Sensory Processing in the Workplace

Neurotype Workplace Survey

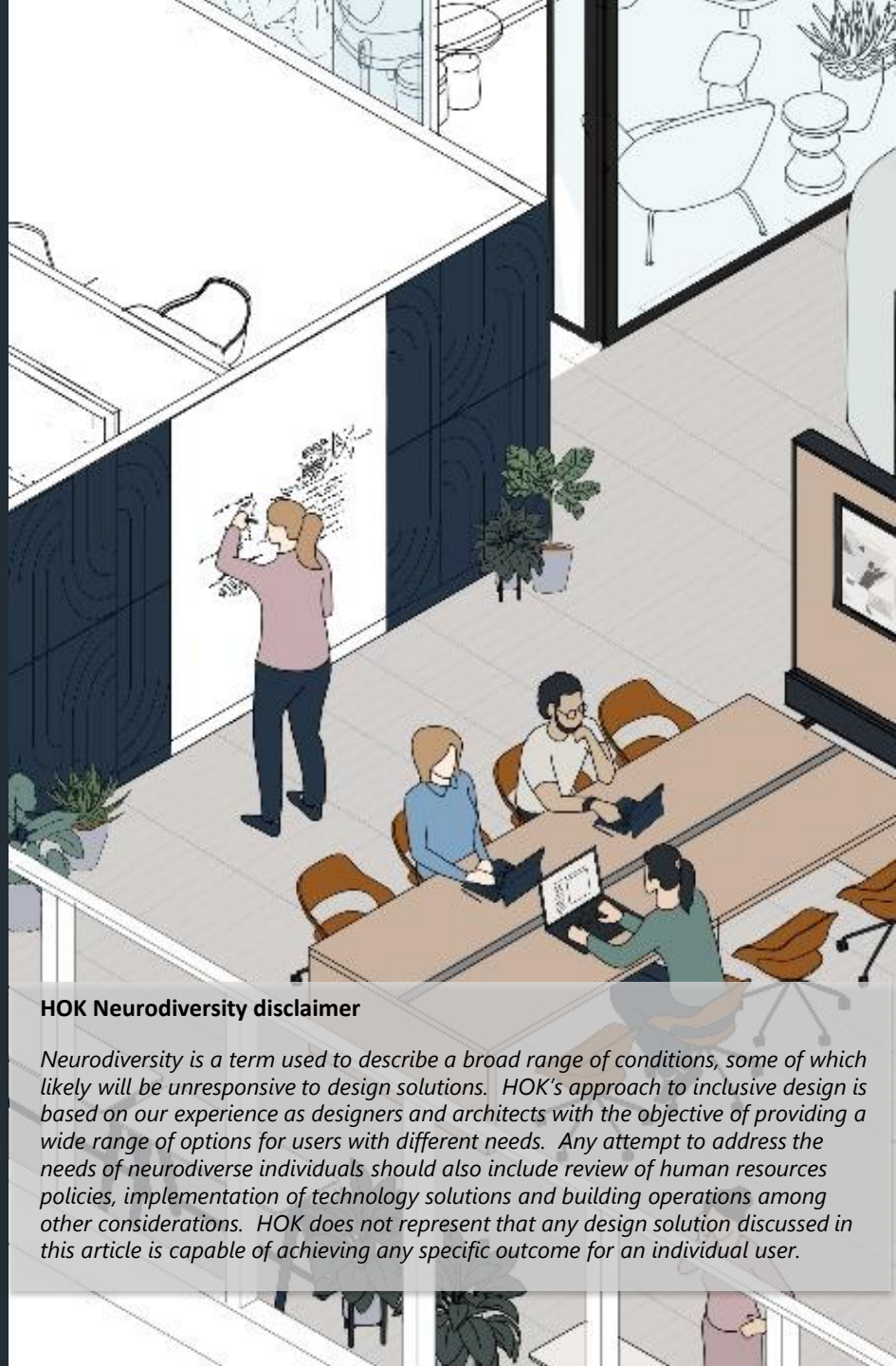
November / December 2023

2023 Neuro-inclusion Research

Over the past 8 years HOK has undertaken continuous research on the topic of designing for neurodiversity and expanded that to include sensory processing and cognitive well-being.

Our WorkPlace team and global practice leaders have conducted surveys, focus groups, and research to develop the initial business case, call to action, and initial design strategies for consideration.

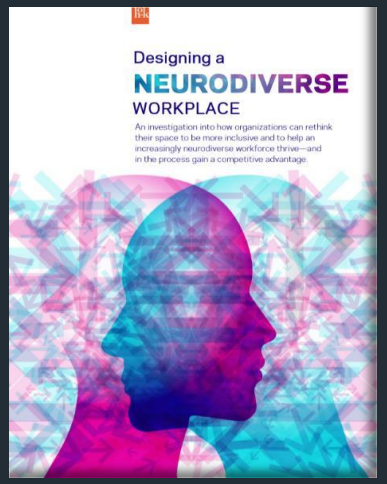
In a continuation of our research, we recently undertook an assessment of the general population in our San Francisco office to assess their sensitivities to sensory stimulation. The survey was open to all office staff on a voluntary basis. Those findings were then compared to the findings from the previous survey done with a neurodivergent sample group. The goal is to identify similarities and differences between the groupings.



HOK Neurodiversity disclaimer

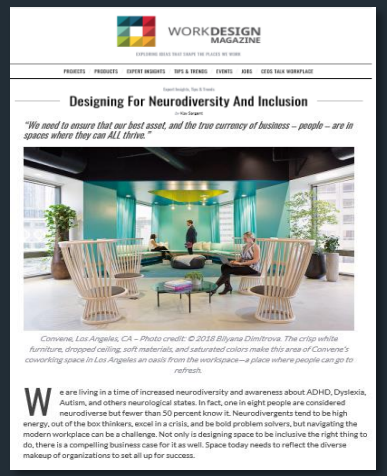
Neurodiversity is a term used to describe a broad range of conditions, some of which likely will be unresponsive to design solutions. HOK's approach to inclusive design is based on our experience as designers and architects with the objective of providing a wide range of options for users with different needs. Any attempt to address the needs of neurodiverse individuals should also include review of human resources policies, implementation of technology solutions and building operations among other considerations. HOK does not represent that any design solution discussed in this article is capable of achieving any specific outcome for an individual user.

Neuro-inclusion Research

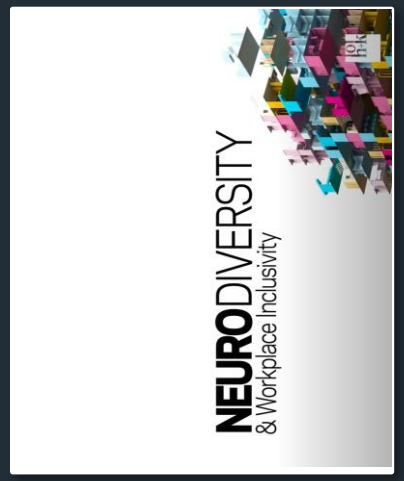


https://www.hok.com/ideas/publications/hok-designing-a-neurodiverse-workplace/

https://www.hok.com/ideas/publications/trends-affecting-neurodiversity-toward-2030/



https://www.workdesign.com/2019/12/designing-for-neurodiversity-and-inclusion/



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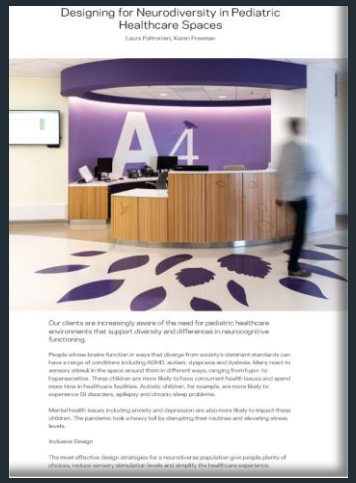
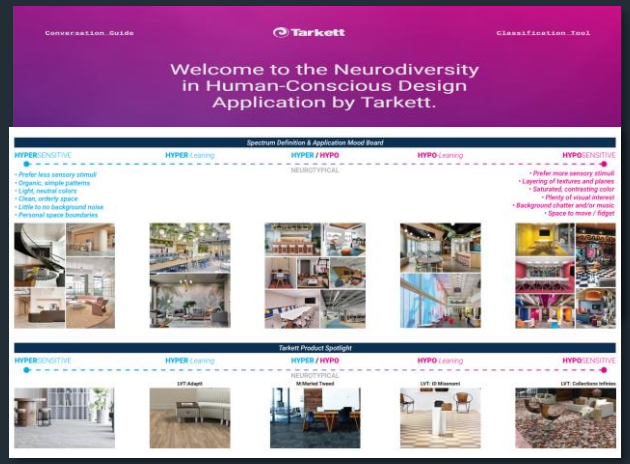


https://www.hok.com/ideas/publications/designing-for-neurodiversity-in-pediatric-healthcare-spaces



https://little-mud-6010.animaapp.io/homepage

http://tarkett-8435814.hs-sites.com/neurodiversity-1

http://www.hokforward.com/read/inclusive-design-for-complex-buildings/

HOK is not a licensed healthcare provider and any recommendations discussed herein are based on HOK's experience and training related to specific projects and elements of design and are not meant to be an endorsement or a solution for every possible situation.

Research Hypothesis

Our theory, based on our past research, is that:

Everyone’s brain functions differently
hence, we are all neurodiverse.

