or 'agile'), but how well the environment has been designed (e.g. the layout and acoustics) for those who use it. Before we can determine the best solutions, we think it's important to look at why we all respond to our environments in different ways.

CHAPTER 4

CONSIDERING THE INDIVIDUAL



SENSORY THRESHOLDS

When designing workplaces with sensory (and therefore cognitive) wellbeing in mind, we need to understand that there are differences in how each of us perceive and react to sensory input. **There are two main human factors that influence our response to sensory stimulation:**

1. Personality Type

The **'Big Five Personality Traits'** (also known as the **OCEAN** model) was defined using self-report questionnaires and peer ratings to identify the most frequent underlying factors of personality.⁵⁵

- **O**penness to experience (inventive and curious rather than consistent and cautious)
- **C**onscientiousness (efficient and organised rather than easy-going and careless)
- **E**xtraversion (outgoing and energetic rather than solitary and reserved)
- **A**greeableness (friendly and compassionate rather than challenging and detached)
- **N**euroticism (sensitive and nervous rather than secure and confident)

Each of these personalities are accompanied by a variety of traits that can shape the way someone **perceives and responds to their environment and others around them.**⁵⁶ This is a psychological response to sensory information that is developed over time through experiences (i.e. nurture, not nature).

For example, in relation to acoustics, **personality and mood are key determinants** of how we perceive sound,⁵⁷ with neuroticism (sensitive and anxious) being the most significant predictor of noise sensitivity.⁵⁸ Further, background noise, such as music, has a more detrimental effect on the creative task performance of introverts in comparison to extroverts,⁵⁹ whilst extroverts generally perform better in noisy environments, as they find the noise stimulating rather than distracting.⁶⁰

However, personality types are not the only human factor that need considering when looking at sensory stimulation and performance. In fact, it turns out they are less significant than we once thought, as we each have different **thresholds** when it comes to being able to **process sensory information**, and these don't always correspond with our personality types.



Psychologists propose that introverts and extroverts have different innate levels of arousal, which in turn affects how noise affects their performance... Noise is considered to be a form of stimulation so it follows that extroverts should perform better than introverts in noisy environments.⁷⁶¹

⁷⁶¹'Planning for Psychoacoustics', Nigel Oseland and Paige Hodsman



2. Sensory Profile

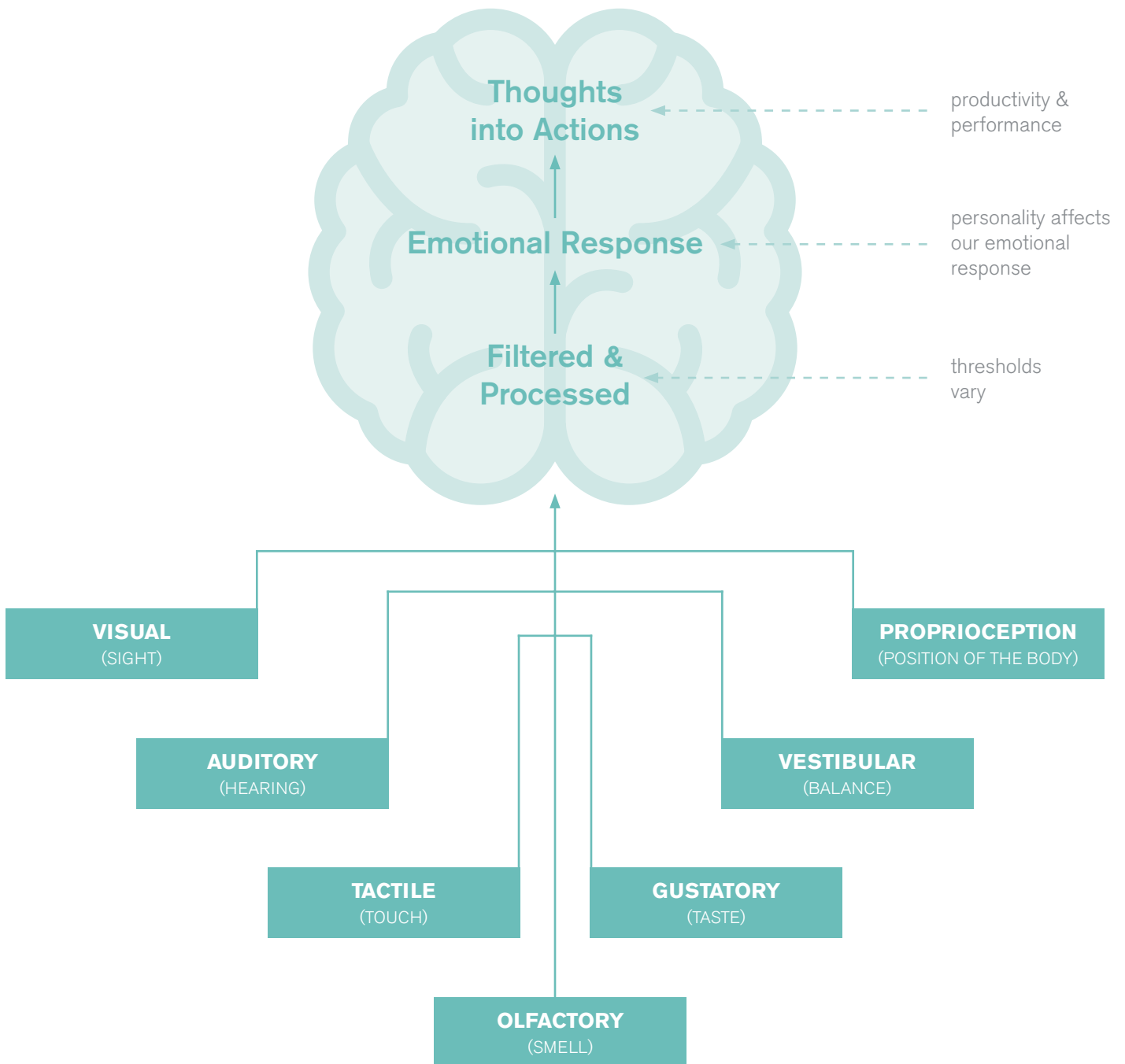
We each have an innate **neuropsychological** (relationship between the brain and behaviour) response to **processing sensory information**; information **enters our brain through our 7 senses** at the bottom, primitive, intuitive lower level where it gets **filtered and processed**. After that, it goes to the middle of the brain for emotional response (where personality comes in), and finally up to the top of the brain – the cortical, executive part of the brain where we have thoughts that are turned into actions. Our ability to process and filter environmental stimuli varies from one person to the next; we all have different thresholds for each of the senses, and this creates our individual sensory profile. Our **sensory profile influences our productivity and performance in different environments.**⁶²

“

How we process our senses through our brain is unique for each of us. In workplace design, we should consider what the environment is doing to the brain, how each human brain is different, and how we use that to help people to be more productive and to be healthier. Certain workplaces can be very toxic and difficult for people to work in, particularly for people who are genetically more sensitive to the environment. If you understand this, you can get a better match between you and your environment.”

Dr Annemarie Lombard, Founder and CEO of Sensory Intelligence®

THE BRAIN



This explains why some of us can easily filter out the feeling of our clothes on our skin and become **habituated** to the sound of traffic outside, whilst others have to work harder to ignore sensory stimuli. In other words, there is **neurodiversity** (neurological differences) between us, all of which affecting how we handle sensory stimuli.



NEURODIVERSITY

Neurodiversity is a term widely used to recognise and promote inclusivity of those diagnosed with ADHD, Dyspraxia, Dyslexia, Autism Spectrum Disorder and other neurological differences. Around 17% of the US population have been diagnosed with a neurodivergent condition, and that's not taking into account the many conditions that go undiagnosed.⁶³ Our understanding of neurodiversity is beginning to be expanded to recognise general human variation in our neurological processes and make-up, and it is particularly important to recognise this in the workplace so that we can support individuals' cognitive wellbeing.

For example, in Dr Annemarie Lombard's ground-breaking research into sensory thresholds, she carried out a study⁶⁴ in four call centres – often loud and open-plan office environments – to measure employees' sensory processing. This involved using a 60-item 'Sensory Profile' questionnaire to track performance, absenteeism rates and turnover. A 'strong, consistent and significant' correlation was found between those who displayed sensation avoiding processing (those with a **low threshold who actively limit their sensory experiences**) and poor job performance. In turn, those who scored highly on sensation seeking processing (those with a **high threshold who actively pursue sensory stimuli**) had higher job performance ratings. Thus, there was a big difference in **ability to work** within such a noisy work environment, **depending on sensory processing capabilities**.

Of course, not everyone has either a low sensory threshold (sensation avoiding) or a high threshold (sensation seeking). There is a whole spectrum of sensory processing thresholds and, for some, **thresholds can fluctuate from sense to sense** (i.e.: someone might seek out visually stimulating environments yet avoid anywhere with a strong smell). **Thresholds** can also **depend on the task** at hand – **complex tasks** that demand more attention can **lower our threshold** for arousal, and thus a quieter environment is preferred.⁶⁵

So, it **isn't as clear cut** as we may have once thought ('I'm an extrovert, therefore I must be able to handle lots of noise around me'). In fact, you could have an extremely extroverted person in a workplace who has a very low threshold to auditory stimuli.

“

Everyone lies on a continuum of thresholds or sensitivity from oversensitive to under sensitive. It's about having the right sensory environment for the individual. I believe that if you get that right fit from the sensory perspective then you're going to influence performance, productivity and wellbeing.”

