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Inclusive Design for NEURODIVERSITY

STU FAD Universal Design

Dr Cathy Dalton

The Neurodiversity paradigm

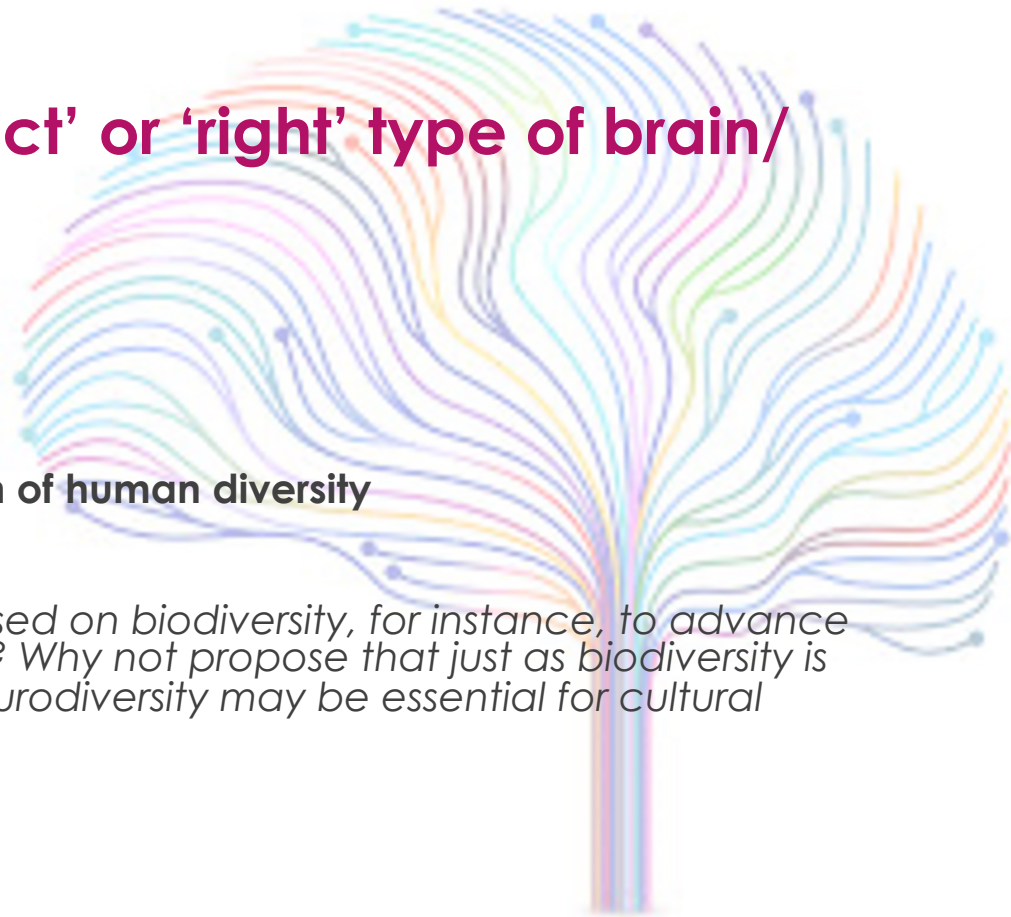
#1

There is no single 'correct' or 'right' type of brain/mind

- ▶ Not all brains are the same (fact)
- ▶ Neurodiversity is an essential form of human diversity

"Why not appropriate metaphors based on biodiversity, for instance, to advance the causes of people with disabilities? Why not propose that just as biodiversity is essential to ecosystem stability, so neurodiversity may be essential for cultural stability?"

-Judy Singer



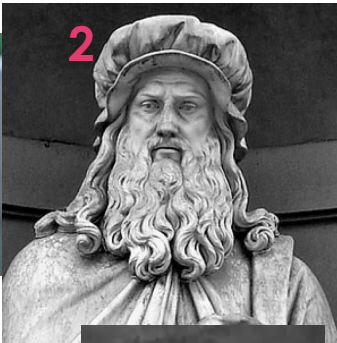
the neurodiversity paradigm

Without neurodiversity we would not have inventors, composers, musicians, artists, designers, coders, engineers architects... 'creatives', genius.

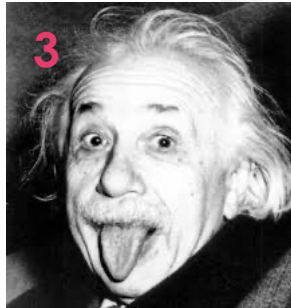
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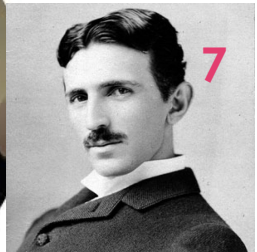
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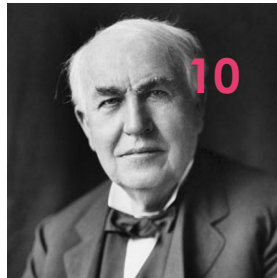
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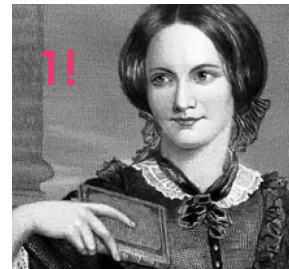
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neurodiversity

Autistic people are not 'neurotypical'

Not all non-neurotypical people are autistic

Other examples include

- ▶ ADHD
- ▶ dyslexia
- ▶ dyspraxia
- ▶ dysgraphia
- ▶ intellectual disability
- ▶ dementia
- ▶ Bipolar
- ▶ Acquired neurodiversity (brain injury, PTSD)
- ▶ People born with sensory disability

15-20% of all people
(+1% = people with dementia)

The neurodiversity paradigm

- ▶ Designing for neurodiversity is an aspect of **Universal Design**
- ▶ **Estimated 15-20% of people + people with dementia**
- ▶ Not all solutions are architectural e.g. assistive technologies, remote learning.