Sensory stimulation impacts everyone, but what might be annoying to neurotypical individuals can be debilitating to neurodivergents.

Their needs aren't actually different from typical people’s, just more intense and specific.

Research Goals

1. Identifying **preferences and design elements** that impact individuals in the built environment.

2. Identifying if the preferences for the **neurodivergent population varies from that of a mixed neurotype population**, and how.

3. Identify **design solutions** that help clients and designers to create **spaces that are welcoming** for a greater percentage of the population.

202
individual neurodivergent respondents

Dec 2021 - Feb 2022

Note: *all participants were professionally diagnosed*

69%
Female or non-binary

54%
ADHD

47%
Hypersensitive

40%
Autism

19%
Dyslexia

82%
30-60 years old

57%
A combination of neurodiversities

22%
Hyposensitive

> **Nothing about us, without us.**
>
> We did this research to give a voice to neurominorities and have a deeper understanding of their experiences.

Most research to date on neurodiverse individuals has focused on the youth and historically, women have been underrepresented. *

2022 Neurodivergent Research Survey

* SOURCE: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8961310/

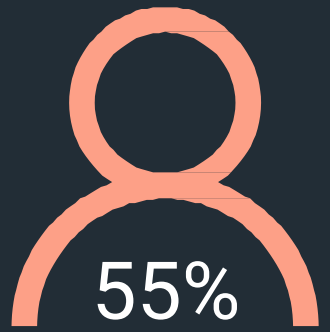
hok.com

74
individual respondents HOK SF Office
Oct 2023 - Nov 2023

Note: This is a sample group of designers and architects, hence likely a heightened awareness of the built environment.

16%
Identified as knowing they were neurodivergent

US average is 15-20%



55%

Female

15%

ADHD

US average is 5-7%

90%

Expressed some hypersensitivity to sensory stimulation

2%

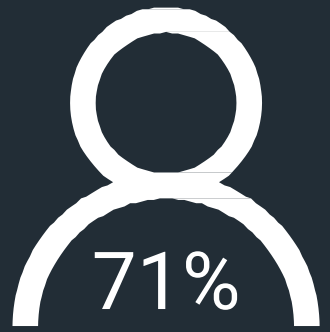
Autism

US average is 2.3%

7%

Dyslexia

US average is 13-14%

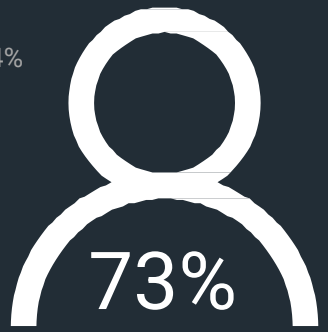


71%

30-60 years old

4%

A combination of neurodiversities



73%

Expressed some hyposensitivity to sensory stimulation

> **We all have a heightened sensitivity**
>
> to our environments and the stimulation within them since the pandemic.

The research was conducted on a typical office population with a mixture of neurotypes, all of working age.

Note: 85-90% of adults with ADHD don't know they have it, and many neurodiverse conditions go undiagnosed.

2023 Mixed Neurotype Research Survey

* SOURCE: https://www.cdc.gov/ncbddd/autism/data.html

hok.com

We are not the same.

Some impairments look like this:

Others look like this:

Some are **temporary**, some are **permanent,**
and some are **situational**.

70% of disabilities are invisible.

SOURCE: https://news.microsoft.com/source/features/diversity-inclusion/leaders-who-revealed-disabilities-found-unexpected-rewards/#:~:text=She%20says%20most%20disabilities%20are,about%20disability%20important%20for%20everyone.

Everyone’s brain functions differently, hence
we are all neurodiverse.

While the functioning of neurotypical individuals falls within set norms, neurodivergents, or neurominorities, fall outside of those parameters.

Neurodivergence is a naturally occurring variation in neurocognitive functioning that is considered different to the predominant neurotype.

Neurodivergence includes Autism Spectrum Disorder (ASD), Attention Deficit Hyperactivity Disorder (ADHD), Dyslexia, Dyspraxia, Dyscalculia, Dysgraphia, Asperger’s, and Tourette’s Syndrome.*

* Definitions in the Appendix

Neurodiversity

”

Physical, cognitive and social exclusion can occur at the point of interaction between the individual and an environment when there is a misalignment between them.

- World Health Organization

SOURCE: World Health Organization .

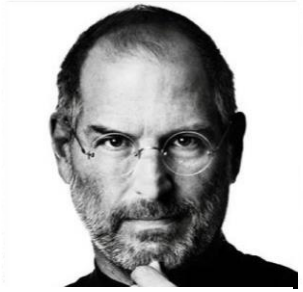
Impairments + Misaligned Environment = Disadvantage

1 in 5 people

are considered neurodivergent…

but fewer than 50% even know it.


Agatha Christy


Steve Jobs

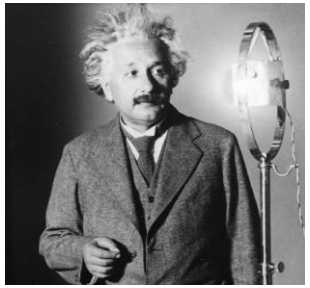
Cher


Tim Burton

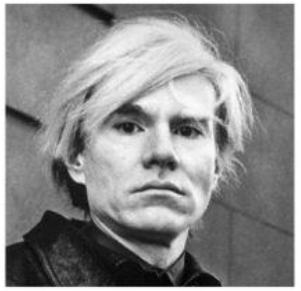

Mozart


Richard Branson

Simone Biles


Albert Einstein


Jennifer Aniston


Andy Warhol


Emma Watson


Bill Gates


Elon Musk


Anthony Hopkins

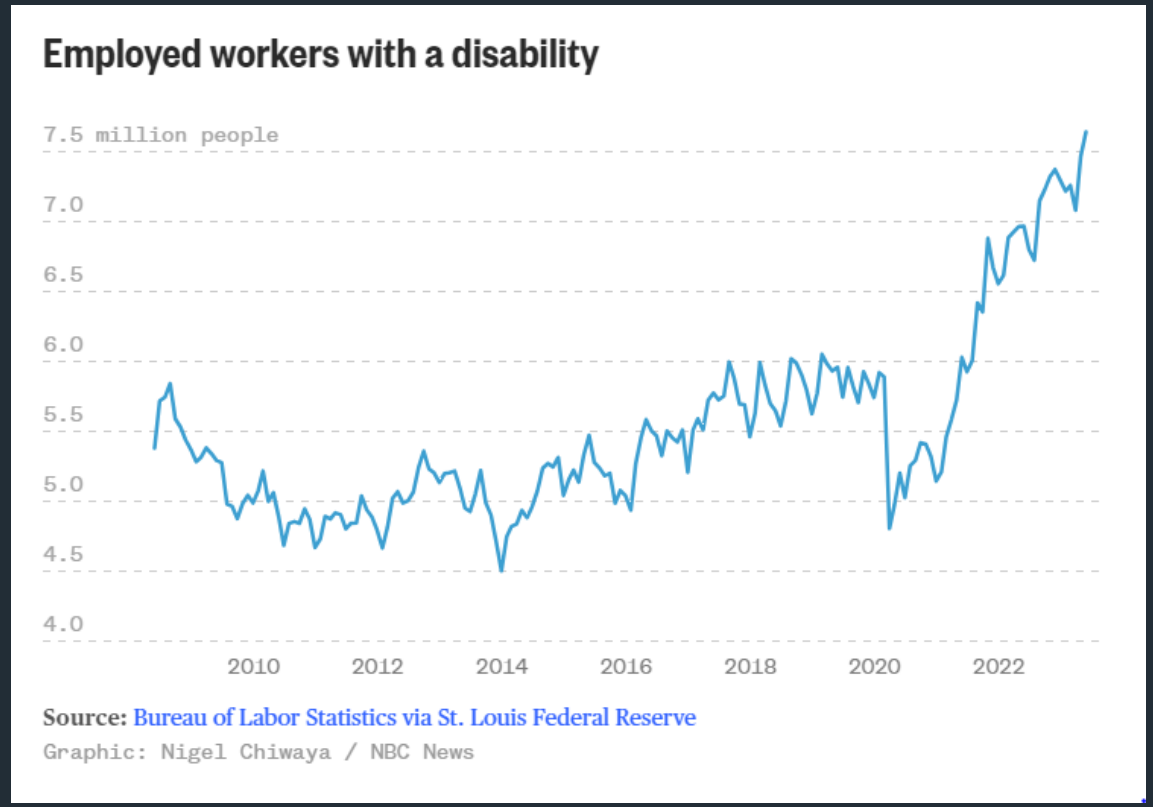
hok.com

SOURCE: Neurodiversity at Work; https://pubmed.ncbi.nlm.nih.gov/32996572/

Employed workers with disabilities stands at a record high of over 22%.

It is estimated that 25% of the U.S. population lives with a disability, but 70% are invisible disabilities and aren't counted.

As a result of stigmas and fear of exposure only 4% of workers self-identify as disabled.



SOURCE: Bureau of Labor Statistics / https://www.nbcnews.com/business/economy/jobs-for-people-with-disabilities-hit-new-post-pandemic-high-rcna93084

We are freshwater fish in salt water.

**Put us in fresh water and
we function just fine.**

Put us in salt water and we struggle to survive.

- An Autistic student

Since the pandemic, the world has shifted.

Now everyone has a heightened sensitivity to their surroundings.

