Exploring the Design Preferences of Neurodivergent Populations for Quiet Spaces

Toar Sadia

Preprint: https://engrxiv.org/fkaqj/

A Little Bit About Myself

- Originally from Israel
- Registered architect in the US
- Practiced architecture in New York City
- BArch, City College of New York
- MSc Health, Wellbeing and Sustainable Buildings, UCL
- Currently working as Accessibility Consultant in Dubai Expo 2020 (with Buro Happold)

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Research Motivation

- People experience spaces differently
- Neuroscience and architecture
- Inclusive design
- Neurodiversity in my family
- Community health



Research Gaps

- Lighting – Correlated Color Temperature
- Quiet Spaces – lack of design guidance



Quiet Spaces & Sensory Overload

A quiet space provides a calm environment where people can find relief from stress and sensory overload. The space does not necessarily have to be silent but rather create a mentally ‘quiet’ environment promoting relaxation.

Sensory overload is a condition in which sensory stimuli are received at an excessive rate or intensity. Sensory overload can produce increases in heart rate, breathing, blood pressure, confusion, anxiety, mental distress, and/or erratic behavior.

Research shows that neurodivergent populations are more susceptible to experiencing sensory overload.

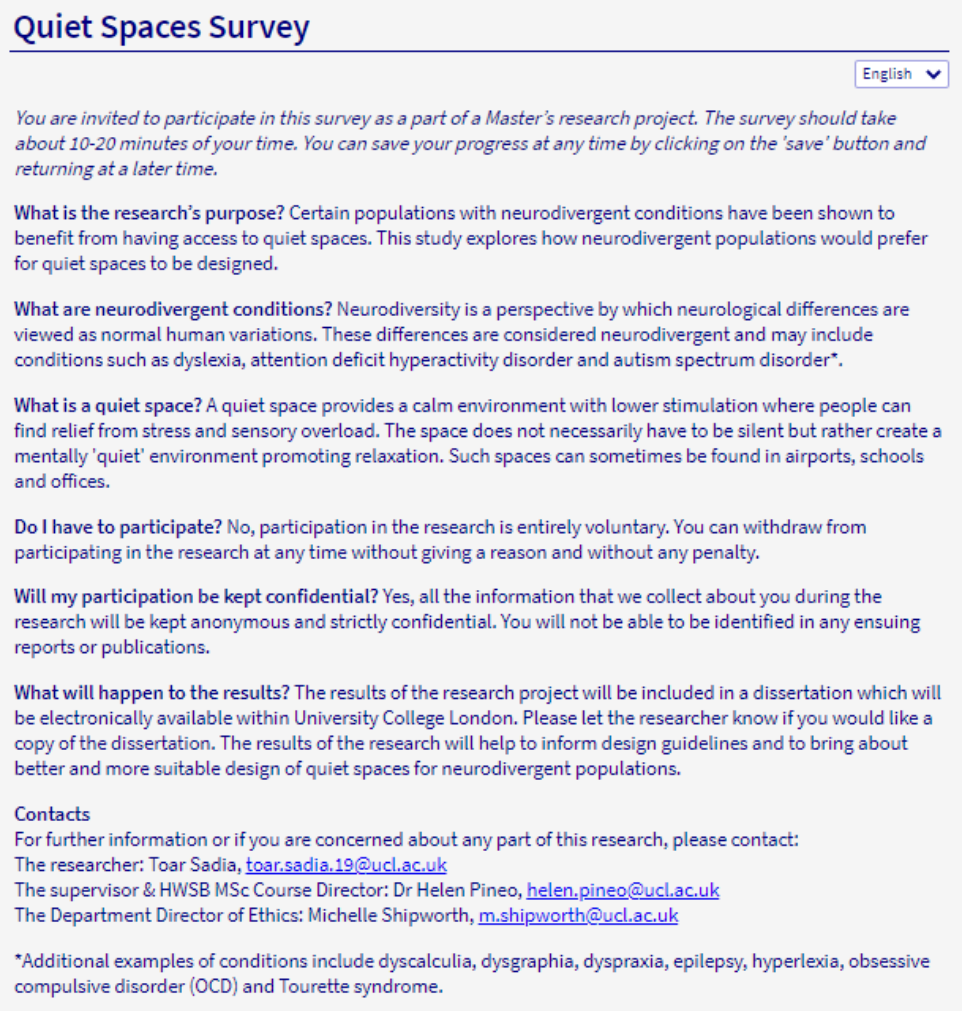
Research Methods

Online survey

- Global
- Translated to Spanish and Hebrew
- About 10-20 minutes
- Closed questions with optional comments

Semi-structured interviews with professionals

- Overlap with survey for clarity
- Open ended and more elaborate
- Questions that could not be asked in the survey format



Quiet Spaces Survey

English

You are invited to participate in this survey as a part of a Master's research project. The survey should take about 10-20 minutes of your time. You can save your progress at any time by clicking on the 'save' button and returning at a later time.

What is the research's purpose? Certain populations with neurodivergent conditions have been shown to benefit from having access to quiet spaces. This study explores how neurodivergent populations would prefer for quiet spaces to be designed.

What are neurodivergent conditions? Neurodiversity is a perspective by which neurological differences are viewed as normal human variations. These differences are considered neurodivergent and may include conditions such as dyslexia, attention deficit hyperactivity disorder and autism spectrum disorder*.

What is a quiet space? A quiet space provides a calm environment with lower stimulation where people can find relief from stress and sensory overload. The space does not necessarily have to be silent but rather create a mentally 'quiet' environment promoting relaxation. Such spaces can sometimes be found in airports, schools and offices.

Do I have to participate? No, participation in the research is entirely voluntary. You can withdraw from participating in the research at any time without giving a reason and without any penalty.

Will my participation be kept confidential? Yes, all the information that we collect about you during the research will be kept anonymous and strictly confidential. You will not be able to be identified in any ensuing reports or publications.

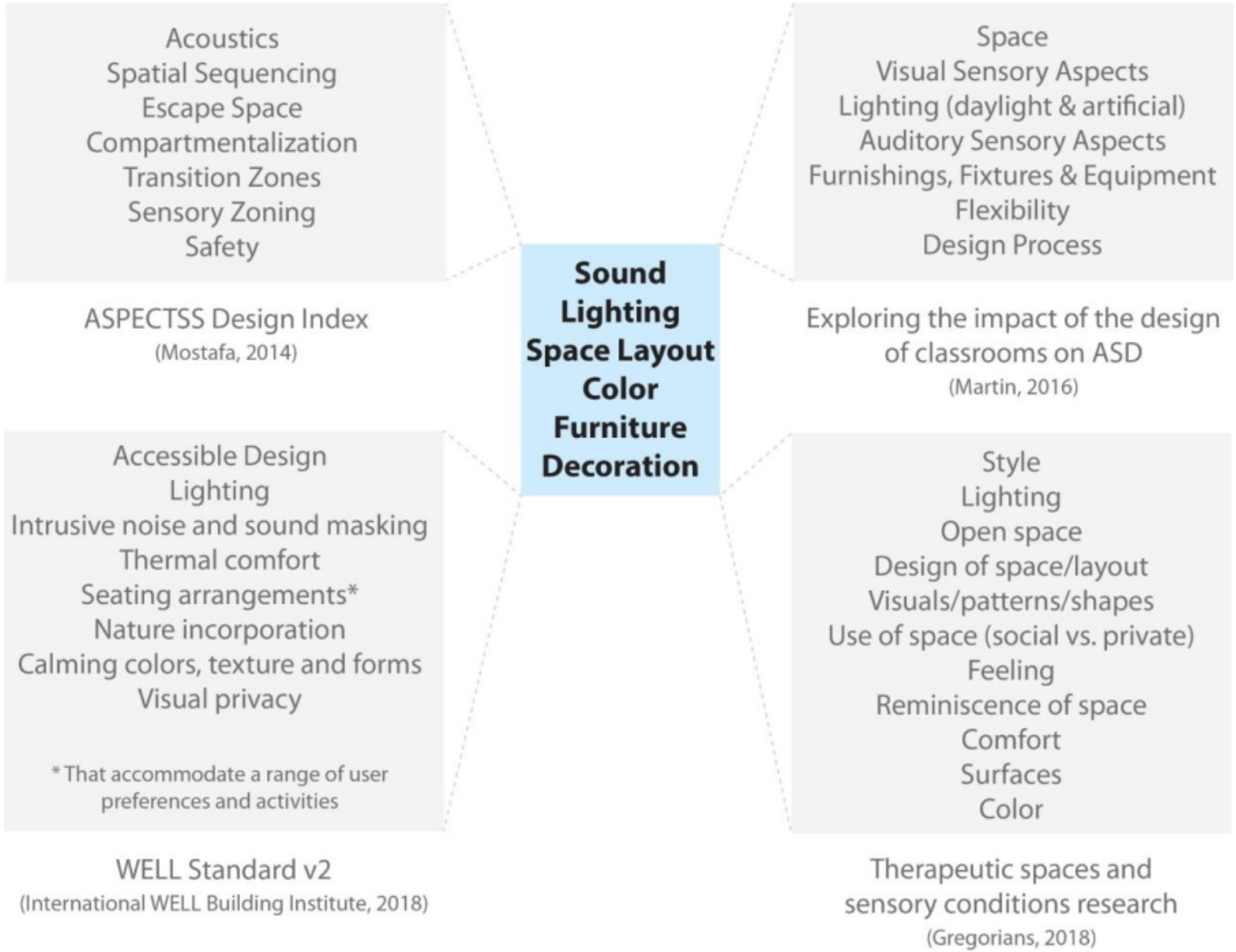
What will happen to the results? The results of the research project will be included in a dissertation which will be electronically available within University College London. Please let the researcher know if you would like a copy of the dissertation. The results of the research will help to inform design guidelines and to bring about better and more suitable design of quiet spaces for neurodivergent populations.