The Neurodiversity paradigm

Idea #2: Acceptance, Not Normalisation

The **neurodiversity paradigm** opposes traditional **medical** and **social** models

Neurodiversity is **not an illness**
(but it can be a consequence of illness or trauma)

It can be **disabling**.

Neurodivergent people can't be 'cured' (**neuroplasticity?**)

Autonomy, dignity, independence, integration through design

'good design enables, bad design disables' -Paul Hogan,
designer, EIDD founder

the five traditional senses



The five 'traditional' senses: **hearing** **sight** **touch** **smell** **taste**

the other senses

6 Proprioception

Understanding where our body parts are
(in relation to the rest of our body and in space)



7 Vestibular sense

Balance and coordination, movement (inner ear)

The vestibular system interprets information in relation to gravity, movement and balance

<http://www.7senses.org.au/what-are-the-7-senses/>



STRESS can affect sensory functioning

interoception: the 8th sense

‘interoception’ is a lesser-known sense that helps you understand and feel what's going on inside your body’.

People who have problems with the **interoception** may have trouble knowing when they feel hungry, full, hot, cold or thirsty, and even in distinguishing these sensations from their emotions.

This can make managing self-regulation (including emotional regulation) a challenge for autistic people. It also impacts on interpersonal relationships, and socialisation.

Autistic people are often aware of being ‘different’ and feel ‘left out’ because they don’t learn social **rules** automatically

People with dementia are also often aware that they have cognitive issues and may try to disguise them

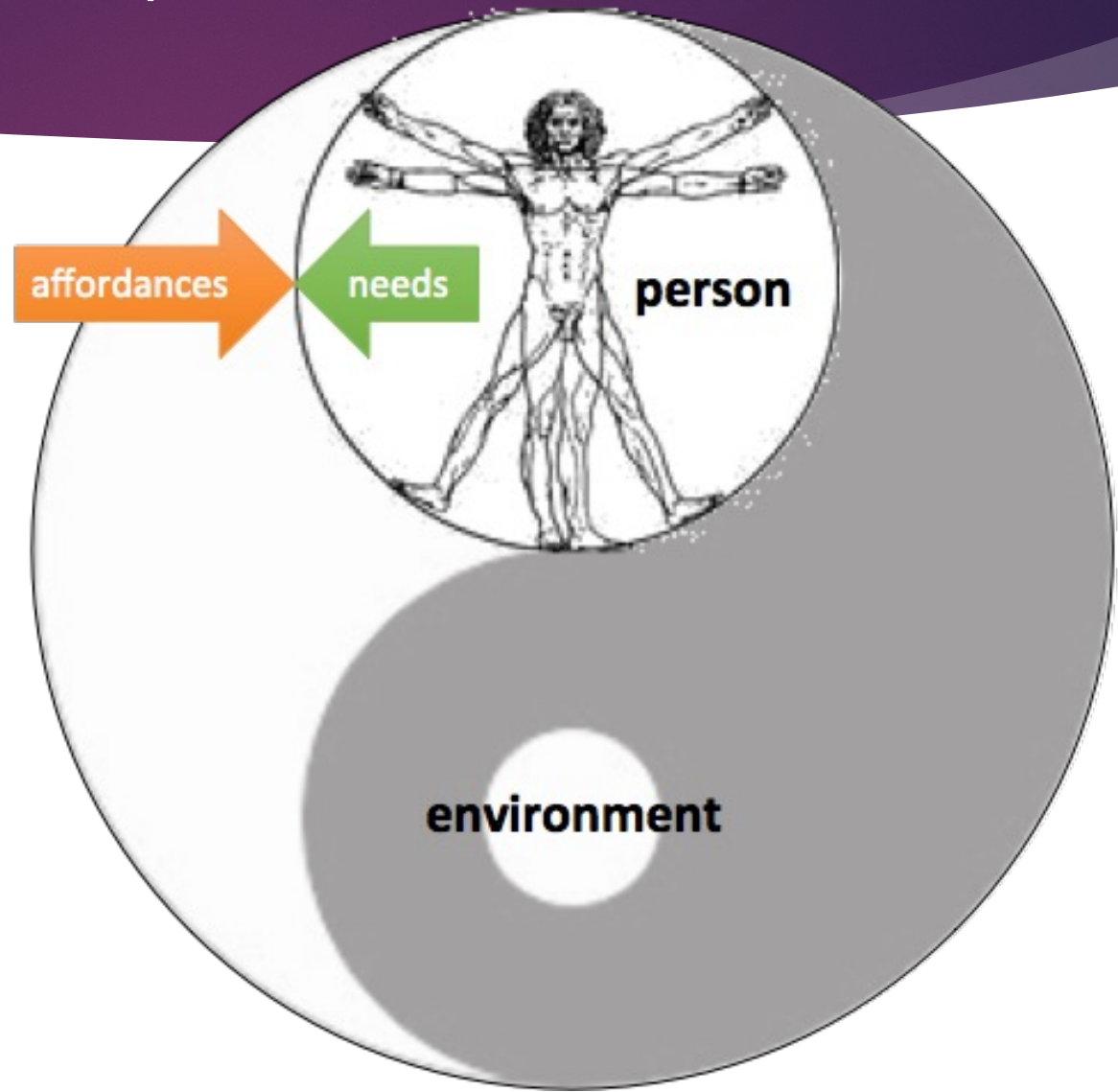
Congruence/'fit'