Tania Barney, Director of Vitality Consultancy Services Ltd

“

When people feel uncomfortable in their surroundings, they are less engaged – not only with the space but also with what they do in it. If they can have some control, that all changes and people report being happier at work, identifying more with their employer, and are more efficient when doing their jobs.”

Dr Craig Knight, Psychologist and Founding Director of Identity Realization

THE IMPORTANCE OF CHOICE

In new workplaces, it is found that satisfaction with ‘**variety of different types of workspace**’ ranges from below 10% to above 95%.⁶⁶ This disparity between satisfaction demonstrates how much we differ in our workplace needs, and so it follows that there really is **no ‘one size fits all’** when it comes to workplace design.

What's more, according to the Yerkes-Dodson Law, **increasing arousal can improve performance** (focusing motivation and attention on the task at hand) up to a certain point. However, if arousal becomes **excessive, performance diminishes**.⁶⁷ Applied to sensory thresholds, this means we all have a **tipping point** when it comes to sensory stimulation. As it would be impossible to design for each person's optimal sensory arousal, **the best approach in workplace design is to support cognitive wellbeing** by recognising there is **neurodiversity**, and **provide a range of sensory environments** for people to move between **according to their sensory profiles** (rather than their personality types), changing needs and preferences throughout the day. Even better – if these sensory elements are inspired by nature, they can support our innate desire for a connection to nature and natural systems.⁶⁸

An aerial photograph of a dense forest with a semi-transparent white text box at the top. The forest is composed of many trees with varying shades of green, from deep forest green to bright yellow-green, suggesting a mix of species or perhaps the beginning of autumn. The text box is centered and contains the chapter title in a clean, sans-serif font.

CHAPTER 5

BRINGING IN
BIOPHILIC DESIGN

THE EVOLUTION OF THE SENSES IN NATURE

The majority of us live in busy, stimulating urban environments, where we spend **85-90% of our time inside**.⁶⁹ Although sadly, we are often surrounded by flat blank walls, rectangular forms, artificial light and uninspiring colours which are very different to the natural environments we once thrived in. From an **evolutionary perspective, our senses developed and evolved in rich and diverse natural landscapes to support human survival:**

1. **Visual** (sight): It isn't hard to imagine all the landscapes and terrains our ancestors navigated. There would have been constant textural variation, and sightlines through woodlands and across savannahs. Our eyes evolved to be particularly observant of visual markers for **navigation and wayfinding, as well as for spotting predators, threats and prey**. This is something not many of us have to do anymore and we can easily navigate our cities with our heads in our phones. Thus, we don't utilise our sight in the same way as we used to and taking in our surroundings is something we forget to do.
2. **Auditory** (hearing): When humans were in closer contact with the natural world, we were more familiar with sounds that marked the progression of the day – from the dawn chorus waking us, to the crickets marking the arrival of dusk. These sounds **connected us to the natural systems of our local ecology**, so we not only understood time and seasons passing, but we also knew if we were safe or not – from the ominous sound of silence signalling danger to the snap of a twig calling us to action.
3. **Tactile** (touch): Commonly thought of as the sensations we feel when something comes into contact with our skin. We **evolved whilst touching natural surfaces all day every day** – when relaxing, walking, and hunting or gathering food and water. Barefoot connections with the earth were frequent. Yet, it has become rare for us to touch a 'natural' surface (even natural materials such as wooden floorboards have had the textures planed off them).
4. **Olfactory** (smell): Our sense of smell is one of the strongest senses we possess, and **links to the memory and emotional functions of the brain**.⁷⁰ We evolved to respond to numerous scents that we no longer experience in our artificial, often sealed spaces. In fact, we spend much of our time exposed to the harsh smells of fuel, cleaning products, off-gassing materials and strong perfumes, masking many of those that may have been essential for survival or wayfinding.
5. **Gustatory** (taste): Our hunter-gatherer ancestors would have picked berries, nuts and leaves from their **natural habitat**. Compare that **seasonal, fresh, and local diet** to the processed, well-travelled, plastic wrapped sandwiches we often find ourselves eating on the go nowadays, and it's clear that we might be falling short in terms of making the most of our taste buds.
6. **Vestibular** (balance and sense of gravity): **We evolved walking through forests, over rocks, and down rivers and streams** – on many natural surfaces with different textures, heights and inclines – whereas now all we need to do is remember to hold the bannister while we walk down the stairs. We've made walking around a somewhat mindless activity, with little need to think much about balance or grip on the flattened surfaces of the urban environment.
7. **Proprioception** (position of the body in space derived from muscle and joint feedback): Back in our natural settings, **we were physically active and constantly aware** of our own bodies in relation to the landscape, as well as sensing those around us, and the distance between ourselves and others, such as our prey when hunting. Nowadays, we aren't moving nearly as much, and with issues such as crowding and proximity, we may even be shutting off our proprioception sense to protect us from becoming overwhelmed.

Whilst we have learned to adapt to the hustle and bustle of the **built environment**, with the **rise in stress,⁷¹ anxiety, depression and burnout**, clearly something is not quite right!

Research suggests that 'higher degrees of connectedness to nature were [found to be] associated with greater well-being and greater mindfulness.'⁷² So, we are still hard-wired to **thrive in spaces that have an abundance of natural sensory information**, and these sensory needs are rarely considered in the design of the spaces where we spend most of our time. Given this, we suggest using Biophilic Design principles as inspiration when creating spaces with the human senses in mind.



The Greenhouse, Interface, UK

THE BIOPHILIC PERSPECTIVE

Biophilic Design* provides a framework for creating **+Positive Spaces** that brings **nature and natural elements** into the built environment and **considers all of the senses**.⁷³ This approach to designing for the senses can be used in the workplace to help support **general cognitive wellbeing**, for example:

For the issues of distraction and mind wandering, **'Attention Restoration Theory'**⁷⁴ proposes that after we have become fatigued from effortful directed attention, we can clear our minds through viewing **gentle distractions** (such as natural settings) that allow for a moment of mental relaxation. Studies to support this have found **ordinary natural settings to have the highest restorative effect**, with everyday urban settings having the lowest.⁷⁵ Simply having a view out onto greenery or incorporating plants into the space can allow for moments of soft fascination.

Improve sleep and reduce fatigue by creating better access to **daylight**, something essential for cueing and regulating our **Circadian Rhythms** (our 24-hour sleep cycle driven by our internal circadian 'body clocks' that **influence our sleep patterns, hormones, body temperature, digestion and eating habits**).⁷⁷ Improved sleep can reduce unhealthy food cravings, increase focus, improve memory and reduce stress.⁷⁸ Artificial circadian lighting systems that follow the cycle of the local daylight can also support this.

Creating **prospect** from a place of **refuge** (i.e. views across or out of the workplace) to fulfil our 'inborn desire' for prospect, so that we can see things from a safe place without being overlooked by others.⁸³ Additionally, where possible, creating **views out over natural landscapes** (or natural elements) is preferable.⁸⁴

Using **Biomorphic shapes, forms and patterns** (like those found in nature e.g. trees, leaves and wood grain) to **reduce stress** and create inspiring spaces.⁷⁹

Introducing **sounds** that are akin to sounds found in the **natural world** can **positively stimulate the nervous system, reduce stress** and create a more **positive atmosphere**.⁸⁵


'Non-Rhythmic Sensory Stimuli' from objects or materials in consistent yet **unpredictable motion** as found in nature (e.g. grass swaying, ripples on water, or leaves in a breeze) can help with psychological restoration whilst reducing eye strain from computers if we refocus our vision every 20 minutes, for 20 seconds, on something 20 feet away (also known as the 20x20x20 rule).⁷⁶ Consider placing plants where there might be airflow, or bringing in water features and kinetic sculptures to provide NRSS in the workplace.

Using colours that are reminiscent of **thriving natural environments** can also have a large impact on our wellbeing. The **Ecological Valence Theory**⁸⁶ explains our responses to certain colours, particularly those found in nature. For example, yellows remind us of **warmth and sunshine**, and thus according to the theory contribute to **feelings of happiness and being welcomed into a space**.

Further, according to the **Savannah hypothesis**, humans tend to seek out colours which are within the colour palette of nature when it's thriving. Think green (healthy vegetation), blue (bodies of water and a clear sky), and red (berries for foraging).

Using **natural materials** to enhance creativity⁸⁰ and incorporating wood into the built environment to **decrease heart rate and perceived stress**⁸¹ (wooden surfaces are rated more positively than coated surfaces for the sense of touch).⁸²

*For more information on the principles of Biophilic Design and how to implement them at a range of scales, take a look at our guide to **Creating Positive Spaces Using Biophilic Design** ([interface.com/whitepapers](https://www.interface.com/whitepapers)).



CHAPTER 6

DESIGNING WITH THE
SENSES IN MIND



Vision becomes transferred to taste as well; certain colours and delicate details evoke oral sensations.”⁸⁷

Junhani Pallasmaa, Architect and Author

We don't experience the world sense by sense; **we feel, see, hear, taste and smell simultaneously**. Thus, it takes careful consideration to get the right balance when designing the sensory landscape of the workplace.

As mentioned earlier, each of us respond in different ways to increased stimuli, with some seeing it as positive and others finding it a mental burden that increases stress and lowers productivity.⁸⁸ So, we need to provide spaces that differentiate between the amount of sensory stimuli present. Let's take a look at how we might go about this...