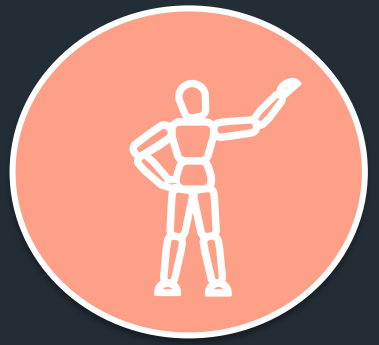
Human Functioning

Sensory

Transmission of information via the senses

Cognitive

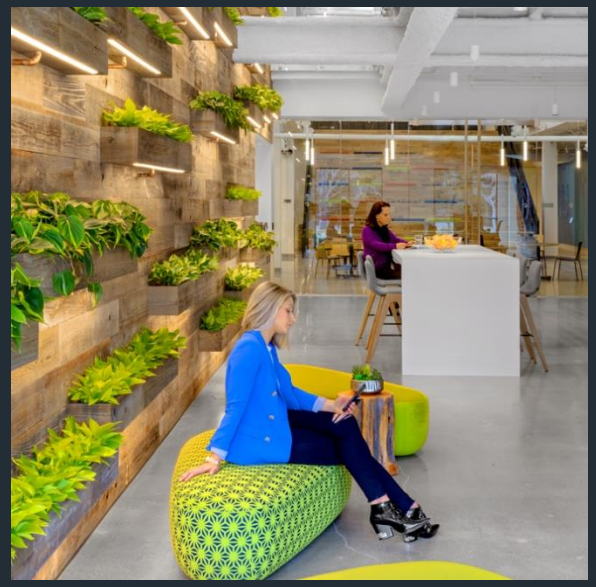
Thinking style and thought process



Behavioral

Human reactions and pattern of action

Sensory Thresholds



HYPERSENSITIVE

NEURO**TYPICAL**

HYPOSENSITIVE

- Prefer less sensory stimuli
- Organic, simple patterns
- Light, neutral colors
- Clean, orderly spaces
- Little to no background noise
- Personal space boundaries

- Prefer more sensory stimuli
- Layering of textures and planes
- Saturated, contrasting colors
- Plenty of visual interest
- Background chatter and/or music
- Space to move/fidget

Sense

Auditory

Visual

Tactile

Olfactory
(Smell)

Gustation
(Taste)

Interoceptive
(Internal sensations)

Proprioceptive
(Body position)

Vestibular
(Balance and coordination)

Sensory Overload

Sensitivity to Sound

Distress with Flickering Lights

Feeling Overwhelmed or Agitated

Aversion to Texture

Irritation with Smell

Irritation with Food Texture or Taste

Exhaustion or Fatigue

Increased Irritability

Headaches, Dizziness or Nausea

Sensory Distractions

(sounds, smells, visual clutter)

Sensory Distractions

(sounds, smells, visual clutter)

Cognitive Distractions

(loss of focus, discomfort)

Sensory Distractions

(sounds, smells, visual clutter)

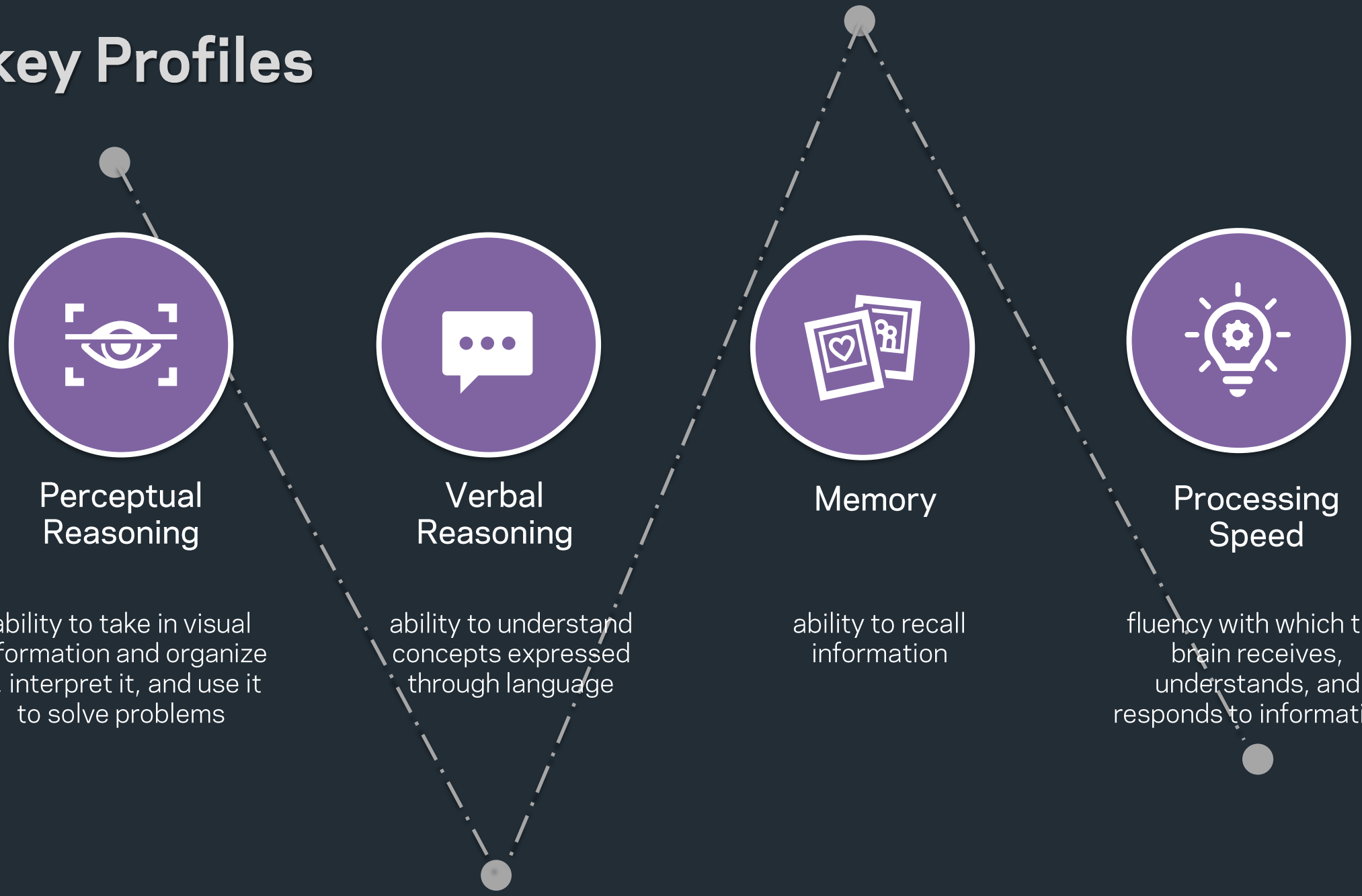
Cognitive Distractions

(loss of focus, discomfort)

Loss of Engagement and Productivity

(presenteeism, poor recall, stress, burnout, dissatisfaction)

Spikey Profiles



Perceptual Reasoning

ability to take in visual information and organize it, interpret it, and use it to solve problems

Verbal Reasoning

ability to understand concepts expressed through language

Memory

ability to recall information

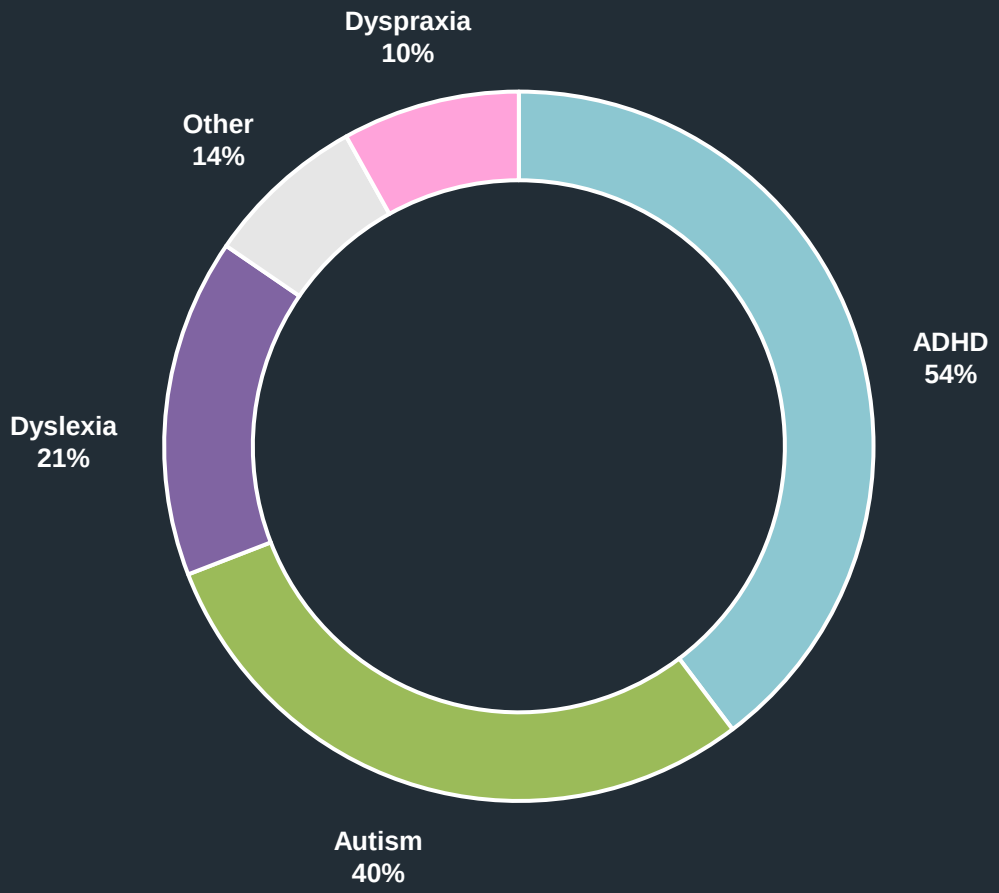
Processing Speed

fluency with which the brain receives, understands, and responds to information.