Congruence

=

environmental 'fit'

sensory 'fit'



sensory processing issues in autism



90-95% of people with autism have atypical sensory processing differences

autism: co-occurring conditions

dyslexia

Dyspraxia-lack of co-ordination, clumsiness

dysgraphia

dyscalculia

ADHD

Intellectual disability (ID)

epilepsy

sensory processing in autism

People with sensory processing issues have trouble **organising sensory information**

- they can experience high **sensory sensitivity**

- this affects **sensory perception**. Sensory Information from the 5 traditional senses can be misinterpreted by the brain

Some autistic people may also have challenges with the sixth and seventh senses – **dyspraxia, vertigo**

Dyspraxia /apraxia and vertigo can also affect people with **dementia**, people with **acquired brain injury**.

sensory processing in autism

Autistic people can experience both

hypersensitivity and **hyposensitivity** to sensory stimulus

They can also experience **fluctuating sensory perception**

Some people may find certain background sounds, which other people can ignore or block out, to unbearably loud or distracting. This can cause anxiety or even **physical pain**.

People who are **hyposensitive** may not feel pain or extremes of temperature.

sensory overload

Sensory overload can occur when there is too much sensory stimulus

TRIGGERS

NOISE is one of the worst triggers, also for people with dementia

CROWDED AREAS close proximity to many other people; noise; smells

GLARE

SUDDEN CHANGES (increase in sensory information)

Too **M**uch **I**nformation

- Providing **transitional spaces** (lobbies, breakout spaces) can help.
- Provide **quiet spaces** nearby which can be reached easily

problems interpreting environment
problems adapting/adapting to environment

sensory perceptual issues

inability to verbalise need

OVERLOAD

sensory processing disorder

sensory sensitivity

states of constant anxiety

Sensory sensitivity and stress

sensory sensitivity can make commonplace life situations difficult or even unbearable

This includes school, workplace, travel, social events etc.

Some of this can be mitigate by **remote** or **blended working/learning**

Sensory sensitivity can be a source of **STRESS**
STRESS exacerbates sensory sensitivity (vicious circle)

Link to videos simulating sensory overload

<https://beaconschoolsupport.co.uk/newsletters/asd-sensory-overload-videos>

sensory sensitivity in non-autistic people

Sensory sensitivity/ sensory fluctuation are **not exclusive to autism**

They also occur in other non-neurotypical people, and in **neurological conditions** like migraine.

High sensory sensitivity is not always disabling (e.g. designers, musicians, artists)

EPILEPSY

Autistic people are far more likely to suffer from **epilepsy** than neurotypical people. Rates may be over 30%. People who are not autistic can have epilepsy.

Stress can cause and increase in frequency and severity of epileptic seizures

autism and intellectual disability

30-50% of autistic people have an **intellectual disability** (ID)

Having an ASD does not automatically imply intellectual disability

Being non-verbal does not imply an intellectual disability

Diagnosis of intellectual disability co-occurring with autism has tended to drop as assessment tools and communication technologies improve

-see **assistive technologies**

Sensory zoning?

- This concept (Magda Mostafa) proposes that rooms should be be zoned by sensory characteristics rather than by function. Proposed for special needs schools. It may not be practicable for general applications in other building types and runs the risk of causing confusion in relation to wayfinding.

Arranging rooms by sensory characteristics is often consistent with arranging rooms by function. Function can affect sensory characteristics, i.e. smaller rooms automatically have different acoustics to bigger rooms. Areas with different functions typically have different finishes to match their function. e.g. meeting-room vs lecture theatre vs lab

alternative: reinforce sensory characteristics of areas with different functions/ zones through use of materials, colour etc

minimising change

CHANGES/ TRANSITIONS

Most autistic people experience difficulty in adjusting to changes in their environment. Preference for **routine**.