ZONING BY SENSORY THRESHOLD

The importance of creating **sensory spaces**, a **diversity of spaces** and **zoning spaces** for different activities in the workplace is something we touched in our guide to **Creating Positive Spaces by Designing for Community** (interface.com/whitepapers). We will expand on those ideas in this section to consider how these spaces could (and should!) vary in the levels and combinations of sensory stimuli so that they can **support the neurodiversity** of those using the spaces for both **focused and collaborative work**.

Natural landscapes are full of **sensory contrasts**; if you think about heathlands, wetlands, grasslands, woodlands, riverines or shorelines, each has its own distinctive look, feel, smell, and textures which we associate with different activities. What's more, their **sensory characteristics and variations** (textures underfoot) help us to identify and navigate them as part of a **sensory journey** through the landscape. We also experience sensory journeys in the built environment and throughout the working day. If this is considered within workplace design, the **changing needs and activities** of individuals can be supported whilst enhancing the **zoning of spaces** and **wayfinding** at the same time.

“

Workspaces can have a significant negative impact on productivity, increase illness and absenteeism. When people are put in a space and it's too busy, noisy and overloading - they can get more distracted, overwhelmed and stressed. When the colours don't work for them, or the lighting isn't right, they are prone to get headaches and get fatigued. When it is too hot, people lose focus and become lethargic. We need to get the basics right in balancing collaboration versus distractions. Focus and quiet spaces, right lighting, temperature and airflow will help to reduce overload and make the workspace more productive.”

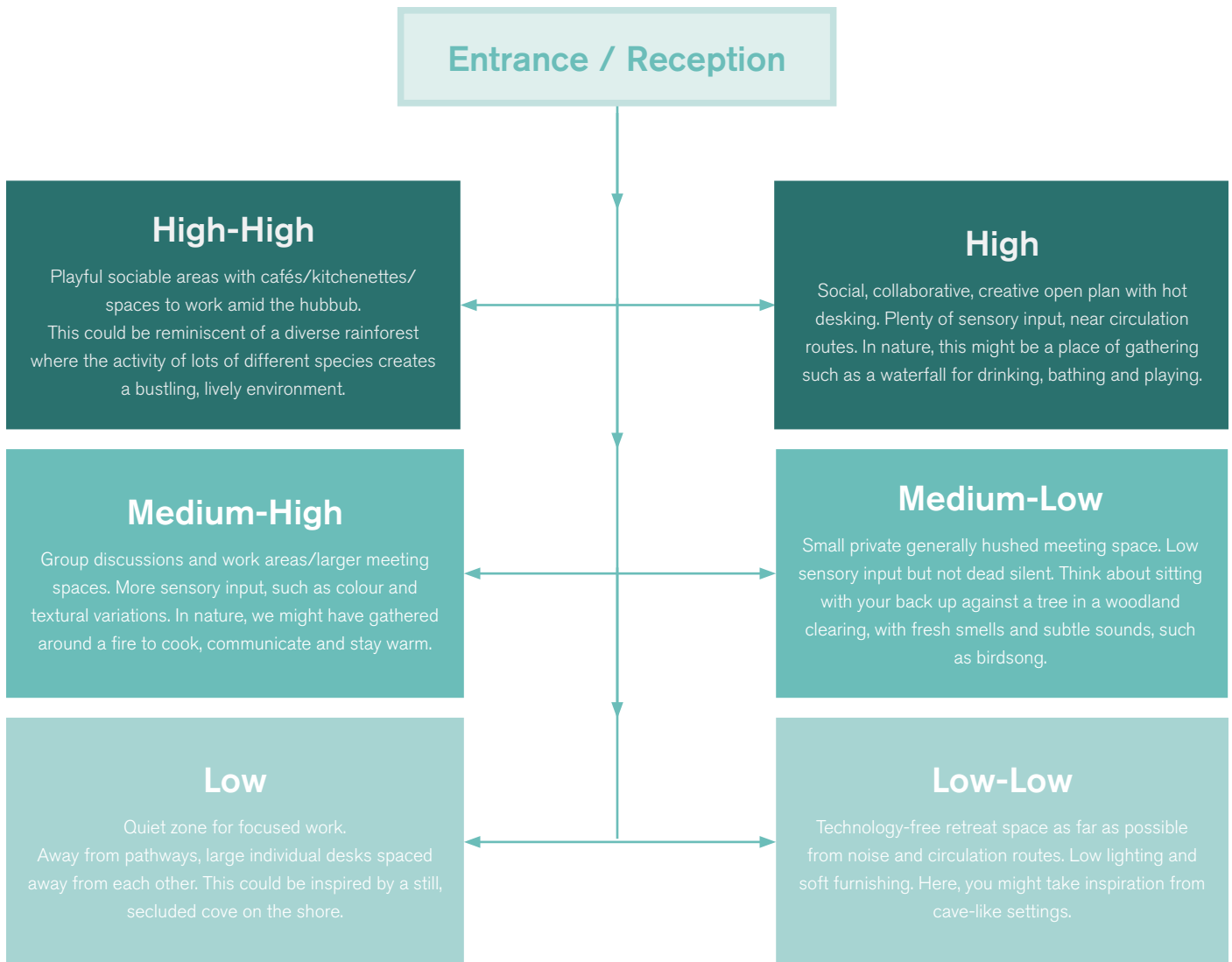
Dr Annemarie Lombard, Founder and CEO of Sensory Intelligence®

“

Guard against sensory overload, which is a common and natural result of dense, open-plan workspaces. You must be very wary that an environment is not too noisy, too busy, too colourful, too dense, too smelly. People respond differently to a workspace as a result of unconscious body-brain responses. People with high thresholds work best in busy and collaborative spaces, needing less time for quiet space. People with low thresholds work best in quiet, contained and focused spaces. And then a medium threshold space should have a bit of both. It is therefore imperative to create a balance of and availability of both busy and quiet spaces to ensure end user choice and productivity.”

Dr Annemarie Lombard, Founder and CEO of Sensory Intelligence®

On the next few pages, we will give examples of design features for different sensory thresholds. First, however, we've created a zoning map to demonstrate **an example of a sensory journey through a workplace** from high, to medium, to low, that can be applied and adapted according to the size of the space:



Spatial considerations:

- **Low threshold spaces** should be furthest from walkways and entrances, exits and passing traffic
- **Medium threshold spaces** are where all thresholds can come together for collaborative work
- **High threshold spaces** can be closest to the entrance and thoroughfares, offering a welcoming hubbub and lively social eating spaces.

We recognise that sometimes a **holistic approach** like this cannot be taken. In these projects, separate breakout spaces, or meditation pods (i.e. Low-Low threshold spaces) can be designed into an existing workplace, to offer moments of **restoration** away from noise and activity. However, where possible, we would always advocate designing a **sensory landscape across the whole workplace**, to provide a **drip feed of positive experiences** throughout the day for all who work there.



The Greenhouse, Interface, UK



DIVERSITY OF SPACES FOR SENSORY THRESHOLDS

By **designing a range of sensory environments**, we can address the distraction issues and lack of control on our surroundings in the contemporary office. **Creating spaces to choose between** according to **sensory threshold** can remove the need for 'mindfulness' practice, having a 'golden hour', or running 'attention management' programmes. **Cognitive and sensory wellbeing** will simply be supported by the spaces themselves.

It is important to have good air quality and encourage healthy eating no matter what the sensory threshold, so we won't specifically go into olfactory and gustatory senses. We do, however, believe that there should be a basic level of consideration for both of these to have in place across the board:

- **Olfactory (smell)** considerations include issues such as **scenting** and **air quality**. People working in offices with enhanced ventilation have been found to score higher in their cognitive function when responding to a crisis or developing a strategy than those working in conventional environments.⁸⁹ Scenting can be extremely divisive and must be approached in a subtle manner, if at all. As a rule, try to **ensure there is good ventilation to reduce negative smells and ensure you use low VOC materials and furniture**.
- **Gustatory (taste)** can affect our ability to focus and our general health and wellbeing through **what we eat and how we eat it**. Studies have found a positive correlation between mindfulness and healthier eating.⁹⁰ Healthier eating results in better overall health, which can lead to lower absenteeism. Thus, **creating more mindful spaces for eating (away from desks)** could improve health in terms of encouraging healthier attitudes towards food for everyone.