Neurotype

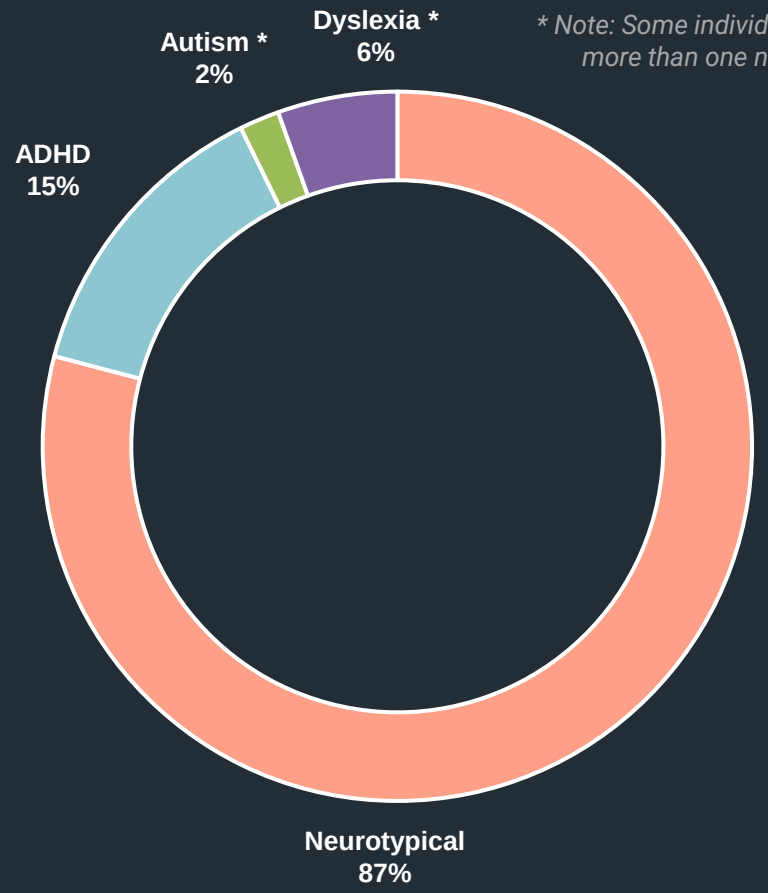
Neurodivergent Population

February 2022



Mixed Neurotype Population

November 2023

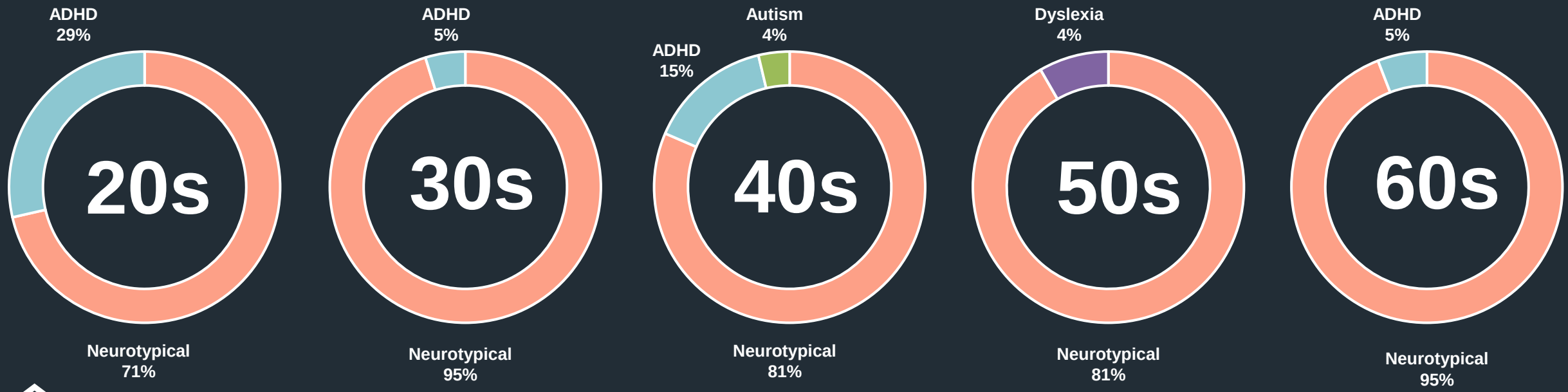


** Note: Some individuals reported more than one neurotype.*

Neurodiversity and Age

Mixed Neurotype Population

November 2023



We are living in a time of increased diagnosis and awareness of neurodivergent conditions. For older generations, neurodiverse conditions were often overlooked and 85 - 90% of adults with ADHD don't even know they have it. And many that do know they are neurodivergent feel they need to fit in so they are hiding it while engaging in neurotypical-passing, masking, or camouflaging. But with an increased awareness that neurodivergents often have valuables skills, the stigma often associated with being different is wearing off.

* SOURCE: https://www.healthline.com/health/autism/autism-masking

Work Styles

What best describes your current work environment?

Neurodivergent Population
February 2022

- 36% Open Environment | Low Paneled Work Points
- 3% High Paneled Workstation
- 4% Private Office
- 34% Home | Remote Work
- 1% Inside Specialist Area with machinery (e.g. laboratory or warehouse)
- 0% Inside Specialist Area with person-centered focus (e.g. school or medical practice)

Mixed Neurotype Population
November 2023

- 72% Open Environment | Low Paneled Work Points
- 15% High Paneled Workstation
- 5% Private Office
- 5% Home | Remote Work
- 3% Inside Specialist Area with machinery (e.g. laboratory or warehouse)
- 0% Inside Specialist Area with person-centered focus (e.g. school or medical practice)

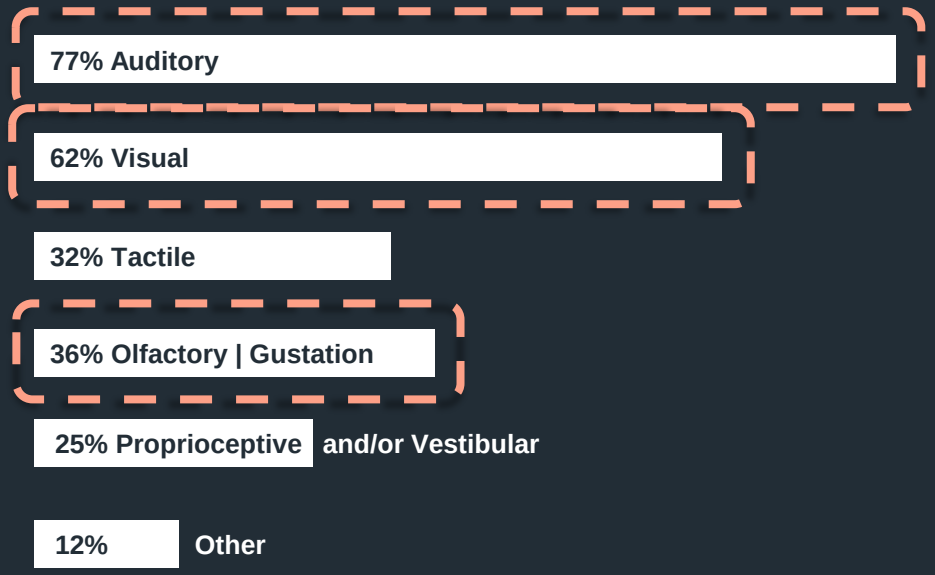
The decrease in remote or home working may be impacted by shifting work policies post pandemic and/or that many neurodivergents are allowed to work remotely to accommodate their specific needs.

Sensory Input

What sensory inputs are you hypersensitive or highly sensitive to?

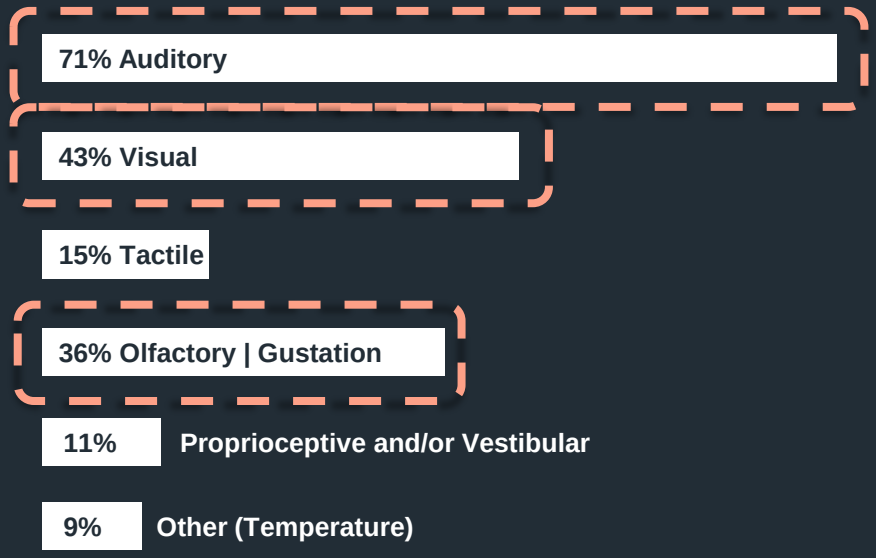
Neurodivergent Population

February 2022



Mixed Neurotype Population

November 2023



~3/4
of all respondents have a heightened sensitivity to sound.