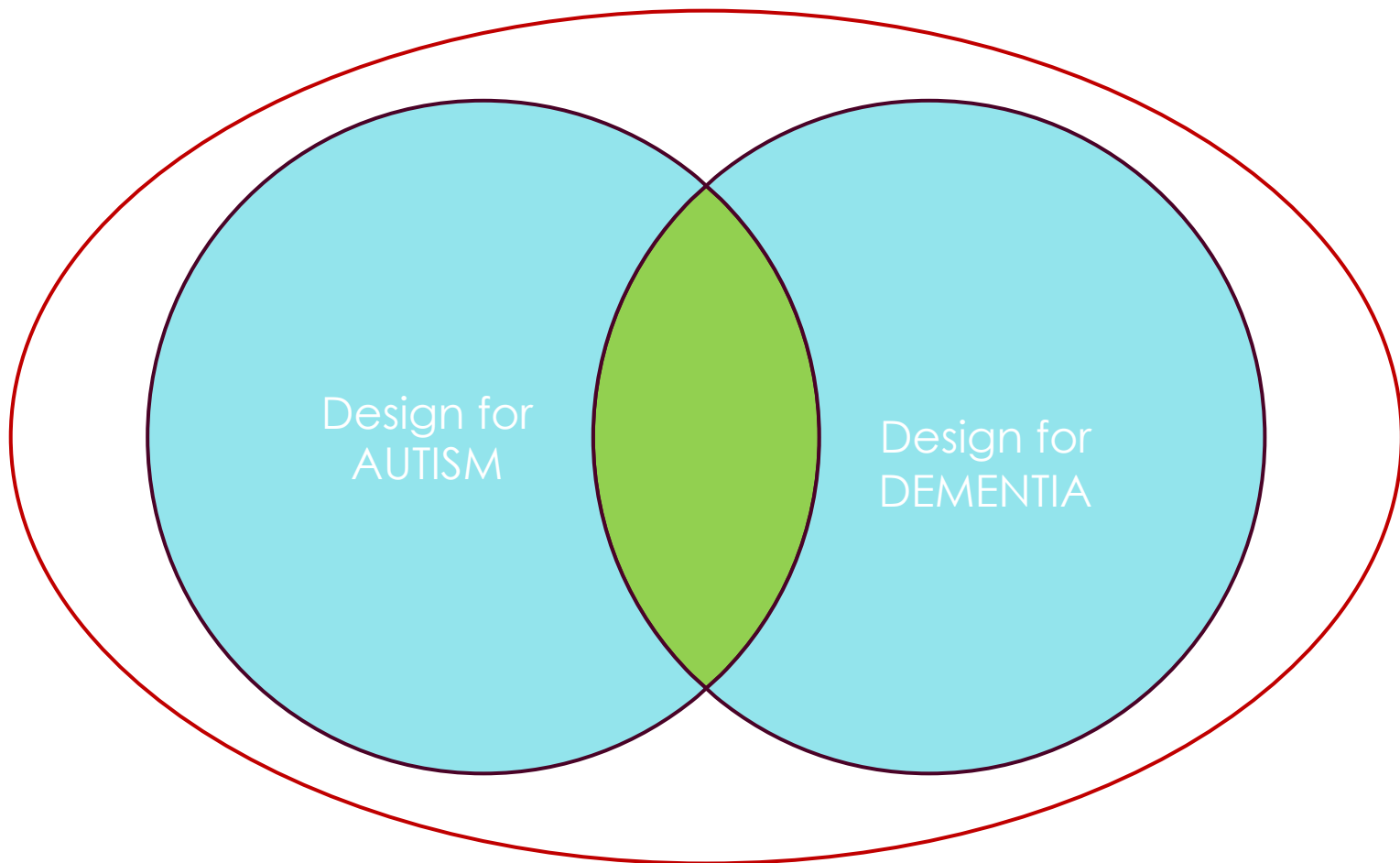
Transitions between different activities also need to be managed. Thoughtful and informed design can help.

assistive building design

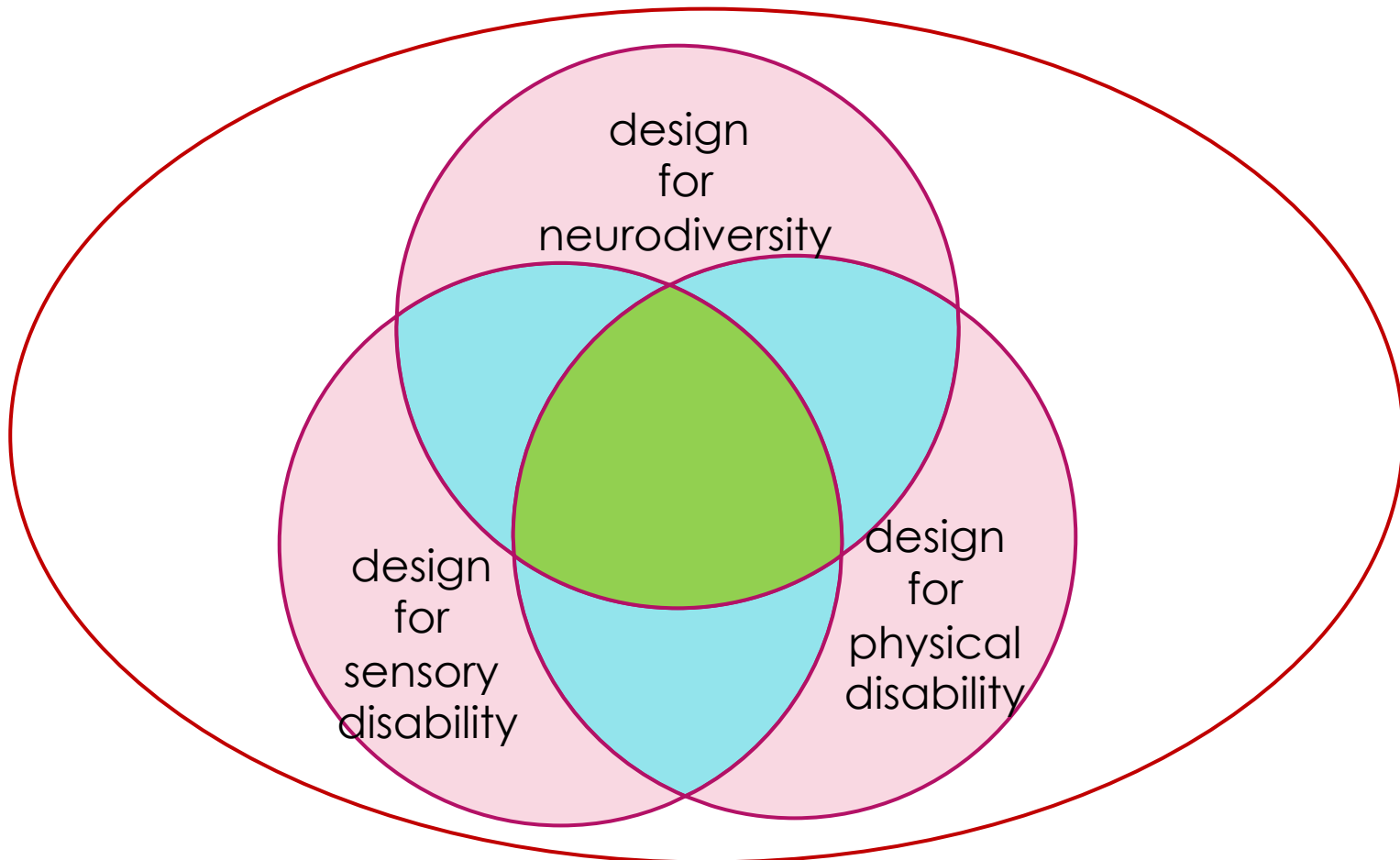
- Building design can assist neurodiverse people, and help to reduce cognitive and social **stress**
- There is overlap with designing for sensory disability
- There is overlap with designing for physical disability