80%

of our sensory input comes through our sight.⁹¹

—

34%

The average satisfaction with levels of noise in the workplace.⁹⁴

Our following design features will focus on the senses in which the differences in thresholds can have the greatest impact:

1. **Visual comfort**
2. **Acoustic comfort**
3. **Tactile comfort** (included in this is vestibular and proprioceptive comfort, as they are all fed into the same process in which stimulation reaches the central nervous system from receptors in the skin)

But first, this is **the basic level of sensory design that needs to be considered for each:**

- **Visual (sight)** covers what we can see in our visual field as well as lighting qualities. This is **our most dominant sense, with more than 80% of our sensory input coming through our sight.**⁹¹ As such, it is often the main focus within design, and can override all the other sensory considerations if we get it wrong! Partitions are a good way to block visual distraction.⁹² Planted partitions will be more stimulating, as well as preventing fatigue during focused work.⁹³ Natural light is important for all, but glare and flickering from light sources will be distracting in any case.
- **Auditory (hearing)** design considerations should look at sound reduction and amplification, as well as introducing new sounds. The average satisfaction with levels of noise in the workplace is 34%⁹⁴ and the **top two forms of distraction in the office are chatty co-workers (80%) and office noise (70%).**⁹⁵ In the education sector, noise has been found to significantly decrease children's reading scores.⁹⁶ Applying this to the workplace, acoustic panels will help reduce general noise levels and reverberation times.
- **Tactile (touch)** includes the feeling of temperature and textures on our skin. Interestingly, 'grounding' or standing barefoot on a natural surface, has been hailed to be "one of the simplest and yet most profound interventions for helping reduce cardiovascular risk" due to reducing blood viscosity (thickness) and, thus, clumping.⁹⁷ Research shows that **tactile stimulation can be used to reduce stress, to energize or to relax.**⁹⁸ However, the best general approach is to ensure there are no rough or abrasive textures and air temperature is kept between 20-21 degrees Celsius.
- **Vestibular (balance and sense of gravity)** considerations within workplace design look at ergonomics of the space and furniture, and how well they support occupants' wellbeing and focus. The vestibular system is very important for our daily functioning, and studies have found that **any type of vestibular damage may result in cognitive impairment.**⁹⁹ A functioning vestibular system will also allow us to make automatic adjustments to our posture to maintain stability,¹⁰⁰ which can be helped with the right furniture.
- **Proprioception (position of the body in space derived from muscle and joint feedback)** in the built environment refers to **the perception and awareness of the position of our bodies in relation to the space and others;** issues such as crowding, density of space, group size, proximity to others and privacy should be considered. Whilst collaboration is more likely to happen when people are sat closer together,¹⁰¹ for some this can be distracting and uncomfortable. Desk sizes, numbers and positions need to be considered so that individuals can choose somewhere they feel comfortable working.

The table on the next page lays out our suggested design features for creating the most beneficial **workplace for cognitive and sensory wellbeing.**

DESIGN FEATURES FOR COGNITIVE AND SENSORY WELLBEING IN THE WORKPLACE

Low Sensory Threshold:

Need little or no noise, no scenting and muted colours, visual and acoustic privacy, and overall tactile comfort (which includes vestibular and proprioception).

Visual comfort

- Provide shielded and segregated areas to work
- Positioning of desks to minimize number of sightlines and views over movement in a space (consider angle & layout of furniture)
- High backed furniture and refuge pods
- Visually lowered ceiling heights
- Plain partitions, desk dividers and curtains for screening
- Use low level circadian lighting systems through the space with adequate task lighting provided by individual desk lamps
- Use pastel colours
- Reduce clutter using enclosed storage
- Focused spaces away from risk and peril/ drops and heights i.e.: when looking out of skyscraper (vertigo)

Acoustic comfort

- Establish spaces as quiet zones
- Reduce reverberation time using acoustic curtains, ceiling and wall panels, soft furnishings and insulation
- Use double or triple glazing, or silent glass, to block sound from internal meeting rooms or external sounds such as traffic and roadworks
- Reduce impact of intermittent mechanical noises through your specification of HVAC systems, and avoid loud clunky keyboards
- Zones and booths for concentrated work e.g.: soundproof modular meeting pods or call booths

Tactile comfort

- Ensure furniture isn't wobbly (spinning chairs made optional) and flooring isn't uneven or squeaky
- Cushioned mouse mats on desks
- Hand rails to support on stairs
- Use soft, non-abrasive, and natural materials
- Give occupants a level of control over thermal comfort e.g.: heated desks, accessible thermostats, operable windows
- Reduce proximity issues – larger desks that aren't too close together, ensure walkways are kept to a minimum and away from desks to prevent people brushing past each other
- Zone & create paths using flooring to distinguish between circulation routes and work areas
- Position focused work spaces away from airflow changes

Medium Sensory Threshold:

Can handle some sensory stimulation but generally prefer low background noise, harmonious colour, not necessarily concerned with total privacy, but cannot handle too much activity in the space.

**Visual
comfort**

- Permeable screening
- Subtly planted partitions or desk dividers
- Positioning of desks to reduce number of sightlines and views over movement in a space (consider angle & layout of furniture)
- Include some high-backed seats
- Use diffused lighting, window films, adjustable blinds, brise soleil, and deciduous planting outside windows
- Use circadian lighting systems throughout the space
- Using tones of the same colour to create a harmonious colour palette
- Include macro images of nature or artworks that show simple natural forms
- Use simple nature inspired patterns in the harmonious colour palette
- Use simple biomorphic shapes and forms - organic shaped furniture and curved edges
- Introduce plants on desks in desk dividers and on shelves

**Acoustic
comfort**

- Reduce reverberation time using plants and planting schemes, as well as acoustic curtains, ceiling and wall panels, soft furnishings and insulation
- Incorporate ways to signal 'do not disturb' (i.e. red/green lights above desks)
- Nature sounds: Incorporate speakers within a space to enable low level positive nature sounds to be played
- Reflective surfaces: include wood as well as soft furnishings

**Tactile
comfort**

- Give occupants a level of control over thermal comfort e.g.: heated desks, accessible thermostats, operable windows
- Include a choice of large and small desks, some in clusters and others more isolated on the periphery
- Use flooring to zone paths away from desks
- Position focused work spaces away from airflow changes
- Organically shaped handrails and door handles (or anything else occupants might touch and interact with)
- Incorporate natural materials within seating, table tops etc.
- Encourage movement with adjustable standing desks

DESIGN FEATURES FOR COGNITIVE AND SENSORY WELLBEING IN THE WORKPLACE

High Sensory Threshold:

Need sensory stimulation, background noise is good, can handle brighter colours, not necessarily concerned with privacy, prefer general hubbub and activity.

Visual comfort

- NRSS, such as kinetic sculptures, fish tanks & dappled light
- Plenty of windows, glass partitions to allow natural light & circadian lighting systems throughout the space
- Use more intense pops of colour in places, and some contrasting tones to visually stimulate (don't overdo it - solid red walls will be too much, even for high thresholds)
- A mixture of nature videos, images and artworks of lush landscapes
- Use more complex nature inspired patterns in places
- Include biomorphic shapes and forms, such as fractals, organic shaped furniture and tree-like columns
- Different types of plants at a range of heights, with contrasting scale, structure and leaf size – pot plants, planting systems or green walls
- Create prospect views – raised platforms at the edge of a room, long sightlines through a space, desks perpendicular to windows to allow views of the outdoors & onto natural elements

Acoustic comfort

- Nature sounds: create a subtle soundscape to mimic the acoustics of a natural setting by varying heights and positions of speakers according to what they are playing
- Reflective surfaces: encourage live acoustic environments (hubbub) by incorporating surfaces such as wood, stone, and glass
- In kitchenettes, cafes and social areas include low rhythmic music without vocals/lyrics

Tactile comfort

- Use plants to line walking routes; these can be brushed past as occupants move around the space
- Incorporate tactile natural materials within seating, table tops etc. that excite the senses when touched, according to area (within seating, table tops, handles, handrails, shelving)
- Organically shaped handrails and door handles (or anything else occupants might touch and interact with)
- Use waney/ live edged wooden countertops
- Cool and tactile marble in bathrooms and kitchens
- Standing/walking desks
- Create a 'no shoe' zone with pebbles in areas of the floor and textured mats under desks
- Mats under desks to act as wobble boards, space for Pilates and yoga, balance balls instead of chairs
- Encourage movement e.g. clear circulation routes, winding paths (mystery), routes for walking meetings, destination points such as outdoor spaces, stairs rather than lifts
- Encourage positive interactions: collision spaces such as townhall steps, eating places, triangulation
- Create dense zones for people to work in closer proximity to one another and encourage interactions i.e. smaller desks closer together
- Create subtle sensory contrasts throughout (think woodland) e.g. variation in flooring surfaces or materials; use hard wooden or leather surfaces in combination with softer furnishings



LinkedIn, Paris

CHAPTER 7

WHO IS DESIGNING FOR COGNITIVE & SENSORY WELLBEING?



We have selected two inspiring examples that show how a range of sensory thresholds can, and are, being considered in workplace design, in order to support focused work. Firstly, we will look at **Workplace's design for Allegro**, in which observations were conducted to decipher, and thus best cater for, the needs of the different work teams. Secondly, we will discuss how **Il Prisma** carried out 'therapy sessions' to understand the needs of their clients before creating **LinkedIn's Paris office**.

Both examples demonstrate the **diversity of spaces** needed when designing for cognitive and sensory wellbeing. We hope you find them inspiring!

ALLEGRO, WARSAW

(Workplace)

Allegro (one of the leading technology-driven trading companies in Europe) had their Warsaw headquarters designed by Workplace to be agile and home-like. Due to the nature of the company, the office needed to accommodate a multi-faceted workforce and their diverse needs. The challenge was to provide a vast range of spaces for their 450 employees to comfortably navigate their way through the 5,500-metre squared office. The main design concept was **to create a truly home-like space, drawing from places that remind us of joyful or relaxing moments such as gardens or living rooms.**

“

Our design is based very strongly on emotions and the “feel” of the space. To transfer our inspirations into reality we used different textures, fabrics and patterns. The amount of sensory engagement changes according to area. Busy, social spaces have a vibrant and joyful design, with lots of greenery and characteristic elements such as swings and deck chairs. The home zones on the other hand have a very calm and simple atmosphere as we wanted to aid concentration during individual work.”

Workplace, Warsaw

The split between space for focused work and for louder activities such as meetings and socialising is fairly even (58% and 42% respectively), which demonstrates the dedication to catering to different needs. From a sensory perspective, the space features many elements of Biophilic Design, such as plants, natural materials, an abundance of natural light and warm colours.