Contacts
For further information or if you are concerned about any part of this research, please contact:
The researcher: Toar Sadia, toar.sadia.19@ucl.ac.uk
The supervisor & HWSB MSc Course Director: Dr Helen Pineo, helen.pineo@ucl.ac.uk
The Department Director of Ethics: Michelle Shipworth, m.shipworth@ucl.ac.uk

*Additional examples of conditions include dyscalculia, dysgraphia, dyspraxia, epilepsy, hyperlexia, obsessive compulsive disorder (OCD) and Tourette syndrome.

Design Features

- 6 Design Features
- Literature Review
- Appropriate for an online survey



Survey Design

Part 1: Experience in a Quiet Space

Participants were asked to identify design features which they appreciated and ones which bothered them from past experiences in dedicated quiet spaces (this section was conditional on the participant having previously experienced a quiet space).

Part 2: Ideal Quiet Space

Participants were asked to choose the preferred design features for their ideal quiet space.

Survey Design

Part 3: Perception of Quiet Spaces

Participants were asked to provide insight on three sample quiet spaces shown as images in the survey.







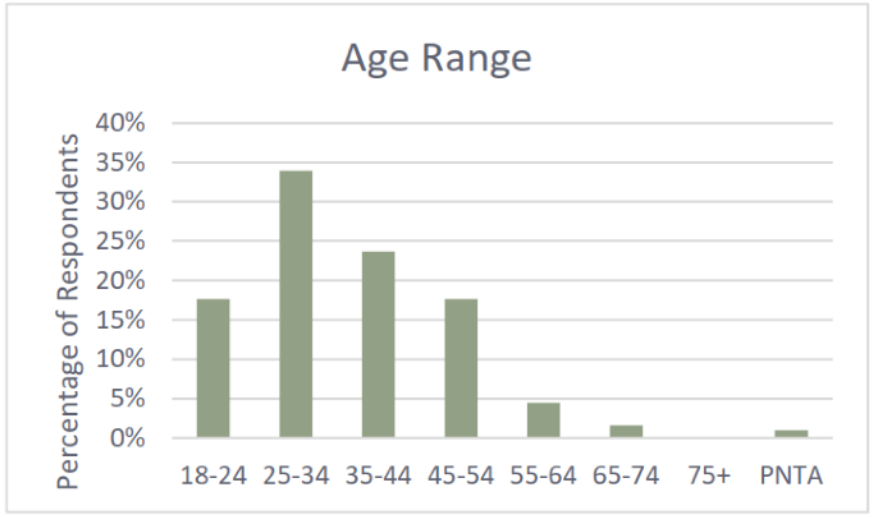
Interviewees

Reference in Text	Name	Role
Dark	Jessica Dark	Founding Director of Hygge Me Global and Supporting and Celebrating Neurodiversity
Farhi	Shmuel Farhi	Interior Designer
Maslin	Steve Maslin	Chartered Architect and NRAC Registered Access Consultant
Mond	Peter Mond	Social Worker and Director of In the Quiet Space Center
Morris	Becki Morris	Director of Disability Collaborative Network and Associate Consultant for EMBED
Stern-Ellran	Keren Stern-Ellran	Founding Director of Senso-Made Rooms and Senior UX Architect & Project Manager at UI – Human Factors