Inclusive Design Synergies-

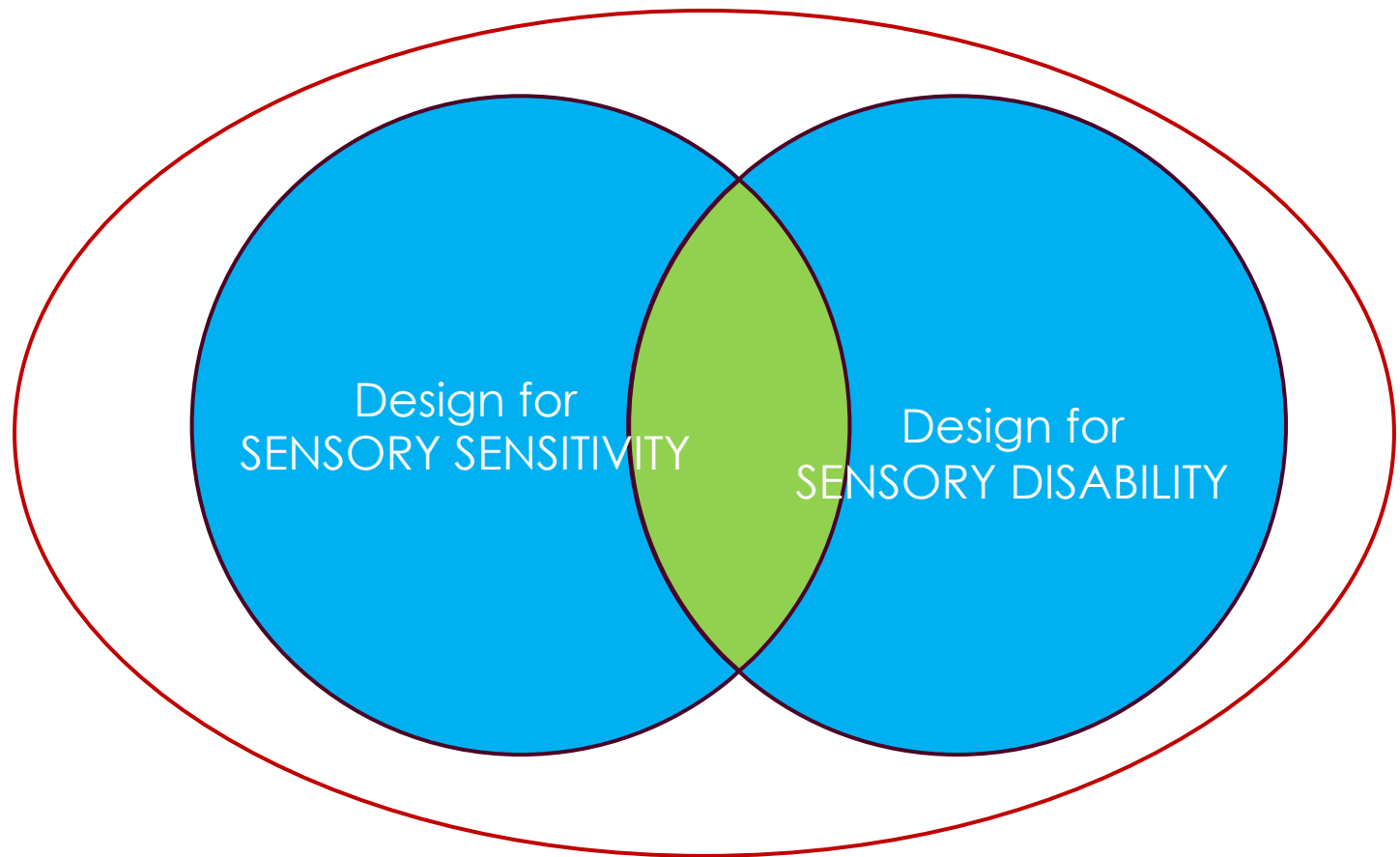
design for neurodiversity



Inclusive Design Synergies



Inclusive Design Synergies



neurodevelopmental-neurodegenerative

Basics: layout and wayfinding.

- **clear spatial hierarchy**
- **clear main circulation routes** which are easy to identify and to follow, **without** relying heavily on signage. Visual and tactile cuing.
- **spatial demarcation** between areas associated with different activities, especially if they conflict
- This is **standard good design practice**. You can achieve it this using form, layout, grouping of rooms by function and importance.

In public buildings, a majority of users may be unfamiliar with the building

basics: physically accessibility.