“

We designed a tailored office environment to nourish the broadly-based needs and specifics of a multi-faceted workplace.”

Workplace, Warsaw¹⁰²

Workplace **conducted interviews among employees and management to assess Allegro’s specific needs.**

Spaces were then split between teams effectively by observing the work profile of each team and adjusting the space to fit their individual needs.

“

Creating a flexible and functional space which enables the execution of a wide range of tasks was one of our main project assumptions. Focused work, creative work, formal meetings, ad-hoc meetings, relationship building and knowledge exchange each require different spaces and equipment. Placing a variety of distinct zones within the office allows each employee to find an area which fits their current needs and preferences.”

Workplace, Warsaw

The first two floors consist of “mini offices” integrated within a larger common space, which each include three zones:

- Individual workstations
- Glass conference rooms to either carry out focused work or video calls
- A creative space designed for brainstorming and group meetings

The third floor of the office is laid out like a house: a ‘hallway’ of meeting rooms and armchairs, the central area known as the ‘winter garden’, and the networking area, reminiscent of being ‘outside’, which features grass-like carpeting, plants and deckchairs.



Allegro, Warsaw

“

We consider comfort on numerous levels during each project. Starting with choosing right locations for each function - grouping louder, busy areas and separating individual work zones with meeting rooms and lockers. We also use acoustic ceilings, floor coverings and add sound absorbing panels if needed. Patterned glass allows for privacy in meeting rooms and the soft, natural materials used in social zones make the space feel warm and inviting.”

Workplace, Warsaw

HOW THE DESIGN SUPPORTS A RANGE OF SENSORY THRESHOLDS:

Low threshold

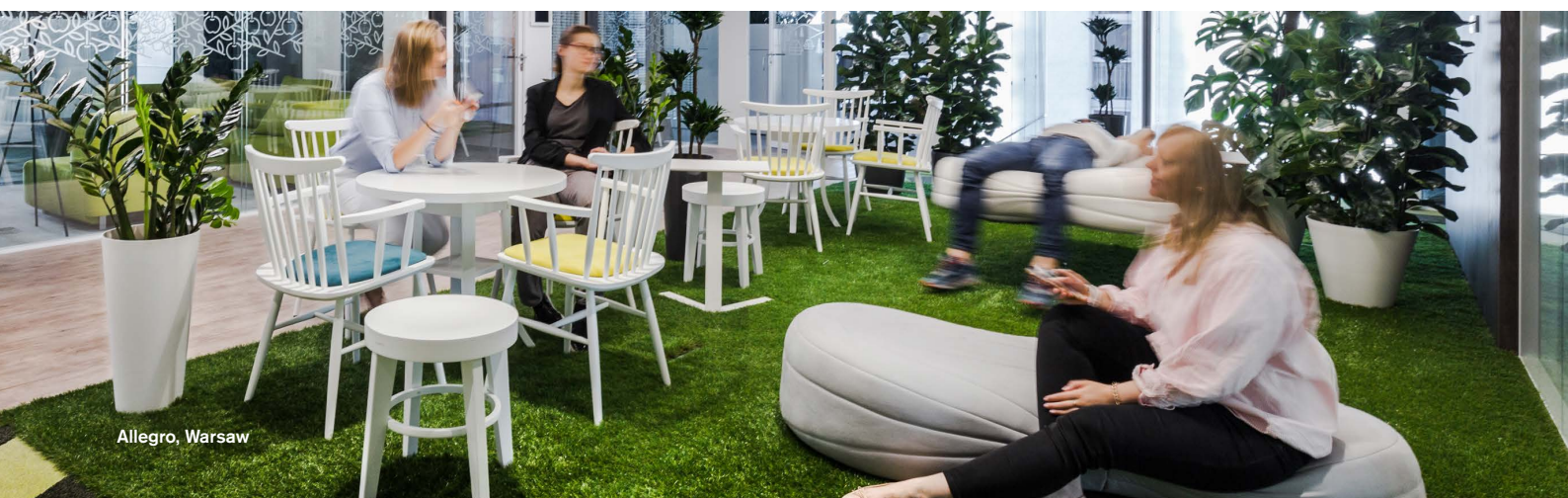
- Generally natural colours used throughout (greens, blues, greys and browns)
- Phone call booths for private calls to limit distraction
- Dark relaxation room with sofas to lie down, a few plants, and black out blinds on all windows for letting the senses rest
- Home zones dedicated to IT developers and small teams to enable focus
- Areas to unwind and recharge throughout the office
- Mobile lamps in individual working areas to give a warm home-like light

Medium threshold

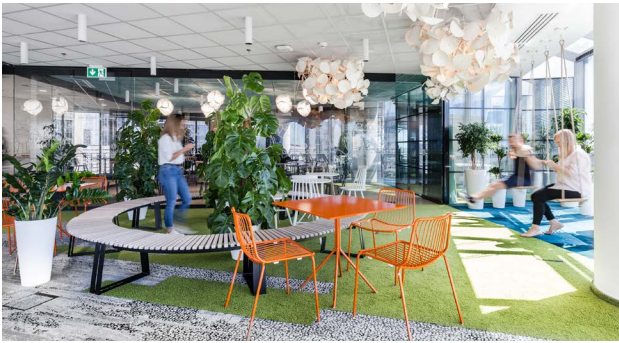
- Glass rooms for focused work that reduce acoustic distraction but offer some visual stimuli
- Individual desks varying in size and height within an open plan layout and task lighting
- Large amounts of greenery, natural materials, and home-like furnishings for a warm and welcoming feel
- Meeting rooms for 2-3 people
- Mobile elements such as curtains and cabinets to control how open or closed off the work zones are at different times

High threshold

- Swings near windows that create a sense of risk and vestibular stimulation
- Large windows with views across Warsaw
- An indoor 'park'
- Social areas (coffee points, kitchenettes)
- Vibrant kitchen with a long communal table
- Changes in floor textures and heights (e.g.: 'grassy patches' in carpet) that provides both tactile and vestibular stimulation
- High contrast black and white patterned carpet with accessible informal seating in an open position
- Patterned glass
- Game space with console, chin-up bar for exercise, pool table and table football
- Large social networking space for the whole company to use
- Casual flexible spaces to encourage daily interactions
- Town hall meeting steps
- A showroom/multifunctional meeting room



Allegro, Warsaw



High-High

Playful, open, sociable areas in the 'winter garden' provide the hubbub some prefer to work & have meetings in.



High

Bright demarked areas with panoramic views located in the 'winter garden' provide partially screened workspaces with plenty of sensory input.



Medium-High

More secluded work areas provide group discussions/meeting areas for those who like some background noise and sensory stimulation (views, light, colour and textural variations).



Medium-Low

Enclosed areas reduce acoustic sensory input whilst still providing some visual stimulus through use of glass and bright colours.



Low

Separate closed off work areas for groups or individuals provide limited acoustic stimuli, reduced sightlines and use natural patterns with a reduced colour palette.



Low-Low

Low-lit recuperation spaces with little sensory input have comfortable seating, dark walls and blinds to block out views.

LINKEDIN, PARIS

(Il Prisma)

LinkedIn, a global online professional networking company, have a culture that is very people focused. They make sure employees are collaborating, forming good relationships and having a good time. So, when designing an office in Paris for LinkedIn, Il Prisma considered each individual within the workplace, to ensure that all of their employee's needs are able to be met on a daily basis.

“

When our workspaces are designed specifically to stimulate and delight all five of our senses, they help us feel more present, more aware, more welcome, and more content.”¹⁰³

Uncommon

Il Prisma, an Italian architecture and design company, carried out a comprehensive research study which looked at **how designing for the senses can impact employee wellbeing, subsequent workplace productivity and employee engagement** with the organisation's brand. They studied brain activity in relation to factors that can help with productivity (such as calm, attention, learning and focus). This was done using electroencephalograms (EEG scans) to measure electrical activity in the brain and an eye tracker device to detect eye movement and the dilation of the cornea.

“

Our research proves that sensorial design improves concentration and learning... It's all about turning on the senses at work, not turning them off.”¹⁰⁴

Elisabetta Pero, Il Prisma architect

Participants completed a problem-solving test in either a 'neutral room', which was a plain meeting room with a white table, or a 'sensorial room', which featured a wooden table, a curtain made of leaves, a variety of wooden chairs, and fragrant and textural cedarwood bookcases, among other sensory elements. It was found that **focusing on the senses** in the workplace **improves wellbeing** at work and engaging one or **more of the senses can improve concentration, learning and memory.**

“

Working with the senses is the most effective way of stimulating the human brain”

Gilberto Vizzini, Il Prisma UK Manager

However, it is important to look at what kind of work will be carried out in each space to inform your design, so that productivity isn't hindered by sensory overload in concentration spaces (the study found that engaging multiple senses can also have a negative effect on work if the type of sensory input is not helpful to the task at hand). In particular, the use of **wood and natural materials** and the **colours blue and green** created brain activity that signalled feeling **calm and relaxed.**

Gilberto Vizzini, Il Prisma UK Manager, explained how they use a 'therapy' session at the start of their conceptual design phase to understand their clients' needs and develop the brief. This helps them understand the individual personalities within the space, the DNA, and the vision of the brand. They pay particular attention to **sensory stimuli and the human relationship with technology** in order to develop a narrative and metaphor for the space.