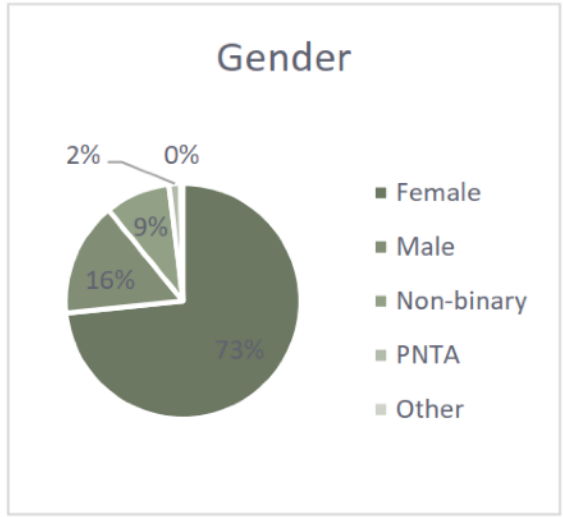
Survey Results

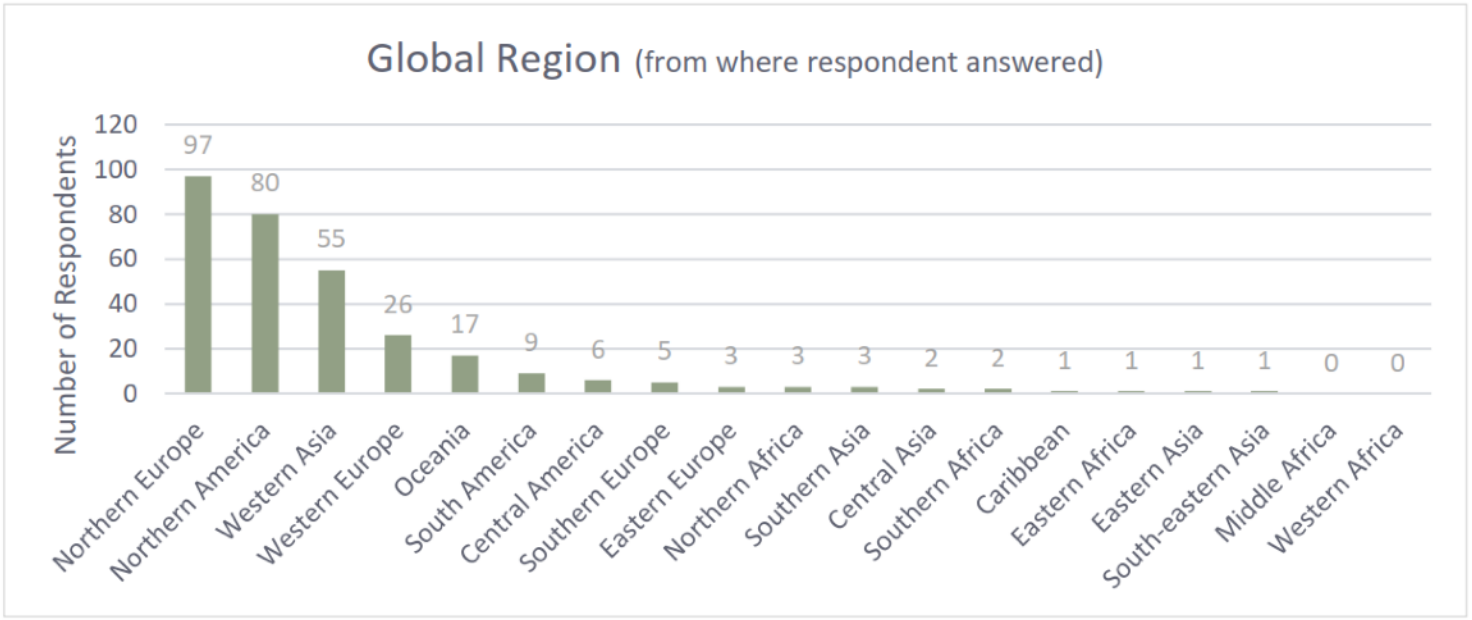
BACKGROUND

336 responses, 312 met the inclusion criteria for data analysis



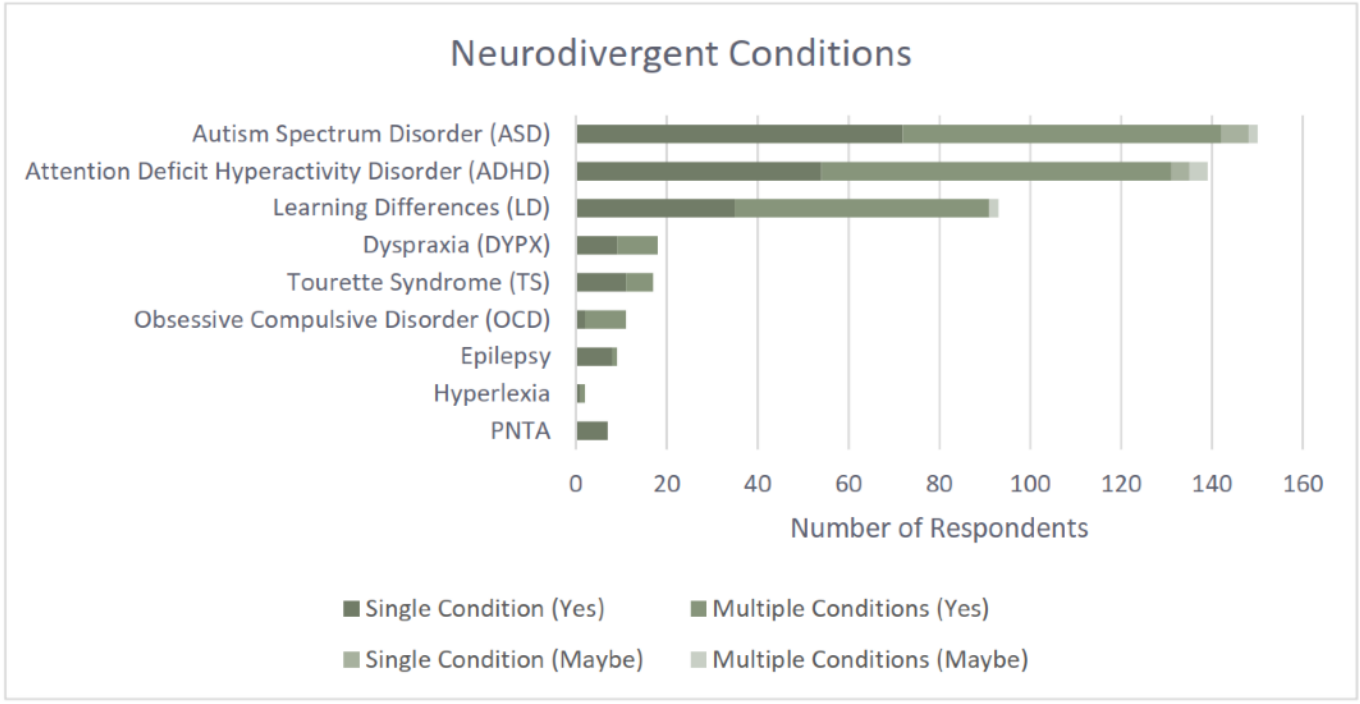
PNTA = Prefer not to answer

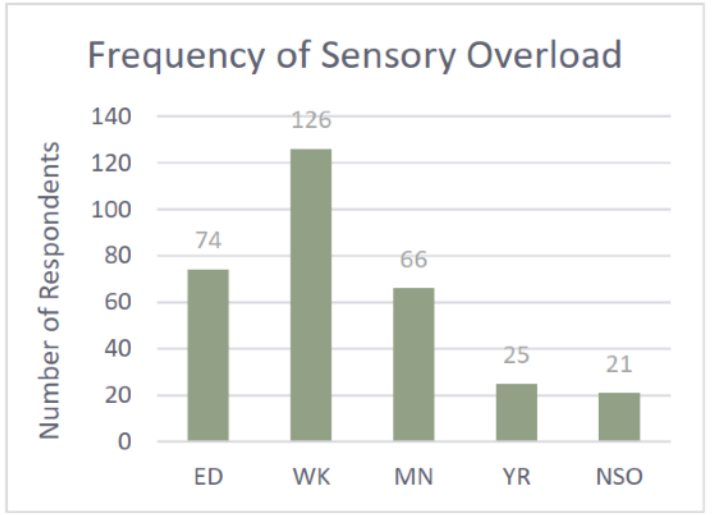


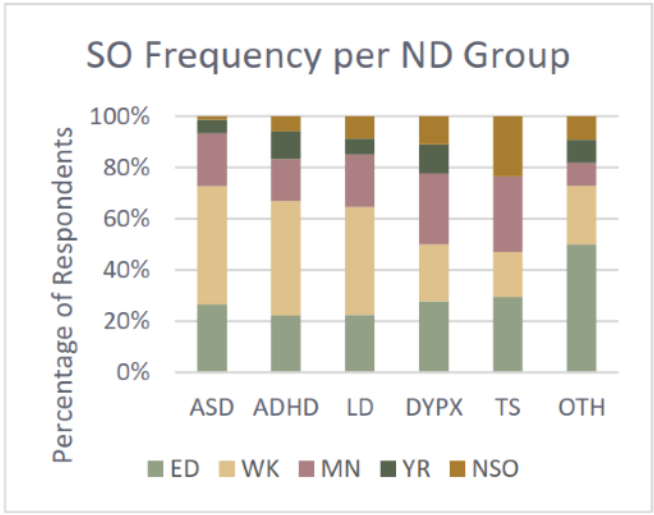