Accessible routes/environments

(step-free routes, handrails, visual and tactile cuing etc.)

also address the needs of

- people with problems with co-ordination and balance (dyspraxia)
- people with chronic pain issues (invisible disabilities).
- people with impaired vision
- people with children and buggies
- people with bags/luggage

sensory design

all buildings are multisensory!

(...even if you don't design them that way)



sensory cuing.

Sensory cues/ sensory reinforcement

REINFORCE IDENTIFICATION of preferred routes and functional zones with **sensory cuing** using

form

materials (colour, texture)

applied colour

visual cues

pictorial signage

e.g. a change in flooring material can provide a useful sensory cue for

-a visually impaired person

-a deaf person

-all users!

sound



This is something the architect/designer can help mitigate, especially in public/shared spaces

To help alleviate this:

- Provide sufficient **space** in rooms, e.g. between desks
- Aim to **separate/ zone** rooms with noisy and quiet activities.
- Use **transitional spaces** to do this (hallways, lobbies etc.) ; this also helps to manage transitions in general.

sound



Many **autistic people can't filter out background noises** that other people simply block out or ignore. Noise can also be a serious issue for people with **dementia**, as well as interfering with audibility of speech for people who are **hard of hearing**, or wholly reliant on hearing (**vision-impaired**)

- most likely to be a problem where there are a lot of **people**
- large spaces** e.g. entrance areas, concourses
- spaces where **physical activity** is happening (cafes, kitchens, labs)
- areas immediately **outside communal spaces**
- heavily-used **circulation areas**
- poor acoustic design can create other problems in smaller spaces e.g. in distinguishing speech.

sound



THINK about the **acoustic qualities** of the spaces you make.

Noise problems will never show up in a photograph!

- use of **materials**. Hard materials reflect sound, can create echoes. They are often used in order to achieve compliance with fire regulations., also for functional reasons They are durable, therefore often used in public buildings.

- possible **conflicts** with other building requirements, e.g. durability, fire safety.

- consider using **acoustic panelling** where hard surfaces are unavoidable, or in a retrofit situation

vision



- **Visual** supports for people who have difficulty with spoken/textual information: colour, shape, pictorial signage
- Lighting: avoid glare. Even lighting on circulation routes
- Task/ activity-appropriate lighting elsewhere
- Considered use of colour, included natural colour of materials

lighting



Fluorescent or harsh lighting can **hurt** the eyes of an autistic person, and can affect visual perception. People with sensory sensitivity can see these types of lights flickering or hear them hum, which can be distracting or stressful.

Some types of fluorescent lighting can cause epileptic seizures. Much of this has been phased out by now, not permitted.

Possible conflict with required higher lighting levels for older people, people with visual impairment.

Dimmable lighting can be used to adjust light intensity to individual preference.

Dimmable LED can also be used to adjust colour.

lighting

- automation of controls** for lighting can reduce cognitive stress and help manage sensory
- personalisation of controls** in individual spaces should be facilitated, to maximise individual 'fit'
- personalisation is **energy-efficient** (allowing user to choose lighting/heat levels)
- cycled lighting** in artificially-lit areas
- lighting **responsive** to external levels
- blinds/shades**/ other measures to reduce **glare**

colour and pattern



Use 'low arousal' (muted) colours and natural materials where you can, unless you are trying to make a specific statement, e.g signalling a change of direction, major space.

Use saturated colours with care, not in large areas (commonsense)

Brilliant white can appear over-bright

Some guidelines on colour for autistic users are referencing unreliable research, with a handful of participants.

Yellow-green at 555nm is the most visible colour on the spectrum. In lighting, green is as visible as blue at about 1/100th the wattage



colour and pattern



Soft furnishings should be kept fairly plain.

Patterned floors can be confusing to walk across and may increase anxiety or cause people to become fixated (not just autistic people, also people with dementia).

‘Either that wallpaper goes or I do’
-Oscar Wilde

floor finishes



- **Soft and/or resilient floor finishes** reduce the impact of falls, and can help reduce noise transmission.

- Loose rugs can cause **trips** for someone who has problems with walking or balance

- **patterns** can cause problems with visual perception. If using a patterned floor-covering, use random or fluid pattern designs. Geometric and repeating patterns can reinforce obsessions related to exact positioning of furniture, and influence personal movement around the rooms. (source: NAS website)

floor finishes

- Changes in flooring type or colour, if used carefully, can be used to support **visual cuing and wayfinding**, by denoting change of activity/use.
- Hard vs. soft flooring, produces different sensory effects, e.g. wood flooring vs. tiling
- Textured flooring can also be used provide sensory cuing, not just for people with visual impairment, but also for hearing-impaired people.
- Coloured or textured flooring inlay can be **CAREFULLY** used to act as a guide or 'signpost'.



visual aids

- **Colour-coding**

Flooring design can be used in conjunction with other interior finishes, to '**colour-code**' areas with different uses in bigger buildings

- Similar principles apply to surface design for external areas.

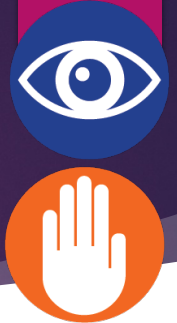
- **Pictorial information** Is more easily understood (also gets around language barriers)

visual cuing



Internal street in a residential care building for people with intellectual disability. Projecting coloured 'porches' signify the 'front door' to individual houses, each with its own colour scheme and associated shape. The entrance hallway of the orange house has a circular motif in the flooring, and externally over the door. Blue house uses a triangle, etc.

visual and tactile cuing



Renovated building

Projecting doorway
Red column

Tactile flooring indicates location of
Reception area and lift

Red lines lead

- from external door to stairs
- from reception area to lift

smell



People on the autism spectrum tend to be chemically-sensitive. They can become overwhelmed by strong smells, and even by subtle smells that you may not notice, such as someone's deodorant or perfume, or the smells of fabrics.