“

It's really important not to forget that you are designing something that has to be used by humans and humans today have a really strong connection with technology. So, we need to consider that technology as being part of our lives when we design spaces. When you think about stimulating the five senses you need to consider not just the physical senses, but how you can also use the digital world to stimulate.”

Gilberto Vizzini, Il Prisma UK Manager



LinkedIn, Paris

“

We tend to divide the space according to activity and change the sensory exposure in each area. This way, employees know what to expect. If someone is working in an area, or booking a room, they know they will have their senses stimulated in a different way compared to the other rooms. For example, in one area there will be more natural light and it will be quiet while in another area it will be darker with a cosier familiar environment”

Gilberto Vizzini, Il Prisma UK Manager

HOW THE DESIGN SUPPORTS A RANGE OF SENSORY THRESHOLDS:

Low threshold

- Cushioned 'day bed' area (soft materials, low lighting and smooth wood)
- Enclosed meeting rooms with muted colours once inside (these are actual 'rooms' and not just separated by glass, which allows for more privacy)
- Enclosed 'relaxation room' with a lie-down sofa and blue lighting
- Individual informal 'reading' area with armchair and footstool

Medium threshold

- Individual workspaces with task lighting line the enclosed meeting room. These are next to large windows and walkways where there will be some auditory, tactile and visual stimulus from the activity of others, but these are limited by the use of partitions.
- Meeting rooms with textural and patterned walls and glass partitions but otherwise minimal furniture and furnishings
- 'Living room' style area semi-screened with a floor-to-ceiling shelving partition, soft furniture and lighting offers a space for informal chatting

High threshold

- Brightly lit open plan work area with patterned and colourful carpets and columns
- Dining/socialising area reminiscent of a Parisian bar/restaurant uses hard surfaces which amplify the hubbub
- Playful 'townhall step' meeting/ presentation area with patterned cushions and carpeting and back lit wall
- Individual hanging seat for breakout with bright lighting and hanging plants – reminiscent of an outdoor space



LinkedIn, Paris



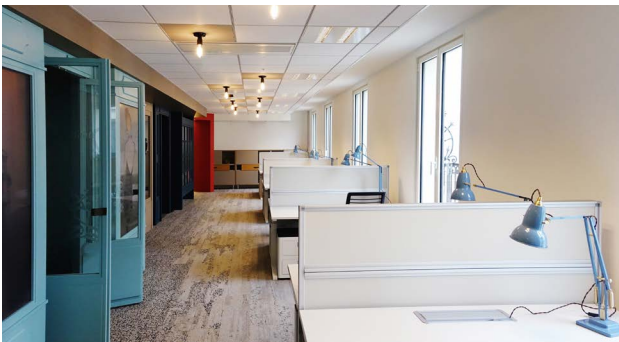
High-High

Sociable area for shared meals and conversation. Low lighting but visually rich and atmospheric, referencing local restaurant culture.



High

Playful use of colour and pattern to stimulate the visual sense. Open plan aspect offers plenty of sensory input.



Medium-High

Individual desks and control over desk lighting for those who like working with some background noise. Near circulation routes that offer additional visual and tactile stimulation.



Medium-Low

Meeting rooms for group or individual work with low sensory stimuli. Use colour and textural variations to stop them feeling sterile, and acoustic panelling to reduce reverberation and noise spilling into nearby quiet areas.



Low

Individual rooms with low lighting and limited views out offer space for focused work away from others.



Low-Low

Retreat space far from noise and circulation routes offers luxurious soft furnishings and lighting in warm tones.



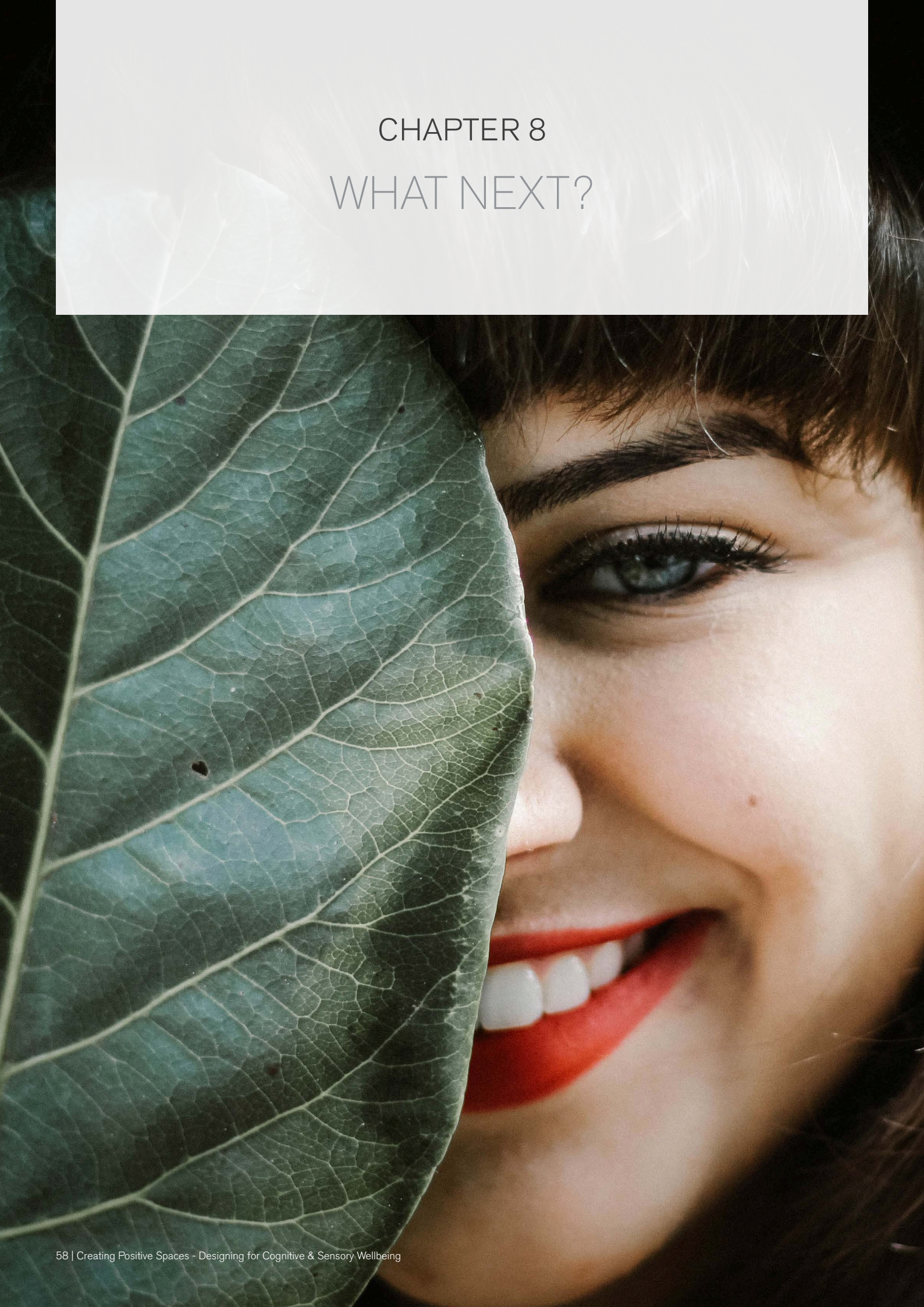
LinkedIn, Paris



Allegro, Warsaw

Both of these designs started with the needs of the occupants. They offer a **range of spaces** for employees to choose from – each with their own identities. The **distinction between the spaces** helps people to choose where they would prefer to work according to both their **personal preference** (derived from their sensory thresholds) and the task at hand; whether they prefer to work in quiet private spaces away from the hustle and bustle of the rest of the office, or socially shared areas amongst their colleagues. So, the take home message is to **find out what people need from their workplace and to design spaces that offer several options**. You can get started with our suggested design features for creating the **ideal workplace for cognitive and sensory wellbeing**.

CHAPTER 8
WHAT NEXT?



Cognitive wellbeing is essential for people to be able to feel their best and carry out focused work. It affects an employee's ability to complete tasks i.e. their productivity, which subsequently impacts on creativity, innovation and collaboration. When it isn't supported it can increase levels of stress, anxiety and burnout, which can result in absenteeism, presenteeism and higher levels of staff turnover. Cognitive issues are associated with both sensory over-and under-stimulation.

As Architects and Designers, we can **create workplaces that support employees' cognitive wellbeing** by:

- Considering the full spectrum of human senses in our projects
- Generally reducing the amount of sensory distraction in the spaces we design
- Creating a choice of sensory landscapes within the workplaces we design

The ground-breaking **neuropsychological research into sensory profiling** that we have presented in this guide has its origins in the field of occupational therapy. It is challenging the personality focused approaches that are currently more widespread in workplace design. As such, Architects and Designers are just starting to understand it's potential and are adopting this more **neurodivergent and cutting-edge approach to human-centred design**.

We hope this design guide will raise the awareness of **designing for cognitive & sensory wellbeing** and now it is in the hands of you, our readers, to create **+Positive Spaces** for building occupants with a range of sensory thresholds and to explain to clients why this is so important.

HOW TO GET STARTED

As we touched on earlier, Occupational Therapist Dr Annemarie Lombard has created the 'Sensory Matrix',¹⁰⁵ which can provide sensory profiling for individuals to help them understand their own sensory thresholds and processing. The e-profiling survey generates a private and individualised report that enables employees to better choose the right sort of environment to suit their sensory profile, providing insights into what they need to do to be able to work effectively.