43 -62%
are sensitive to visual distractions.

~1/3
of all respondents had a sensitivity to smells.

Women
tend to be more sensitive to visual clutter

Men
tend to be less sensitive to touch and smells.

Neurodivergent Population

February 2022

> Too much background chatter.

> Movement around me is distracting and upsetting when concentrating.

> Highly sensitive to noise.

> I struggle with certain patterns like lines, color contrasts, and fluorescent lights.

Mixed Neurotype Population

November 2023

> Too much background noise.

> Dark rooms without circadian rhythm or biophilia make me lose concentration.

> I do not like unpleasant smells and too much cologne/perfume.

> People talking loudly while I am trying to concentrate.

Hypersensitive

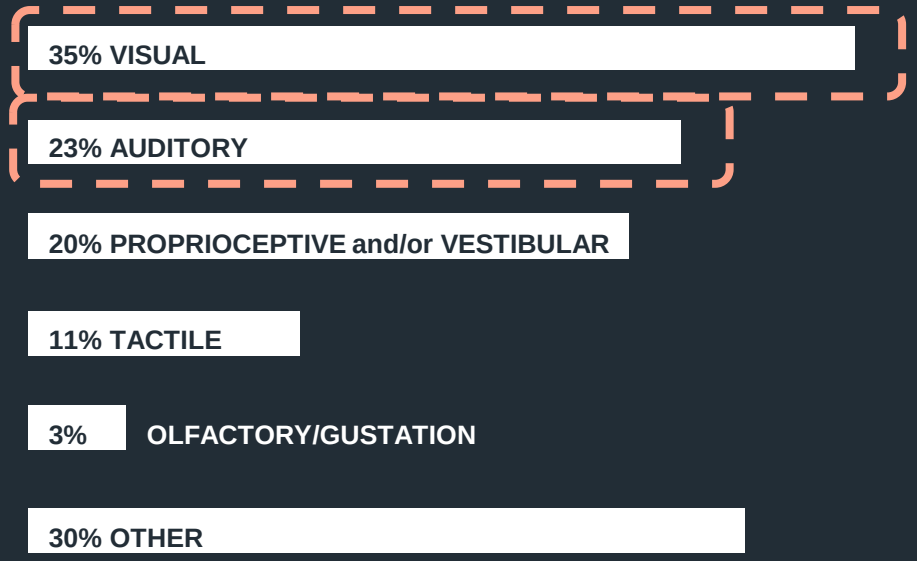
Similar sensitivities
to stimulation in the built environment.

Sensory Input

What sensory inputs are you hyposensitive or highly sensitive to?

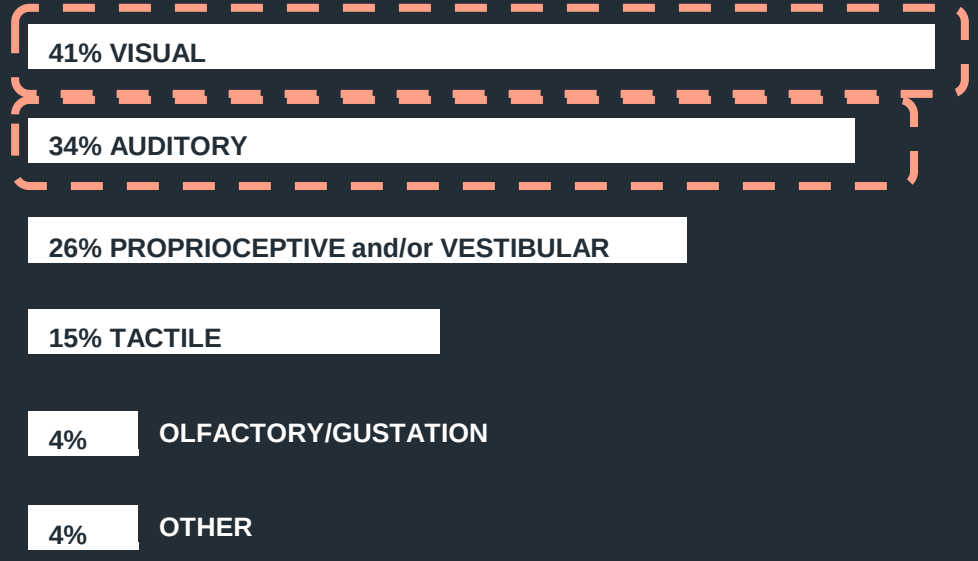
Neurodivergent Population

February 2022



Mixed Neurotype Population

November 2023



34-41%
are sensitive to visual distractions.

25-35%
Need more acoustical stimulation or sound.

Women

tend to need more visual stimulation than men and are more impacted by visuals than acoustics .

Men

tend to be less aware of self-movement and body position.

Neurodivergent Population

February 2022

Good smells help to regulate my anxiety.

I need to be able to fidget and move to be able to concentrate.

I need to be able to physically engage or touch things in space.

I need some sound or music to be able to function better.

Mixed Neurotype Population

November 2023

A very quiet environment is not comforting.

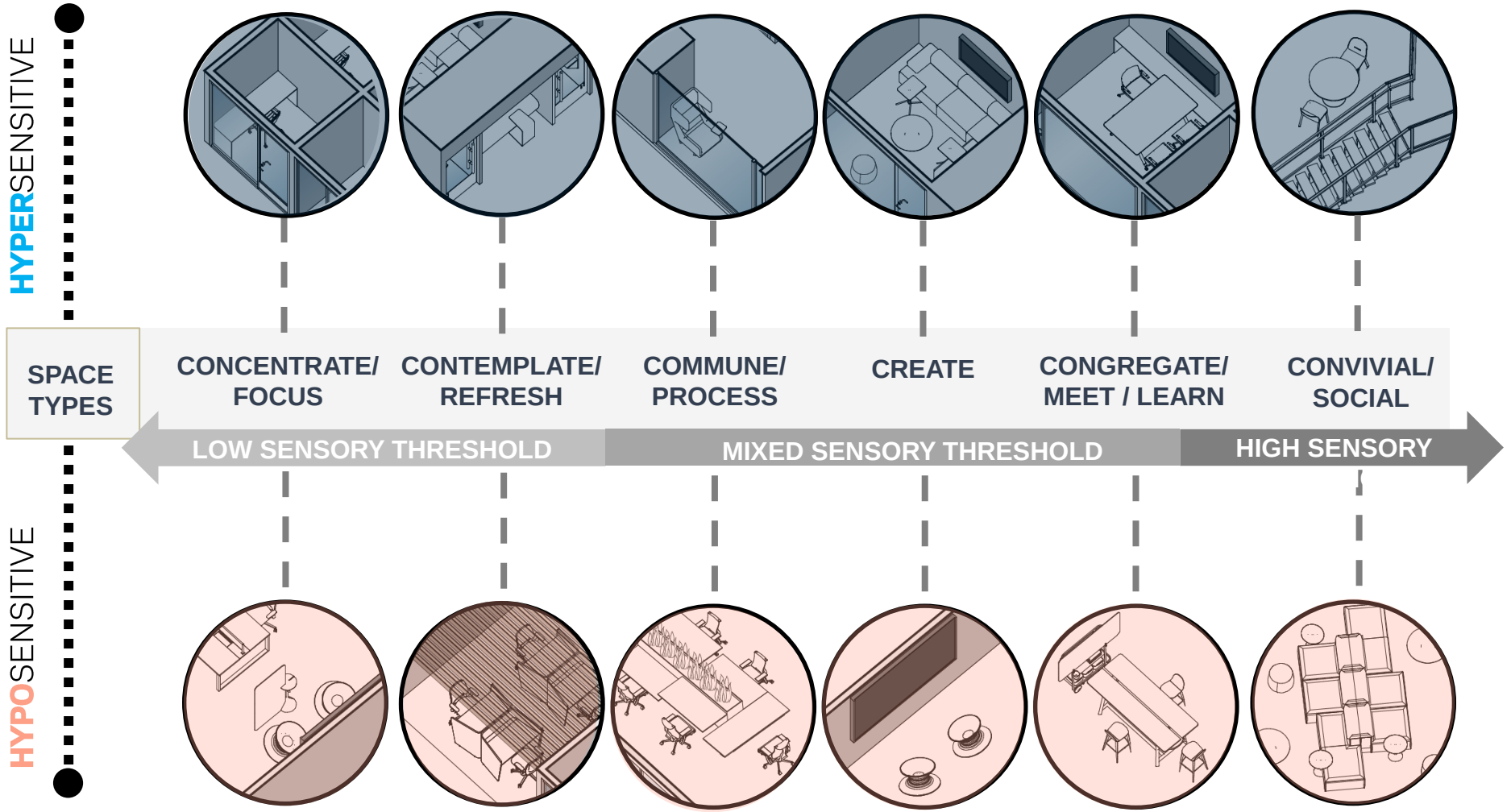
I need a window with a view to blue sky and green trees.

Color. Too much gray and white in here.

Low number of people is distracting and disorienting. I need a base level of activity for comfort.