Outgassing from synthetic materials/plastics may be an issue.

e.g. use zero formaldehyde MDF.

Natural scent over synthetic.

Scent can give someone with sensory and/or chemical sensitivity a headache or make them feel nauseous.

furniture and finishes

- It is very important to have enough **SPACE** in rooms to allow people to move around without bumping into furniture.
- Carpet/soft flooring is **quieter** than hard floor finishes
- Soft upholstered furniture can also help absorb noise, as can certain wall finishes.
- Soft furnishings can also help create a feeling of security
- Furniture specification/ arrangement can reduce chances of bumping into sharp or hard surfaces. Avoid furniture with **sharp** edges.



social interaction/ social anxiety

Many autistic people have difficulty in making and maintaining relationships with others. They may need both time and space to be alone, including to deal with stress and sensory issues, as well as social anxiety.

Building design can assist in avoiding unnecessary stress in social settings, in addition to minimising the likelihood of sensory overload.

social interaction /social anxiety

- **Sufficient space allocation in circulation spaces; wide corridors**, to avoid collisions. This also benefits deaf people as it allows space to sign while walking. see **Deafspace**
- a **variety of spatial types** (quiet, busy, shared, personal)
- **large communal rooms** with high ceilings
- **choice of exits** from communal rooms
- **quiet rooms/ escape spaces**, including garden/external, located to allow easy access
- **transitional spaces**...Lobbies, concourse, outdoor routes

refuge/restorative spaces

A restorative or quiet space can be **indoor** or **outdoor**

Outdoor

landscaped courtyard,
garden or **green space** between building blocks
Lightwell within building perimeter

These should be provided close to busy/ crowded spaces

Views out to green space can help de-stress and re-focus your users

If there isn't a green space, you can make one!

refuge/restorative spaces

Indoor

Quiet spaces with comfortable well-spaced seating, low lighting

Quiet spaces with **views** to **green space** or **water**

Individual **quiet rooms**

sleep pods

sensory rooms

Quiet rooms/ spaces can incorporate appropriate sensory features

sensory rooms

There is almost no reliable independent research evidence for 'Snoezelen', the type of sensory room most people associate with the term, despite their widespread use. It is a trademark.

Their use is usually associated with schools for students with special educational needs, including autism and intellectual disability. Also used for therapeutic purposes for to people with dementia, PTSD.

Dedicated sensory rooms do not need to cost a huge amount of money. Alternatively, design typical sensory room features into other areas of your building, and into the general specification.

sensory rooms

Sensory rooms should create a relaxing, calm, but stimulating environment. Controllability and personalization are important. Suggestions:

- projection equipment, bespoke video/interactive installation
- sound system/speakers, music and relaxation soundtracks
- dimmable, colour changing LED
- Sound-proofing for walls, door (even a fire door will help)
- Comfortable seats /beanbags
- wifi connection
- tactile elements

natural environments - BIOPHILIA

Nature experiences are known to be **restorative**

- decrease stress and anxiety
- restore attention (even short-term)
- improve cognition
- reduce inflammation, improve immune function