This could be an incredibly useful tool in a **Pre-and Post-Occupancy Evaluation (POE)** process to help employees understand what they really need from their workplace, how well the space meets those needs, and better communicate their spatial needs to the organisation they work for.



If you really want to be transformative, we need to help people to understand this so that they can make better choices going forward. Because at the end of the day, you want to create the best workspace for health, wellbeing and productivity, but also empower people to understand what this is all about if they move into a new workplace so that they know how to navigate it.”

Dr Annemarie Lombard, Founder and CEO of Sensory Intelligence®

We foresee POE becoming a standard tool for workplace design as more organisations realise the benefits of a human-centred approach to their spaces. You can read about the process of conducting a Pre-and Post-Occupancy Evaluation (POE) in our previous design guide here (interface.com/whitepapers).

GET INVOLVED

We hope this guide has given you something to think about. Perhaps you are considering how you can put designing for cognitive and sensory wellbeing at the centre of your building or next project. If that's the case, we would love to hear what you are planning to do and see the results. That way, you can add to the growing number of case studies demonstrating how design can improve people's wellbeing through **Creating +Positive Spaces**.

If you need support in thinking about your next step towards designing for cognitive and sensory wellbeing, Interface (www.interface.com) have a team of designers and consultants who can support you in this process and provide information on upcoming seminars, workshops and events. Enjoy creating!



The Greenhouse, Interface, UK

REFERENCES

- ¹ <https://www.britannica.com/science/information-theory/Physiology>
- ² J.M. Hillis, et al, 2002. Combining sensory information: mandatory fusion within, but not between senses. *Science*, 298(5598), pp.1627-1630.
- ³ C. Kayser, et al, 2005. Integration of touch and sound in auditory cortex. *Neuron*, 48(2), pp.373-384.)
- ⁴ <https://www.ics.uci.edu/~gmark/chi08-mark.pdf>
- ⁵ <https://news.harvard.edu/gazette/story/2010/11/wandering-mind-not-a-happy-mind/>
- ⁶ Levitin, D. J. (2015). Why the modern world is bad for your brain. *The Guardian*, 18.
- ⁷ Levitin, D. J. (2015). Why the modern world is bad for your brain. *The Guardian*, 18.
- ⁸ <https://lindastone.net/2009/11/30/beyond-simple-multi-tasking-continuous-partial-attention/>
- ⁹ https://research.udemy.com/research_report/udemy-depth-2018-workplace-distraction-report/
- ¹⁰ <https://www.emerald.com/insight/content/doi/10.1108/14725960810872622/full/html>
- ¹¹ Liebl, A., Haller, J., Jödicke, B., Baumgartner, H., Schlittmeier, S., & Hellbrück, J. (2012). Combined effects of acoustic and visual distraction on cognitive performance and well-being. *Applied ergonomics*, 43(2), 424-434.
- ¹² Levitin, D. J. (2015). Why the modern world is bad for your brain. *The Guardian*, 18.
- ¹³ <https://lindastone.net/2009/11/30/beyond-simple-multi-tasking-continuous-partial-attention/>
- ¹⁴ <https://www.nytimes.com/2006/07/05/opinion/05friedman.html>
- ¹⁵ Levitin, D. J. (2015). Why the modern world is bad for your brain. *The Guardian*, 18.
- ¹⁶ <https://blog.dscout.com/mobile-touches>
- ¹⁷ <http://www.deloitte.co.uk/mobileuk/>
- ¹⁸ <http://www.deloitte.co.uk/mobileuk/>
- ¹⁹ Ito, M., & Kawahara, J. I. (2017). Effect of the presence of a mobile phone during a spatial visual search. *Japanese Psychological Research*, 59(2), 188-198.
- ²⁰ Levitin, D. J. (2015). Why the modern world is bad for your brain. *The Guardian*, 18.
- ²¹ Stothart, C., Mitchum, A., & Yehner, C. (2015). The attentional cost of receiving a cell phone notification. *Journal of experimental psychology: human perception and performance*, 41(4), 893.
- ²² <https://www.theglobalrecruiter.com/aussie-workers-more-distracted-than-ever-before-says-survey/>
- ²³ https://j4kul1vgvqfzak62jhqj1e4-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/250k_Report.pdf
- ²⁴ Bugeja, M. (2008). The age of distraction: The professor or the processor?. *The Futurist*, 42(1), 68.
- ²⁵ <https://iorgforum.org/wp-content/uploads/2011/06/CostOfNotPayingAttention.BaseReport1.pdf>
- ²⁶ <https://www.telegraph.co.uk/finance/jobs/11691728/Employees-waste-759-hours-each-year-due-to-workplace-distractions.html>
- ²⁷ https://research.udemy.com/research_report/udemy-depth-2018-workplace-distraction-report/
- ²⁸ <https://businessadvice.co.uk/hr/recruitment/revealed-the-secret-costs-of-replacing-your-staff/>
- ²⁹ <https://msutoday.msu.edu/news/2013/brief-interruptions-spawn-errors/>
- ³⁰ <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.198.7755&rep=rep1&type=pdf>
- ³¹ Mark, G., Gudith, D., & Klocke, U. (2008, April). The cost of interrupted work: more speed and stress. In *Proceedings of the SIGCHI conference on Human Factors in Computing Systems* (pp. 107-110). ACM.
- ³² <https://uk.adp.com/resources/adp-articles-and-insights/articles/w/workforce-view-2019.aspx>
- ³³ https://www.huffingtonpost.co.uk/natasha-shearer/work-related-stress-business_b_3545476.html
- ³⁴ <http://www.stressmanagementsociety.com/files/The%20Costs%20of%20Work%20Stress%20a%20report%20from%20The%20Stress%20Management%20Society.pdf>
- ³⁵ <http://www.hse.gov.uk/statistics/causdis/stress.pdf>
- ³⁶ https://www.exeter.ac.uk/news/featurednews/title_98638_en.html
- ³⁷ <https://www.sapience.net/>
- ³⁸ <https://www.chieflearningofficer.com/2018/07/17/a-distracted-workplace-costs-far-more-than-productivity-loss/>
- ³⁹ Dane, E., & Brummel, B. J. (2014). Examining workplace mindfulness and its relations to job performance and turnover intention. *Human relations*, 67(1), 105-128.
- ⁴⁰ <https://www.inc.com/marissa-levin/why-google-nike-and-apple-love-mindfulness-training-and-how-you-can-easily-love-.html>
- ⁴¹ Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory capacity and GRE performance while reducing mind wandering. *Psychological science*, 24(5), 776-781.
- ⁴² Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory capacity and GRE performance while reducing mind wandering. *Psychological science*, 24(5), 776-781.
- ⁴³ Mrazek, M. D., Franklin, M. S., Phillips, D. T., Baird, B., & Schooler, J. W. (2013). Mindfulness training improves working memory capacity and GRE performance while reducing mind wandering. *Psychological science*, 24(5), 776-781.
- ⁴⁴ Levy, D. M., Wobbrock, J. O., Kaszniak, A. W., & Ostergren, M. (2012, May). The effects of mindfulness meditation training on multitasking in a high-stress information environment. In *Proceedings of Graphics Interface 2012* (pp. 45-52). Canadian Information Processing Society.
- ⁴⁵ Davidson, R. J., Kabat-Zinn, J., Schumacher, J., Rosenkranz, M., Muller, D., Santorelli, S. F., ... & Sheridan, J. F. (2003). Alterations in brain and immune function produced by mindfulness meditation. *Psychosomatic medicine*, 65(4), 564-570.
- ⁴⁶ Aikens, K. A., Astin, J., Pelletier, K. R., Levanovich, K., Baase, C. M., Park, Y. Y., & Bodnar, C. M. (2014). Mindfulness goes to work: Impact of an online workplace intervention. *Journal of Occupational and Environmental Medicine*, 56(7), 721-731.
- ⁴⁷ https://ucsdnews.ucsd.edu/index.php/pressrelease/war_and_peace_of_mind
- ⁴⁸ https://www.huffingtonpost.com/matt-tenney/4-ways-mindfulness-improv_b_9738720.html
- ⁴⁹ <https://www.nytimes.com/2015/03/01/business/at-aetna-a-ceos-management-by-mantra.html>
- ⁵⁰ https://osha.europa.eu/en/tools-and-publications/publications/literature_reviews/calculating-the-cost-of-work-related-stress-and-psychosocial-risks
- ⁵¹ Porter, N., & Thomas, J. B. M. . Mindfulness and design: creating spaces for well being. *Creative Practices for Improving Health and Social Inclusion*, 199.
- ⁵² https://j4kul1vgvqfzak62jhqj1e4-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/250k_Report.pdf