Survey Results

BACKGROUND



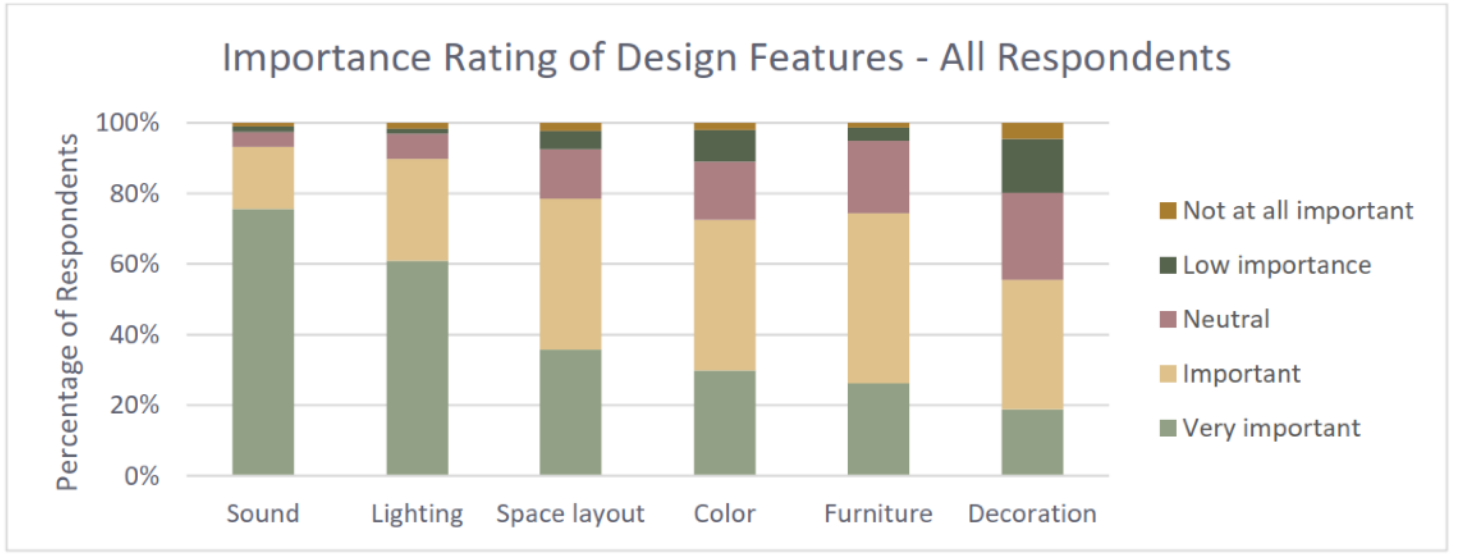


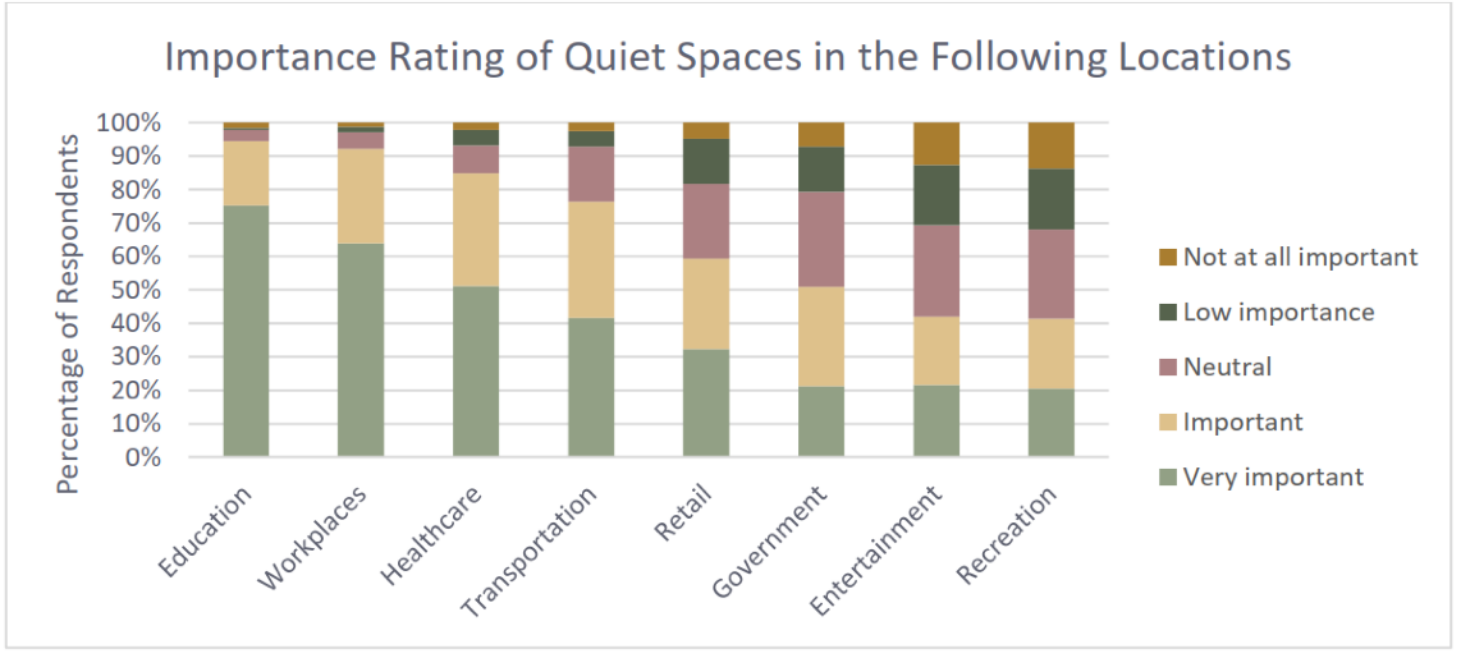


ED = Everyday; WK = Once to a few times a week; MN = Once to a few times a month; YR = A few times a year to once every couple of years; NSO = No experience of sensory overload