Hyposensitive

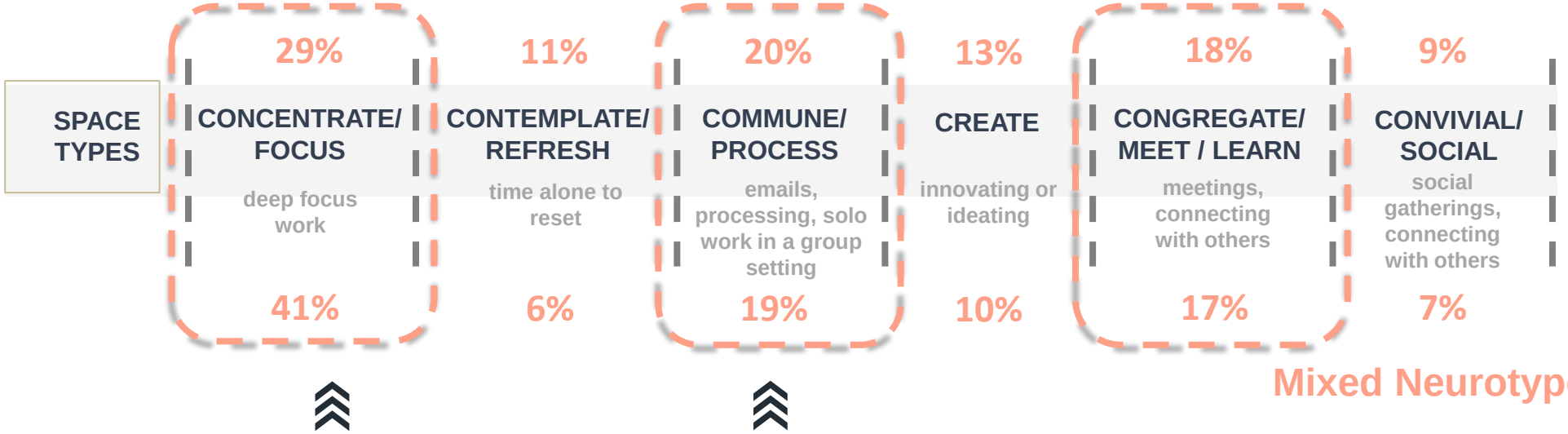
Similar sensitivities to stimulation in the built environment.



Tasks / Work Modality

Neurodivergent Population

February 2022



Mixed Neurotype Population

November 2023

Focus
respondents noted they spend the most time doing concentrative/focus work.

1/5
of the day was spent doing processing work.

50-60%
respondents noted they spent the majority of their time doing solo tasks – concentrative and communal work.

~1/5
of the day is spent in meetings.

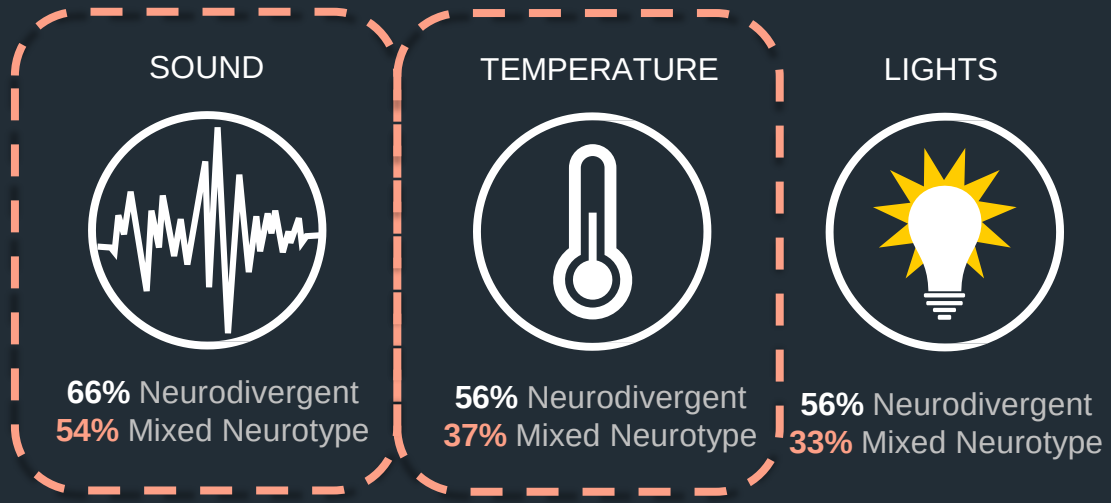
Tasks / Work Modality

“Autistic people are
canaries in the coal mine:
our needs aren't actually different
from typical people’s,
just more intense and specific.”

- Kirsten Lindsmith
blogger on autism

Challenges

Design elements you find **challenging** in environments?



A majority of respondents in both groups found auditory issues the most challenging elements in the built environment. Working remotely in more isolated environments has added to the heightened sensitivity to sound and desensitized many to being in shared spaces.

Temperature sensitivities edged out **lighting sensitivities** to round out the top 3 elements people find challenging.

Challenges

Design elements you find **challenging** in environments?

SOUND

66% Neurodivergent
54% Mixed Neurotype

TEMPERATURE

56% Neurodivergent
37% Mixed Neurotype

LIGHTS

56% Neurodivergent
33% Mixed Neurotype

NUMBER OF PEOPLE

53% Neurodivergent
35% Mixed Neurotype

PROXIMITY TO OTHERS

48% Neurodivergent
32% Mixed Neurotype

Working remotely has also desensitized many to being around other, especially in crowds and when in close proximity to others.

Challenges

Design elements you find **challenging** in environments?

SOUND

66% Neurodivergent
54% Mixed Neurotype

TEMPERATURE

56% Neurodivergent
37% Mixed Neurotype

LIGHTS

56% Neurodivergent
33% Mixed Neurotype

NUMBER OF PEOPLE

53% Neurodivergent
35% Mixed Neurotype

PROXIMITY TO OTHERS

48% Neurodivergent
32% Mixed Neurotype

CONFINED OR IN CLOSED SPACE

40% Neurodivergent
29% Mixed Neurotype

LACK OF ENCLOSURE

36% Neurodivergent
17% Mixed Neurotype

Many assume that individuals with heightened sensitivities should work in enclosed, private spaces but our research shows that more people are challenged by being in closed or confided spaces versus being in more open environments. But a lack of enclosure, or feeling exposed, is a concern as well, just to a lesser degree.

Since preferences vary, providing options and choice is key to meeting the needs of individuals

Challenges

Design elements you find **challenging** in environments?

SOUND

66% Neurodivergent
54% Mixed Neurotype

TEMPERATURE

56% Neurodivergent
37% Mixed Neurotype

LIGHTS

56% Neurodivergent
33% Mixed Neurotype

NUMBER OF PEOPLE

53% Neurodivergent
35% Mixed Neurotype

PROXIMITY TO OTHERS

48% Neurodivergent
32% Mixed Neurotype

CONFINED OR IN CLOSED SPACE

40% Neurodivergent
29% Mixed Neurotype

LACK OF ENCLOSURE

36% Neurodivergent
17% Mixed Neurotype

PATTERNS

21% Neurodivergent
8% Mixed Neurotype

COLOR

16% Neurodivergent
6% Mixed Neurotype

TEXTURE

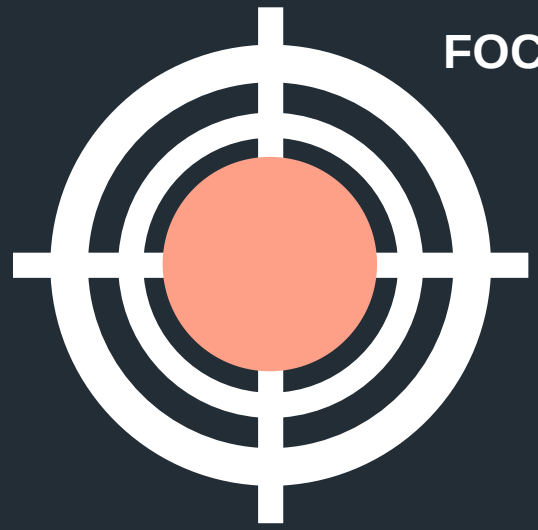
12% Neurodivergent
6% Mixed Neurotype

TACTILE INTERACTION

Individuals with ADHD often seek often out **more tactile stimulation** but **less auditory and visual input**.

Individuals with ADHD and Autism often have the **gift of hyper-focus**.

It's a misunderstanding to assume that attention deficit means a lack of focus as it actually is a challenge in regulating it, so for some it's a lack of, and for others to an intensification of focus on certain things.



FOCUS

Many individuals are kinesthetic learners and/ or have to move to function well.