Natural environments provide multisensory restorative experiences

RESEARCH- Dr Cathy Dalton

MyRoom: A user-centred model of affective responsive architecture

<https://cora.ucc.ie/items/05eb3705-4331-4711-8d46-b83d1bd74c46/full>

PhD and postdoctoral research based on 5 key concepts

SALUTOGENESIS

promoting good health through design

CONGRUENCE and COHERENCE

maximising environmental fit

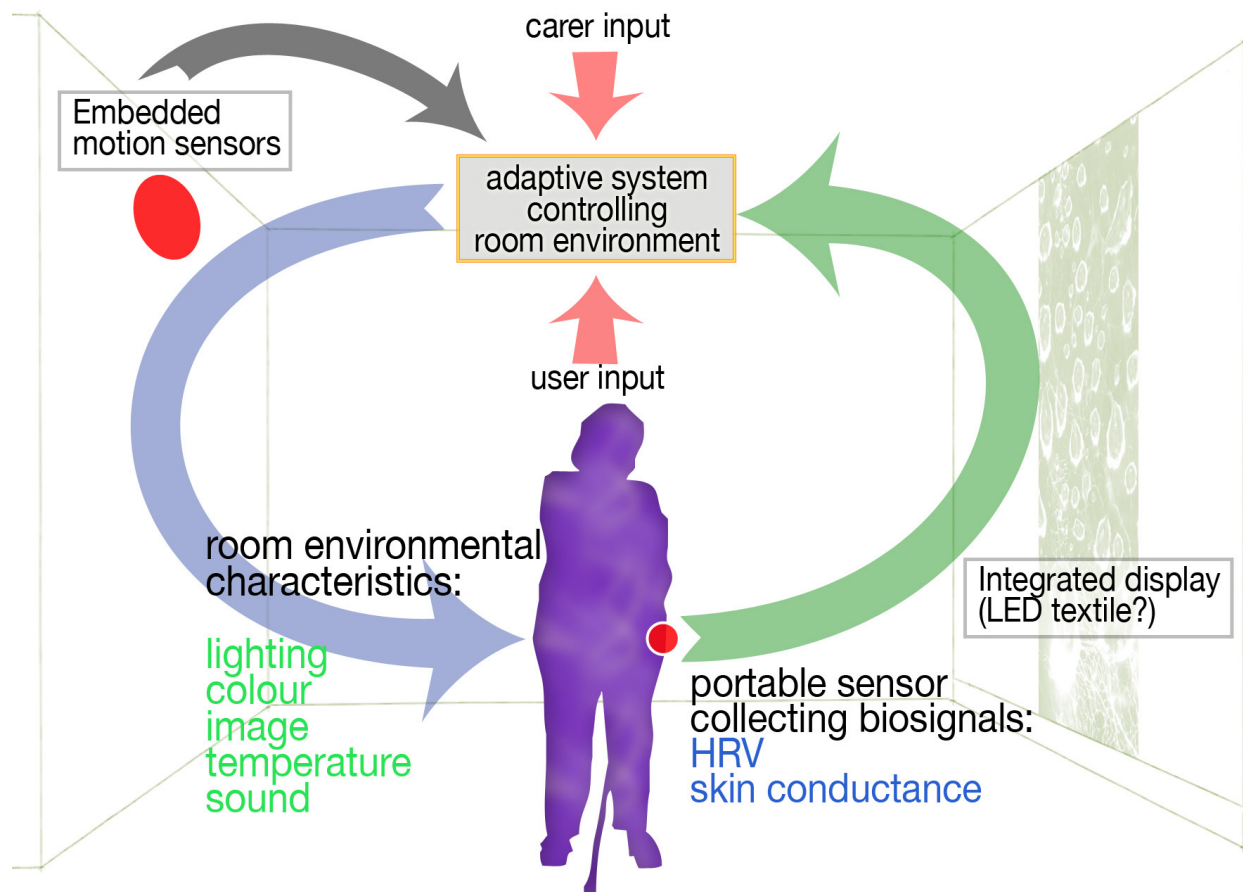
UNIVERSAL DESIGN

maximizing usability and fir for all users

BIOPHILIA

Humans have an inbuilt affinity for nature and natural environments

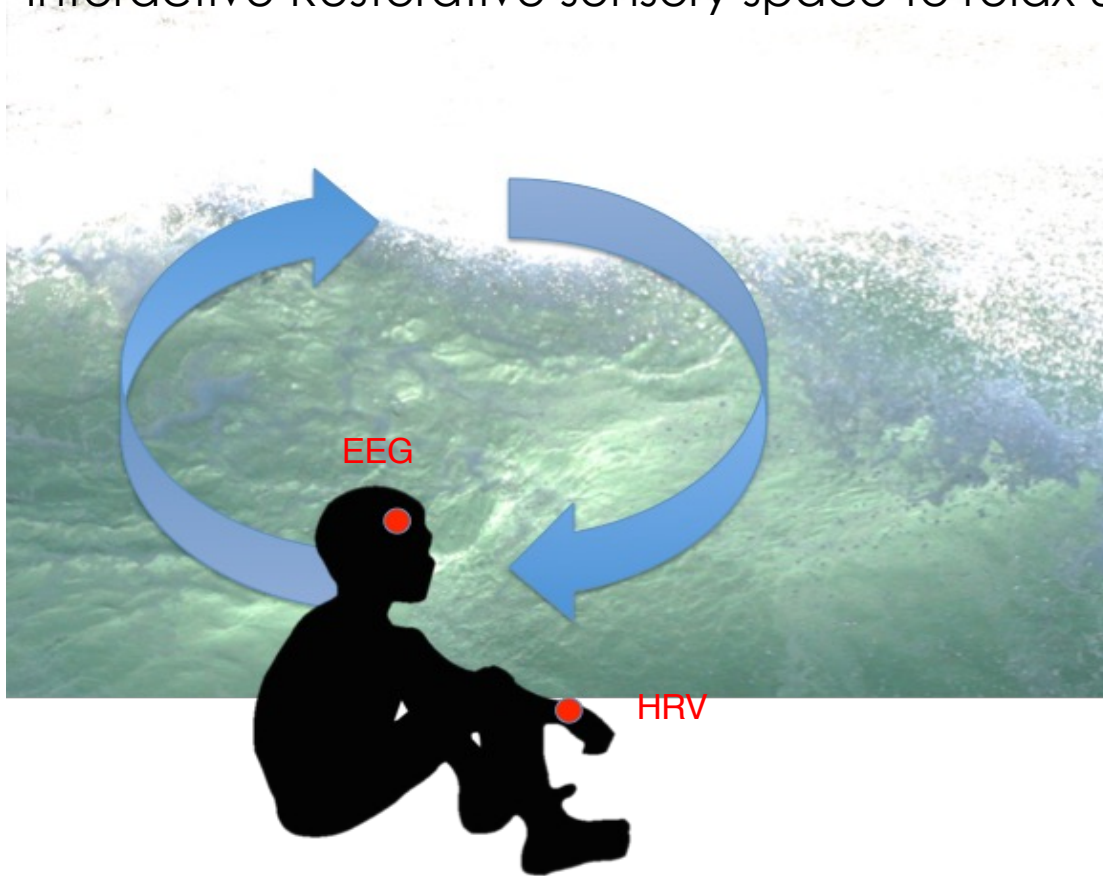
MyRoom



Adaptive personal Space for an elderly person with dementia which responds to emotion state

AMbiARt

Interactive Restorative sensory space to relax user and re-focus attention



Light

Sound

Colour

Imagery

Aroma



e!

THANK YOU

If you write, please cite!