Survey Results

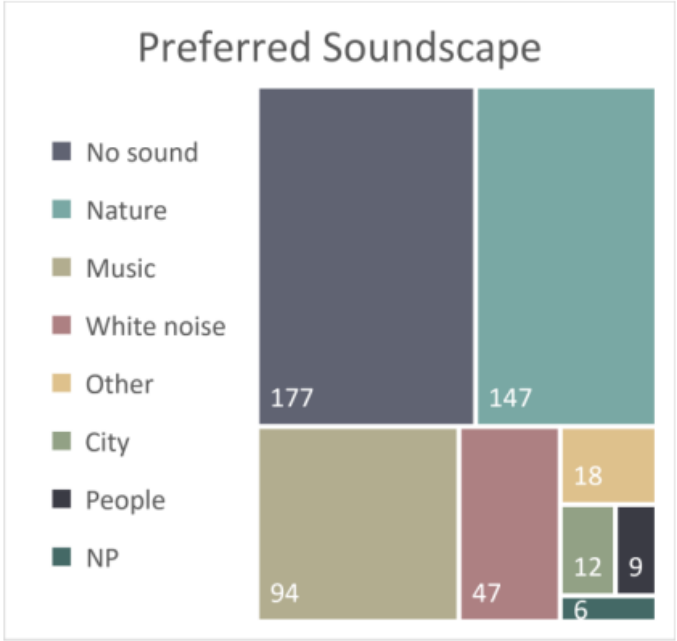
GENERAL

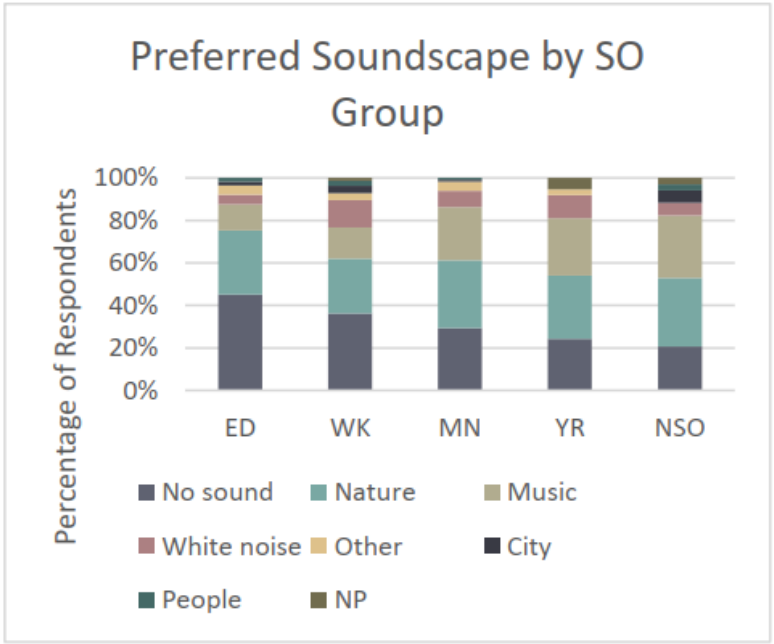


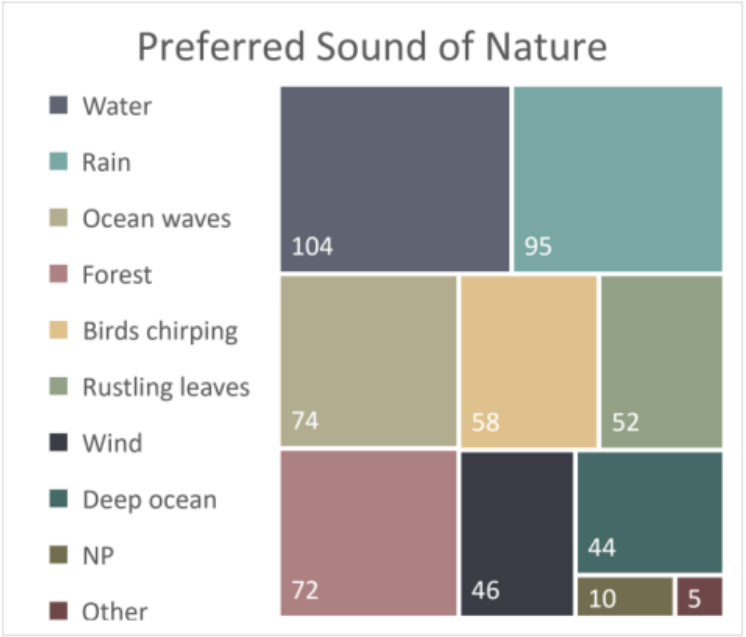


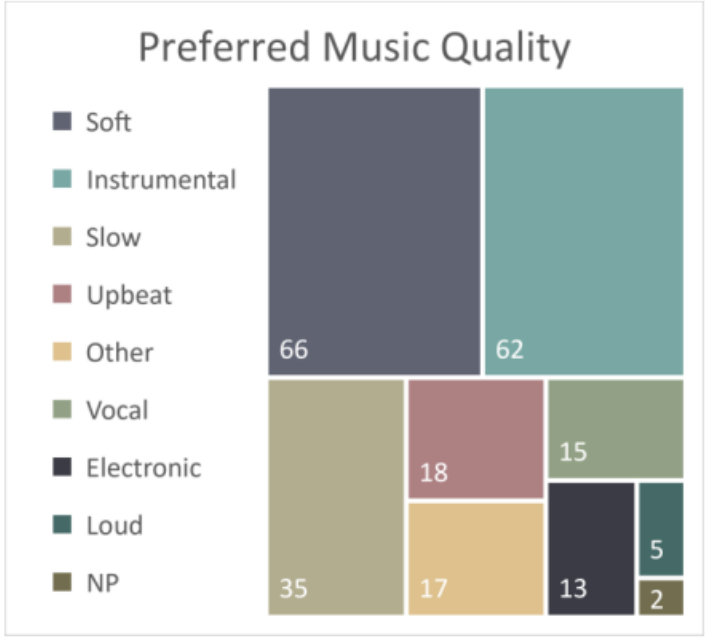
Survey Results

SOUND





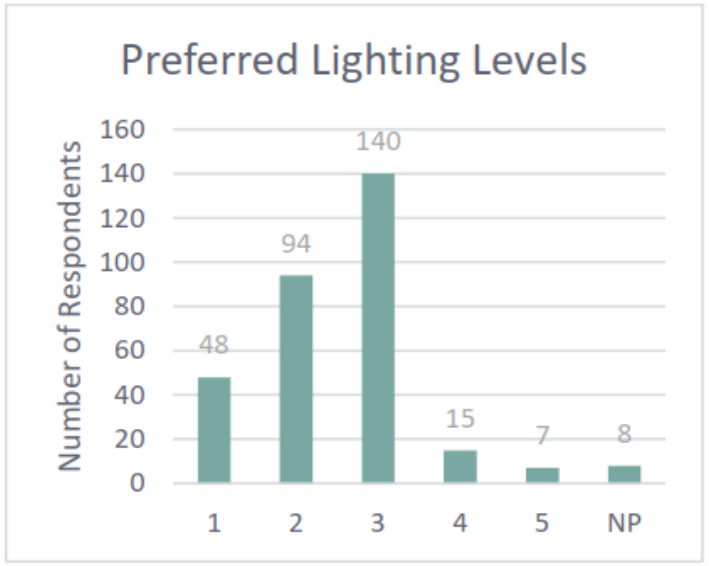




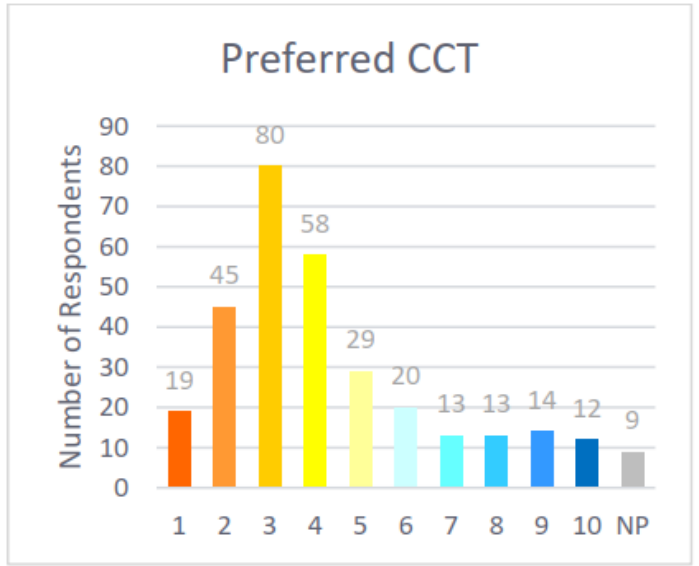
Survey Results

LIGHTING

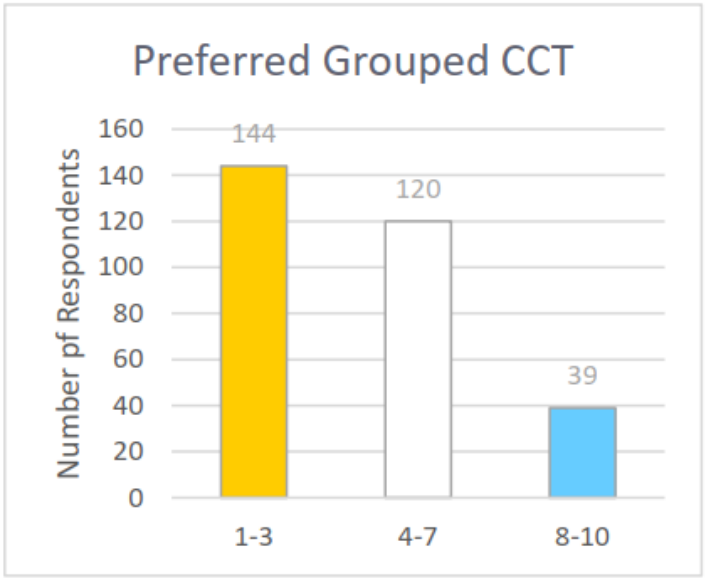


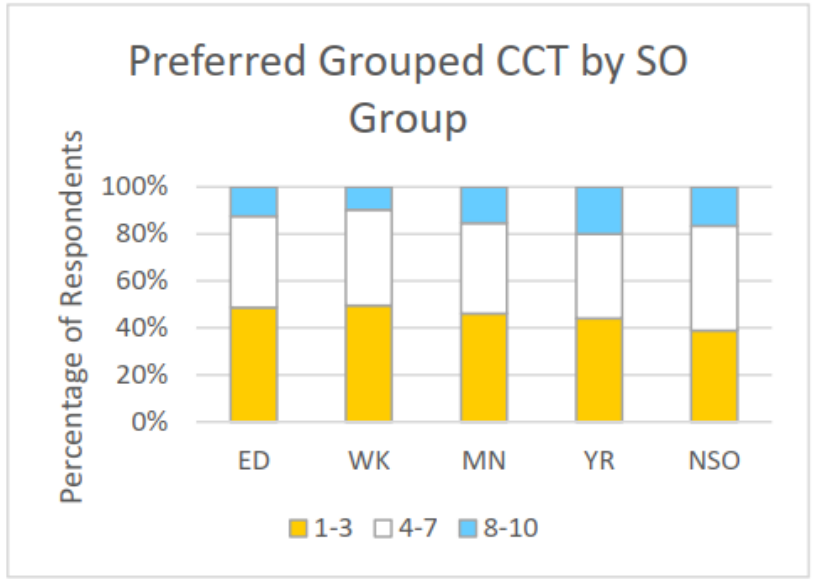


1 = Very dim lights; 5 = Very bright lights



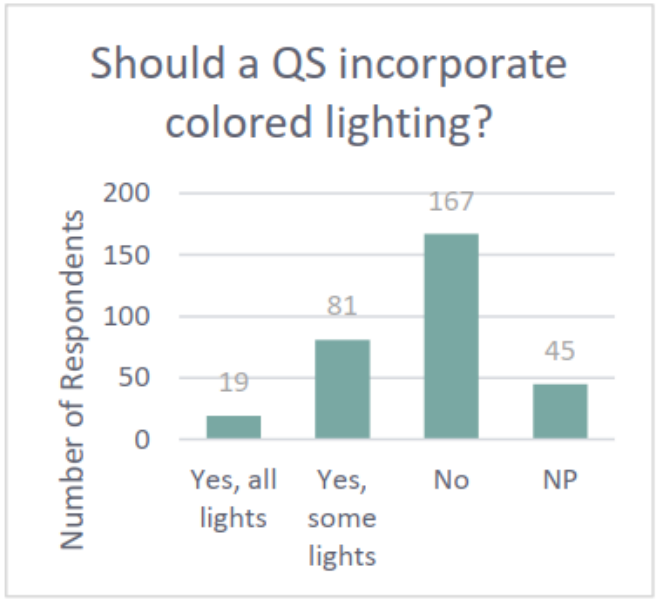
1 = 1000K; 2 = 2000K; 3 = 3000K, etc.