- ⁵³ https://j4kul1vgvnqfzak62jhqi1e4-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/250k_Report.pdf
- ⁵⁴ https://j4kul1vgvnqfzak62jhqi1e4-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/250k_Report.pdf
- ⁵⁵ <https://psycnet.apa.org/record/1991-09869-001>
- ⁵⁶ <https://positivepsychologyprogram.com/big-five-personality-theory/>
- ⁵⁷ <https://workplaceunlimited.com/Ecophon%20Psychoacoustics%20v4.5.pdf>
- ⁵⁸ Belojevic, G., Jakovljevic, B., & Slepcevic, V. (2003). Noise and mental performance: personality attributes and noise sensitivity. *Noise and Health*, 6(21), 77.
- ⁵⁹ Chamorro-Premuzic, T., Swami, V., Terrado, A., & Furnham, A. (2009). The effects of background auditory interference and extraversion on creative and cognitive task performance. *International Journal of Psychological Studies*, 1(2), 2.
- ⁶⁰ https://www.ecophon.com/globalassets/media/pdf-and-documents/uk/ecophon_officenoise_v9_lo.pdf
- ⁶¹ <https://workplaceunlimited.com/Ecophon%20Psychoacoustics%20v4.5.pdf>
- ⁶² Interview with Annemarie Lombard, Founder and CEO of Sensory Intelligence®
- ⁶³ <https://www.workdesign.com/2019/12/designing-for-neurodiversity-and-inclusion/>
- ⁶⁴ Lombard, A. (2012). The effect of sensory processing on the work performance of call centre agents in a South African context (Doctoral dissertation, University of Cape Town).
- ⁶⁵ https://www.ecophon.com/globalassets/media/pdf-and-documents/uk/ecophon_officenoise_v9_lo.pdf
- ⁶⁶ https://j4kul1vgvnqfzak62jhqi1e4-wpengine.netdna-ssl.com/wp-content/uploads/2020/07/250k_Report.pdf
- ⁶⁷ Yerkes RM, Dodson JD (1908). "The relation of strength of stimulus to rapidity of habit-formation". *Journal of Comparative Neurology and Psychology*. 18 (5): 459–482. doi:10.1002/cne.920180503.
- ⁶⁸ <https://bitly/20Kwf2H>
- ⁶⁹ http://europa.eu/rapid/press-release_IP-03-1278_en.htm
- ⁷⁰ <http://www.fifthsense.org.uk/psychology-and-smell/>
- ⁷¹ The growth and the stagnation of work stress: Publication trends and scientific representations 1960–2011 Ari Va'a'na'nen Finnish Institute of Occupational Health, Finland Michael Murray Keele University, UK Anna Kuokkanen University of Helsinki, Finland
- ⁷² <https://www.sciencedirect.com/science/article/pii/S0191886911001711>
- ⁷³ Kellert, S. & Calabrese, E. (2015) The Practice of Biophilic Design <https://www.biophilic-design.com/>
- ⁷⁴ <https://positivepsychologyprogram.com/attention-restoration-theory/#what-attention-restoration-theory>
- ⁷⁵ Herzog, T. R., Black, A. M., Fountaine, K. A., & Knotts, D. J. (1997). Reflection and attentional recovery as distinctive benefits of restorative environments. *Journal of environmental psychology*, 17(2), 165-170.
- ⁷⁶ <https://www.terrabinbrightgreen.com/blog/2015/12/non-rhythmic-sensory-stimuli/>
- ⁷⁷ https://www.nigms.nih.gov/Education/Pages/Factsheet_CircadianRhythms.aspx
- ⁷⁸ <https://uncommon.co.uk/sip-on-your-success/>
- ⁷⁹ <https://pdfs.semanticscholar.org/08a9/bd25df650197fb58bf8b9c8647ad0abc07a7.pdf>
- ⁸⁰ https://www.tandfonline.com/doi/abs/10.1207/S15326934CRJ1434_11
- ⁸¹ Kelz, C., Grote, V., & Moser, M. (2011, September). Interior wood use in classrooms reduces pupils' stress levels. In *Proceedings of the 9th Biennial Conference on Environmental Psychology*.
- ⁸² Bhatta, S. R., Tiippana, K., Vahtikari, K., Hughes, M., & Kytä, M. (2017). Sensory and Emotional Perception of Wooden Surfaces through Fingertip Touch. *Frontiers in psychology*, 8, 367. doi:10.3389/fpsyg.2017.00367
- ⁸³ Appleton, J. (1975) *The Experience of Landscape*
- ⁸⁴ <https://www.sciencedirect.com/science/article/pii/S0169204686900058>
- ⁸⁵ <https://www.thersa.org/discover/publications-and-articles/rsa-blogs/2018/05/the-senses-at-work>
- ⁸⁶ <https://www.pnas.org/content/107/19/8877.short>
- ⁸⁷ <https://sites.psu.edu/arch311w/2015/12/12/office-space-designed-by-the-senses-2/>
- ⁸⁸ <https://repository.tudelft.nl/islandora/object/uuid%3Aa8d6b7ae-5d21-495d-a30b-28437f4f2d70>
- ⁸⁹ <https://green.harvard.edu/tools-resources/research-highlight/impact-green-buildings-cognitive-function>
- ⁹⁰ Jordan, C. H., Wang, W., Donatoni, L., & Meier, B. P. (2014). Mindful eating: Trait and state mindfulness predict healthier eating behavior. *Personality and Individual Differences*, 68, 107-111.
- ⁹¹ Porteous, J.D. (1996). *Environmental aesthetics: ideas, politics and planning*. Routledge, ISBN: 0203-43732-2, London.
- ⁹² Biophilia: Does Visual Contact with Nature Impact on Health and Well-Being
- ⁹³ Ruth K. Raanaas, Katinka Horgen Evensen, Debra Rich, Gunn Sjøstrøm, Grete Patil, Benefits of indoor plants on attention capacity in an office setting, *Journal of Environmental Psychology*, Volume 31, Issue 1, 2011, Pages 99-105
- ⁹⁴ https://www.leesmanindex.com/media/250k_Report.pdf
- ⁹⁵ https://research.udemy.com/research_report/udemy-depth-2018-workplace-distraction-report/
- ⁹⁶ <https://workdesign.com/2014/06/sensory-experience-workplace/>
- ⁹⁷ <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3576907/>
- ⁹⁸ Gallace A, Spence C. The science of interpersonal touch: an overview. *Neurosci Biobehav Rev*. 2010 Feb;34(2):246-59. doi: 10.1016/j.neubiorev.2008.10.004. Epub 2008 Oct 17. PMID: 18992276.
- ⁹⁹ Smith, P. F. (2017). The vestibular system and cognition. *Current opinion in neurology*, 30(1), 84-89.
- ¹⁰⁰ <https://vestibular.org/understanding-vestibular-disorder/human-balance-system>
- ¹⁰¹ Kraut, R., Egido, C., & Galegher, J. (1988, January). Patterns of contact and communication in scientific research collaboration. In *Proceedings of the 1988 ACM conference on Computer-supported cooperative work* (pp. 1-12). ACM.
- ¹⁰² <http://workplace.pl/story/allegro-home-like-office-2/>
- ¹⁰³ <https://uncommon.co.uk/sensory-design-workplace/>
- ¹⁰⁴ <https://www.steelcase.com/asia-en/research/articles/topics/wellbeing/engaging-five-senses/>
- ¹⁰⁵ <https://sensoryintelligence.com/sensory-matrix/>



Allegro, Warsaw



To capture insights from industry and thought leaders, **Interface** have co-authored a series of papers (interface.com/whitepapers) to **explore the value of human-centred design, understand how nature can inspire the creation of positive spaces and examine the future of sustainable buildings**. Interface want to share their pioneering approach to human-centred design and help architects, designers and decision makers pave the way towards innovative ways of creating sustainable buildings with wellbeing at their heart.

Authors:

Oliver Heath

Founder and Director of Oliver Heath Design

Victoria Jackson

Senior Sustainable Designer and Researcher at Oliver Heath Design

Eden Goode

Human Centred Design Specialist at Oliver Heath Design

We would like to thank Workplace and Il Prisma for giving consent for their case study material to be included in this publication. We are also especially grateful to those who gave their time to provide information, images and quotes to include throughout this Design Guide.

You can find more information at www.interface.com
E: designlab@interface.com

For information about Oliver Heath Design please go to www.oliverheath.com

T: +44 (0) 1273 326031
E: studio@oliverheathdesign.com
Twitter: [@oliver_heath](https://twitter.com/oliver_heath)

Publishing date: October 2021



Allegro, Warsaw





Interface® in collaboration with



www.oliverheath.com

Europe, Middle East & Africa

AE	+971 556881979	GR	+30 211 2120820	PT	+351 217 122 740
AT	+43 1 8102839	HR	+385 14 62 30 63	RO	+40 21 317 12 40/42/43/44
BA	+387 33 522 534	HU	+36 1 349 6545	RS	+381 11 414 92 00
BE	+32 2 475 27 27	IE	+353 1 679 8466	RU	+7 495 234 57 27
BG	+359 2 808 303	IL	+972 97403034	SA	+966 554622263
BY	+375 17 226 75 14	IT	+39 02 890 93678	SE	+468 241 230
CH	+41 44 913 68 00	KZ	+7 495 234 57 27	SI	+421 911 104 073
CZ	+42 0 233 087 111	LT	+370 37 337332	SK	+421 911 104 073
DE	+49 2151 3718 0	LV	+371 672 18 744	SI	+386 8 205 4007
DK	+45 33 79 70 55	NL	+31 33 277 5555	TR	+90 212 365 5506
EE	+372 6518 313	ME	+381 11 414 92 00	UA	+38(044)238 27 67
ES	+34 932 418 750	MK	+389 2 323 01 89	UK	+44 (0)800 3134465
EG	+(202) 3760 7818	NO	+47 23 12 01 70	ZA	+27 11 608 4270
FR	+33 1 58 10 20 20	PL	+48 22 862 48 40		

www.interface.com



Climate change is undeniable. And reversible. Our mission is to prove it. Join the #ClimateTakeBack and help create a climate fit for life.

BROXXXENAO49 10/2021