Hyposensitivity

* SOURCE: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7851038/

”

Indifference towards people

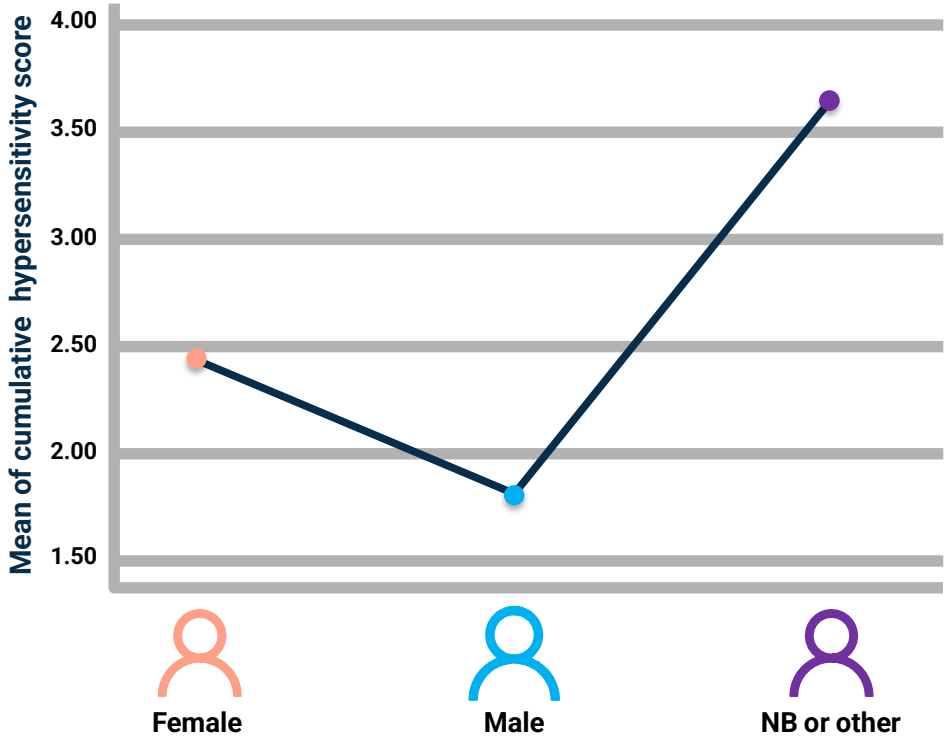
and the reality in which they live is the one

and only cardinal sin of design.

- Dieter Rams

Women in both surveys tend to…

- Report having more sensitivities than men
- Work remotely at a slightly higher rate than men.
- Be more hyposensitive to visual stimulation than they are to auditory stimulation and desire more visual stimulation then men.
- Be less challenged with being in open, communal space.
- Prefer warmer spaces.



Men in both surveys tend to…

- Be less sensitive to touch and smells.
- Be less awareness of self-movement and body position.
- Be less challenged by pattern, color and texture than women.
- Prefer cooler temperatures.

Tasks

Variances between the genders

TACTILE

PROPRIOCEPTIVE & VESTIBULAR

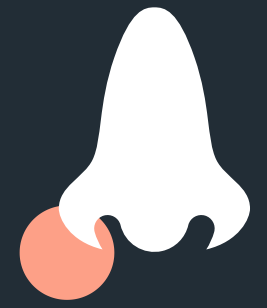
Neurodegeneration, where sensory processing changes over time, can be more pronounced for those with age related conditions.

As we age our sense of taste, equilibrium, hearing, eyesight and sense of touch **diminish** for some individuals and that can have an impact the way we process sensory stimulation.

VISUAL

AUDITORY

OLFACTORY



Neurodegeneration

SOURCE: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4287457/

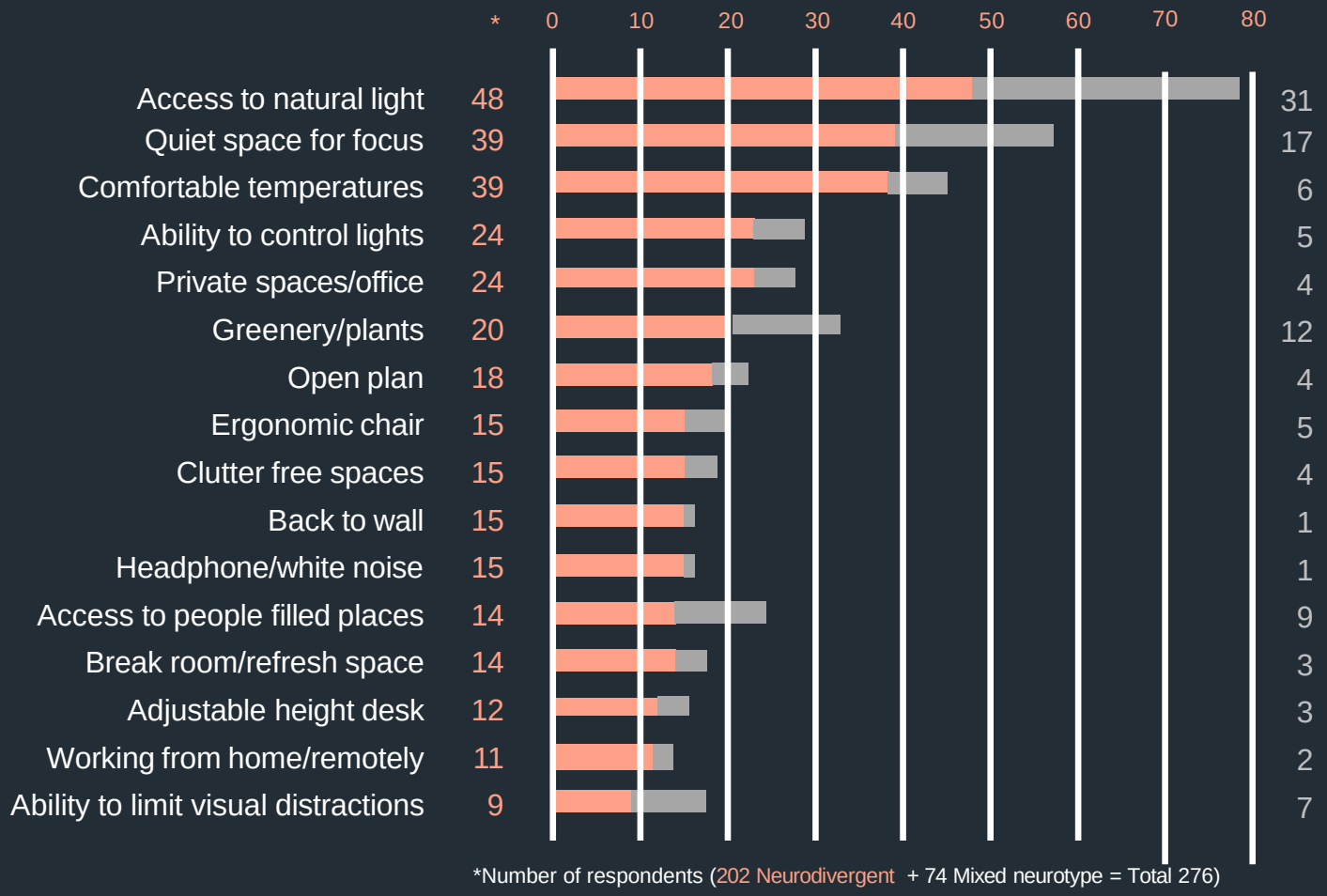
The under 30 group
spend more time in group settings
congregating, learning and socializing

The 30-60 group
spend the most time contemplating
and needing refresh space

The over 60 group
spend the least amount of time in group
settings congregating, learning,
contemplating and socializing

Tasks

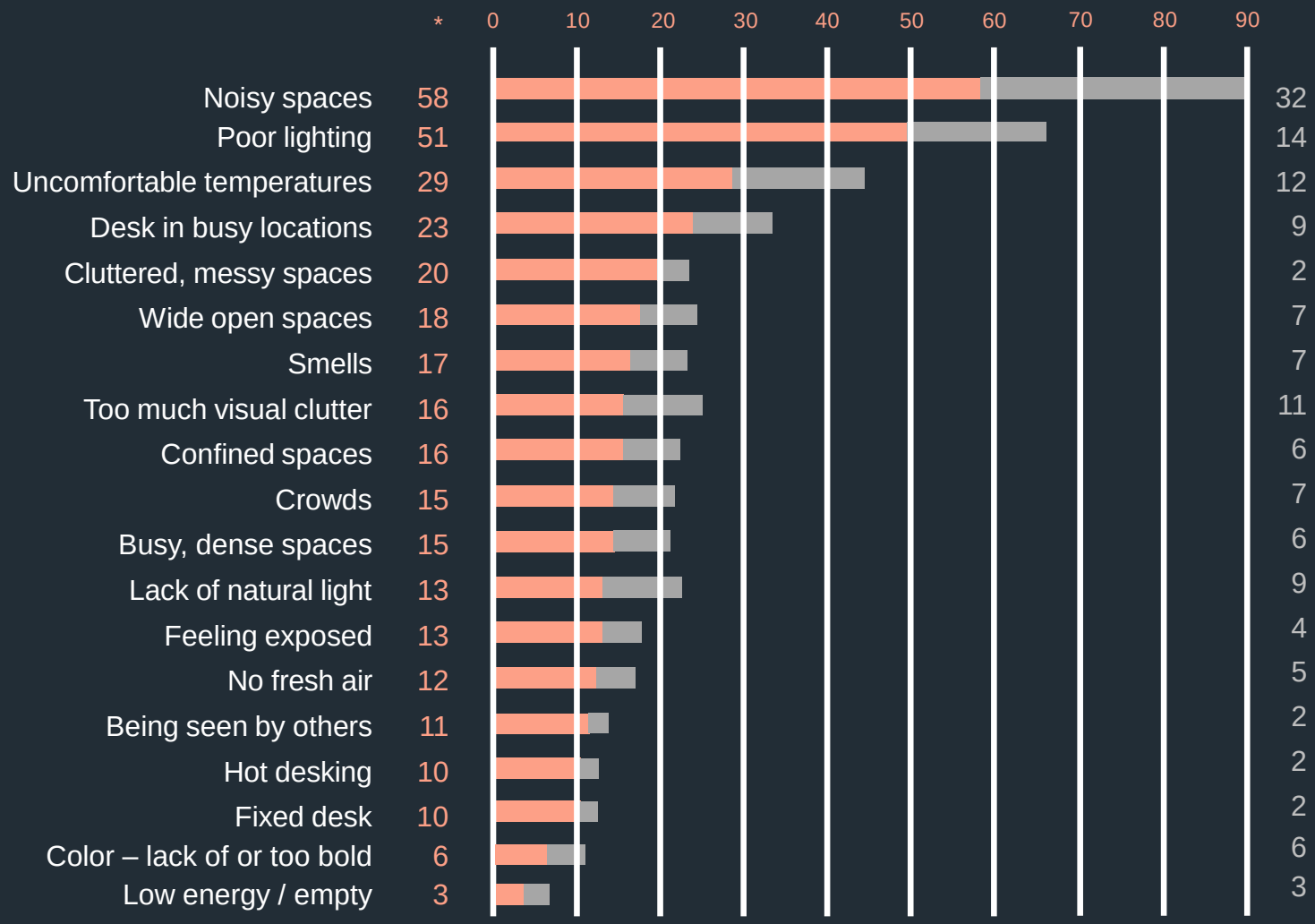
Variances between the age groups



*Number of respondents (202 Neurodivergent + 74 Mixed neurotype = Total 276)

Design Strategies

What types of spaces or elements do you find comforting?