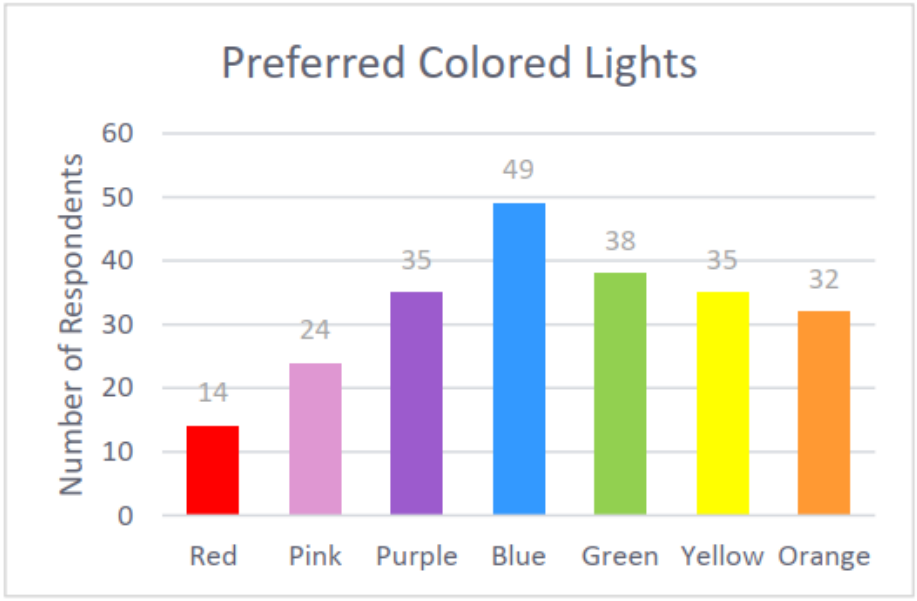


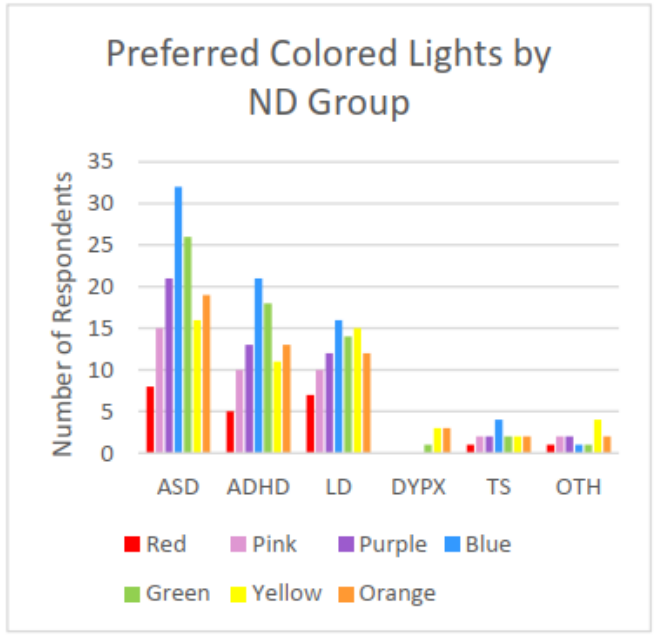


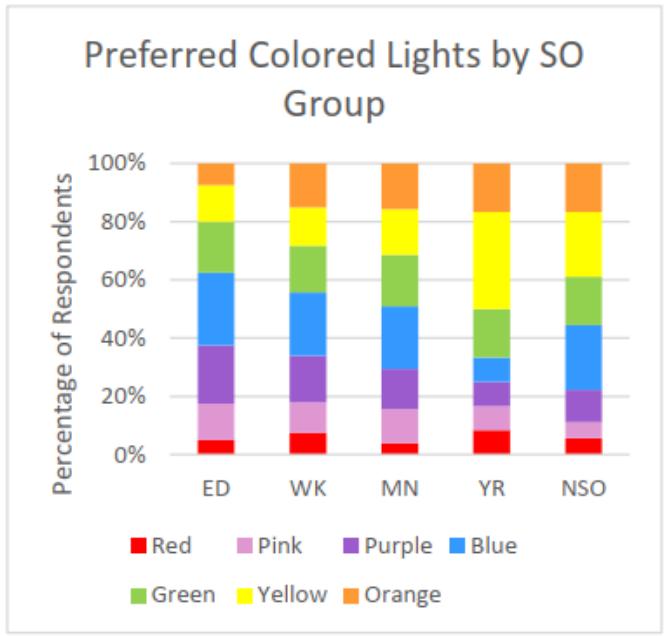
Survey Results

LIGHTING



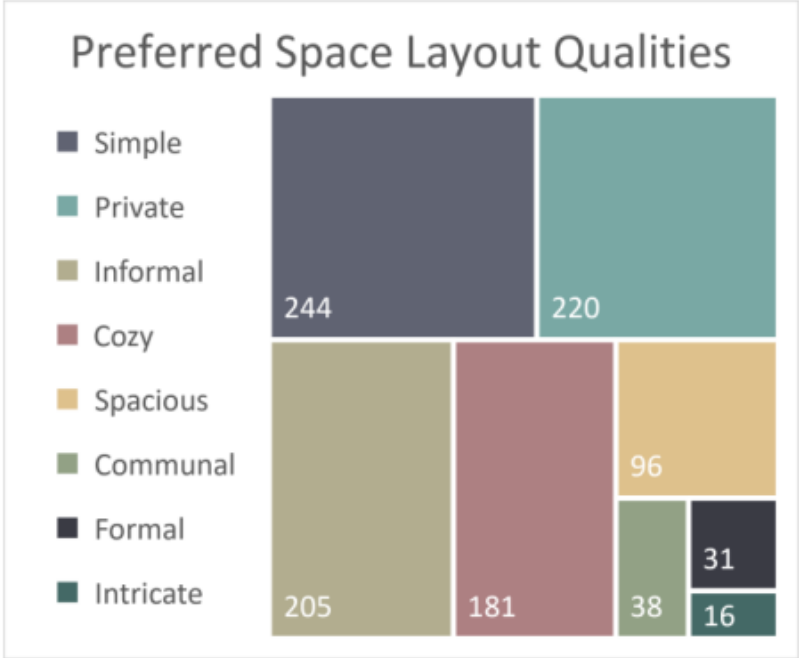


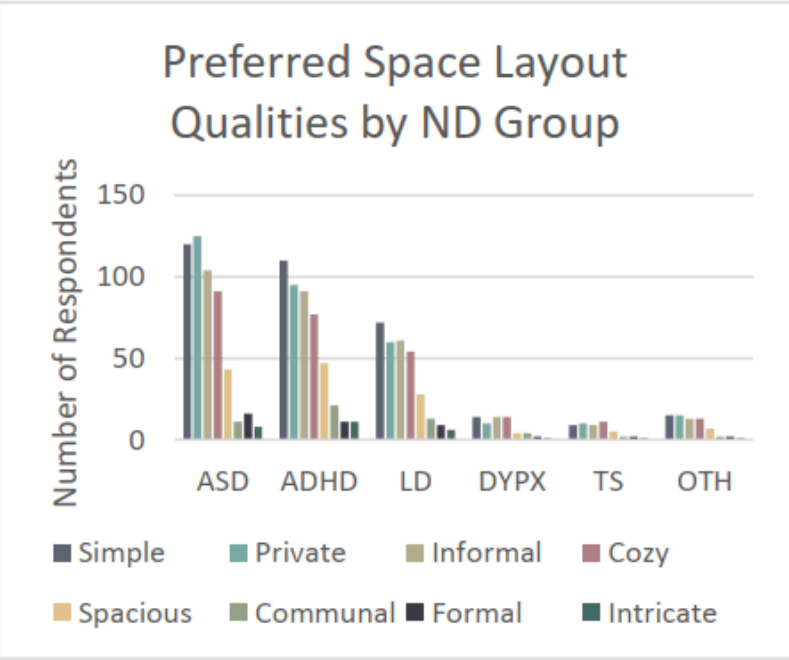




Survey Results

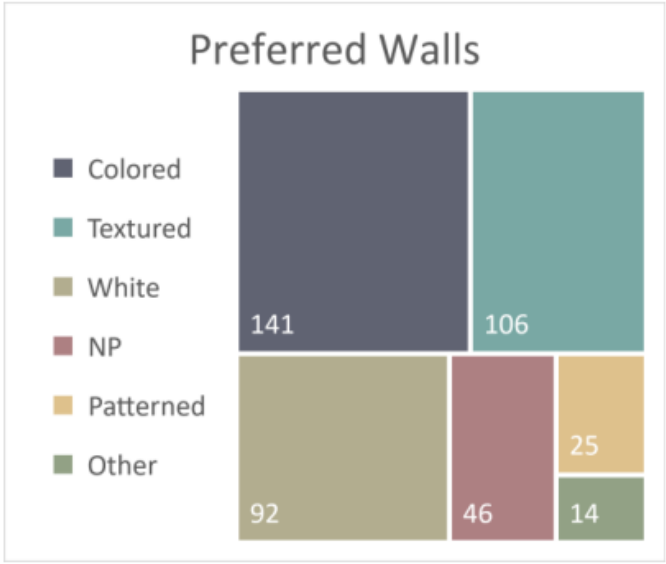
SPACE LAYOUT

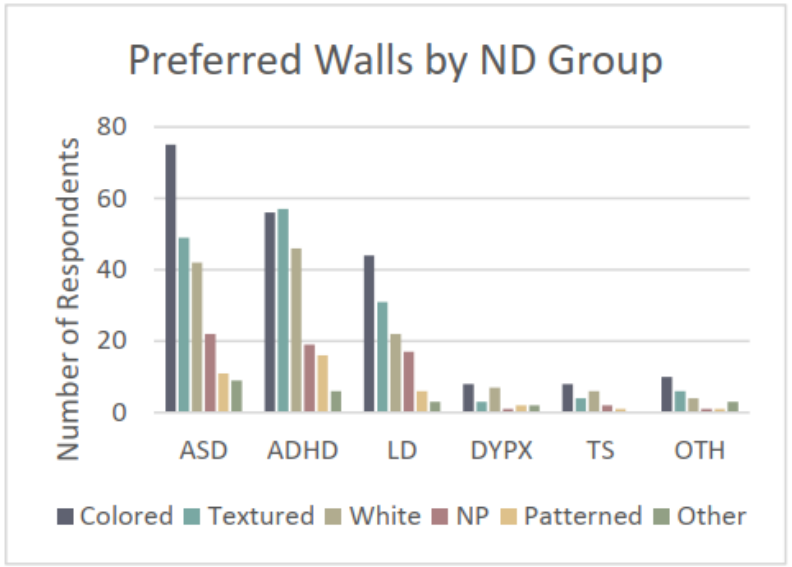


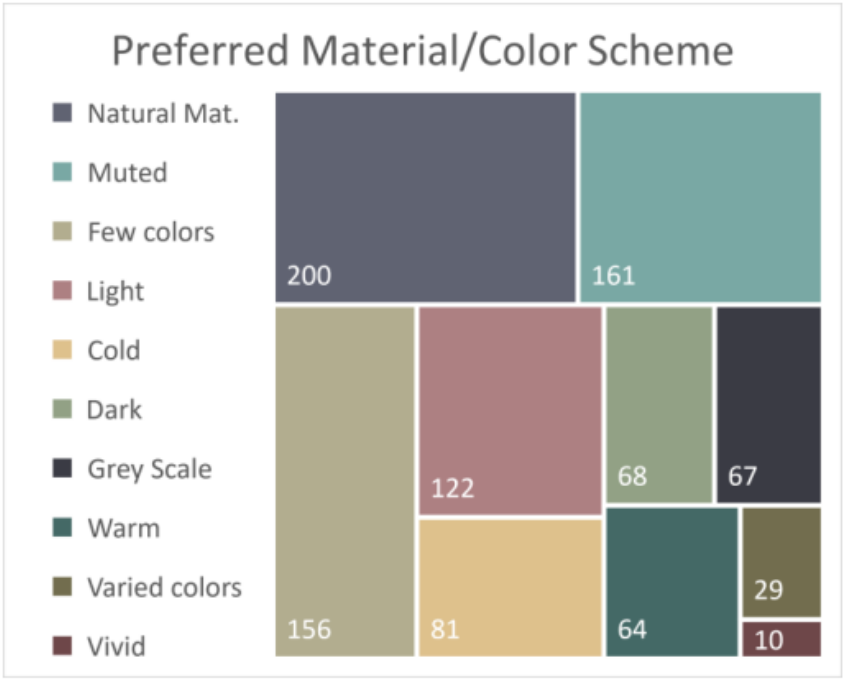


Survey Results

COLOR

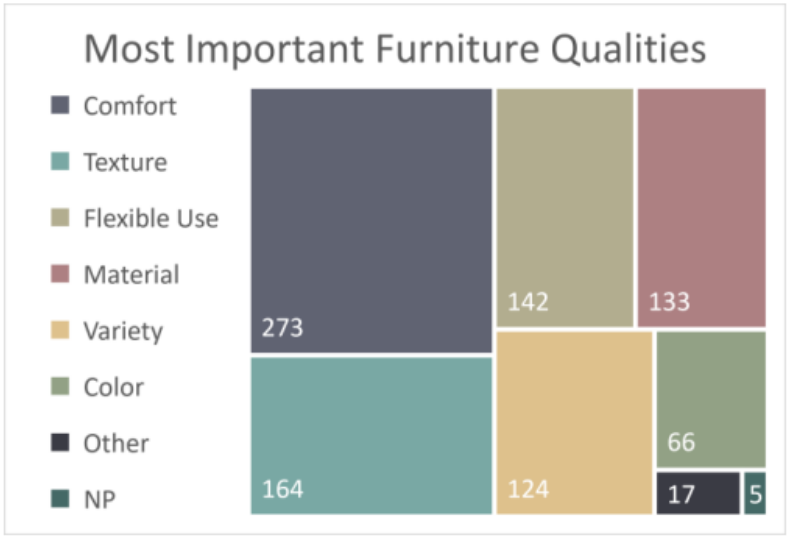


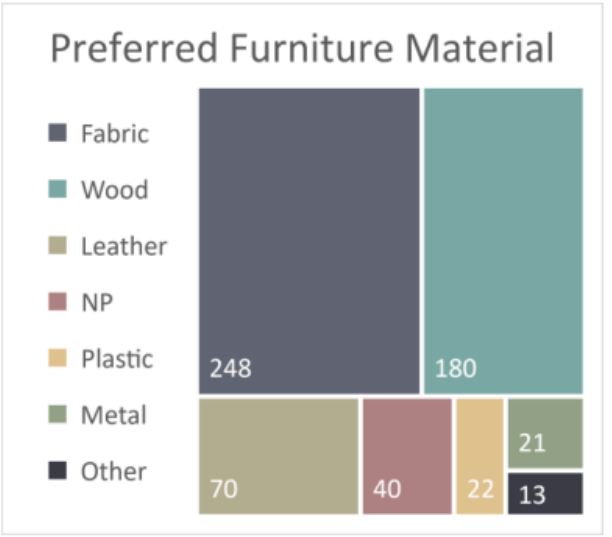