*Number of respondents (202 Neurodivergent + 74 Mixed neurotype = Total 276)

Design Strategies

What types of spaces or elements do you find uncomforting?

When you design for the extreme,

you benefit the mean.

Top Design Strategies

Neurodivergent Population

February 2022

1. Having the option to select where you will work
2. Spaces that allow you to move
3. Having a dedicated space you are assigned to
4. Access to natural daylight
5. Work points in low-traffic areas
6. Dedicated quiet rooms
7. Spaces that have areas to retreat to
8. Spaces with adjustable lighting levels or turn them off
9. Spaces that incorporate natural elements
10. Adjustable, ergonomic furniture
11. Reduce visual clutter
12. Screens to block and reduce noise and visual distractions
13. Spaces that enable visual connections and clear lines of sight

Mixed Neurotype Population

November 2023

1. Having a dedicated space you are assigned to
2. Access to natural daylight
3. Adjustable, ergonomic furniture
4. Work points in low-traffic areas
5. Having the option to select where you will work.
6. Spaces that allow you to move
7. Dedicated quiet rooms
8. Screens to block and reduce noise and visual distractions
9. Spaces that incorporate natural elements
10. Reduce visual clutter
11. Spaces that enable visual connections and clear lines of sight
12. Spaces with adjustable lighting levels or turn them off
13. Spaces that have areas to retreat to

1. Awareness training to help staff understand neurodiversity among colleagues.

2. Flexible work policies that allow staff to work from home.

3. Flex hours so staff can work during off-hours with minimize distractions.

4. Noise-canceling headphones to reduce auditory distractions.

5. Ability to have intermittent breaks between tasks.

6. Having clear action points and assignments.

7. Ability to book meeting rooms for concentrative task.

Top Operational Strategies

or accommodations that are the most effective, as reported by respondents.

1. Use visual checklists to track progress.

2. If working in an open space, choose a low-traffic area.

3. Avoid getting stuck in a daily routine. Schedule breaks and make slight changes to your days.

4. Use visual timelines to track dates and break down assignments.

5. Break tasks up into manageable pieces.

6. Perform one task at a time. When possible, don't start a new task until you complete the current one.

7. Only attend critical meetings, as defined by your supervisor's interpretation, where you can maintain your focus.

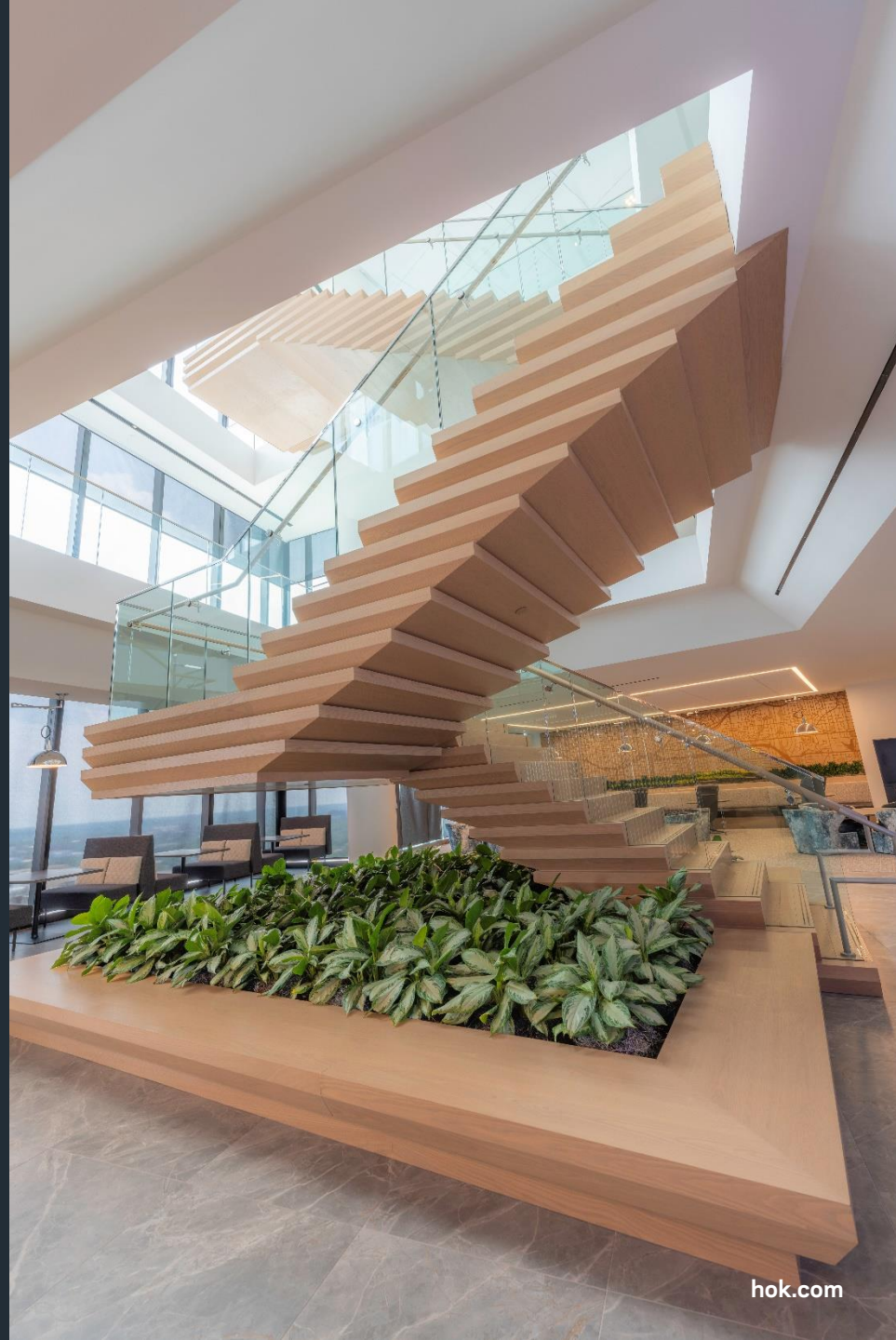
8. Altered shift patterns/break times.

9. Give advance warning of any changes.

10. Regular meetings with the manager/buddy/mentor.

Top Individual Adjustments

which are the most effective, as reported by respondents.



There is a compelling human and business case to be made for ensuring we approach the design of workplaces to help address mindfulness, health, safety, wellbeing and inclusivity.

2023 Research Partners

2022 Research Partners

We are no longer designing environments.

We are designing the experience.

Words matter, and we understand that different groups prefer different terminology, but for the intent of this report, we have strived to use the most commonly accepted terminology as of December 2023. We also use identity first language, such as ‘ADHD-er’ or ‘autistic people’ since this is the preference of many groups participating in our sample group.

Neurodiversity: refers to the breadth of human cognitive functioning, including both those whose cognition is typical and atypical, in line with Judy Singer’s original concept

Neurotypical: individuals falls within set norms

Neurotype: describes the different conditions

Neurodivergents, or neurominorities: individuals with one or more of the typically included neurotypes / conditions

Hypo-sensitivity: also known as Sensory under-responsivity, refers to a decreased sensitivity to sensory input

Hyper-sensitivity: (also called hypersensitivity intolerance, refers to an increased sensitivity to sensory input

Neurodivergence: a naturally occurring variation in neurocognitive functioning that is considered different to the predominant neurotype.

Autism Spectrum Disorder (ASD):a neurological and developmental condition that affects how people interact with others, communicate, learn, and behave

Attention Deficit Hyperactivity Disorder (ADHD): a neurological condition marked by an ongoing pattern of inattention and/or hyperactivity-impulsivity that interferes with functioning or development

Dyslexia: a neurological condition that involves problems identifying speech sounds and learning how they relate to letters and words

Dyspraxia: a neurological condition that affects movement and co-ordination

Dyscalculia: a neurological condition that affects a person's ability to understand number-based information and math

Dysgraphia: a neurological condition that affects a person’s ability to turn their thoughts into written language

Tourette Syndrome: a neurological condition that causes people to have “tics”, sudden twitches, movements, or sounds repeatedly

Terminology Definitions

SOURCE: https://languages.oup.com/google-dictionary-en/