Survey Results

FURNITURE

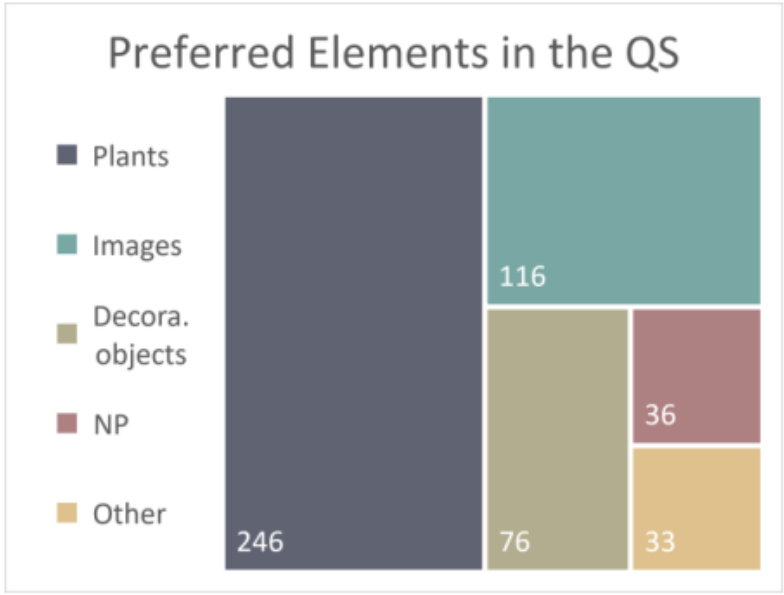


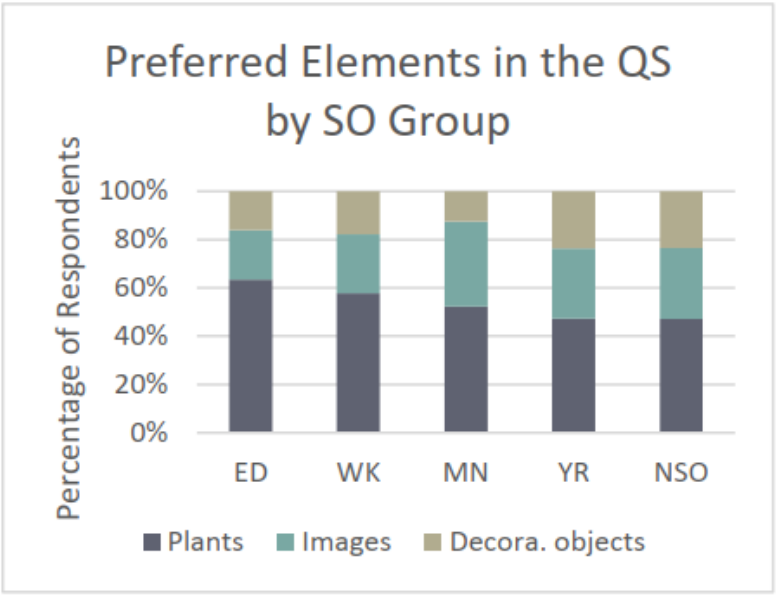


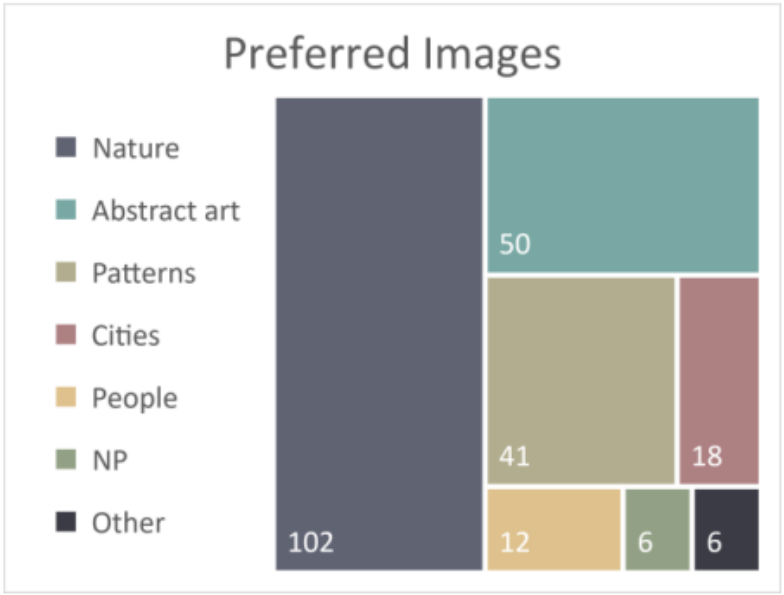


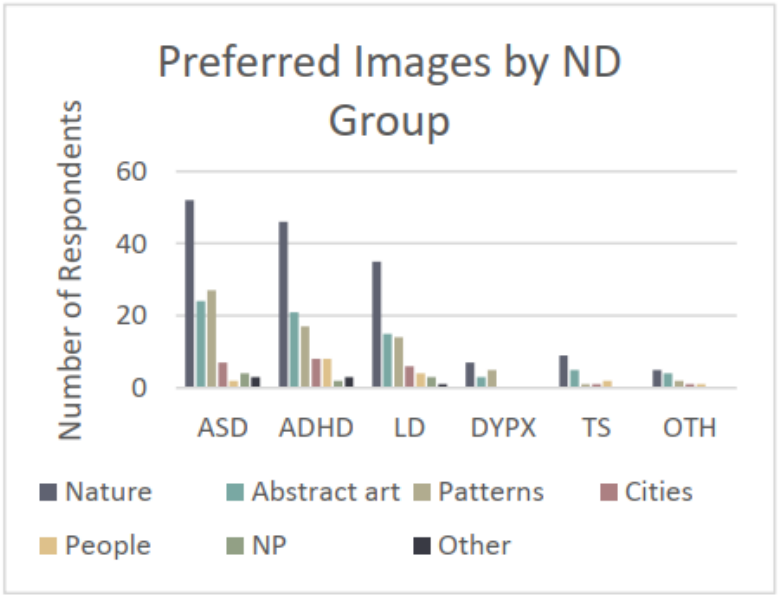
Survey Results

DECORATION





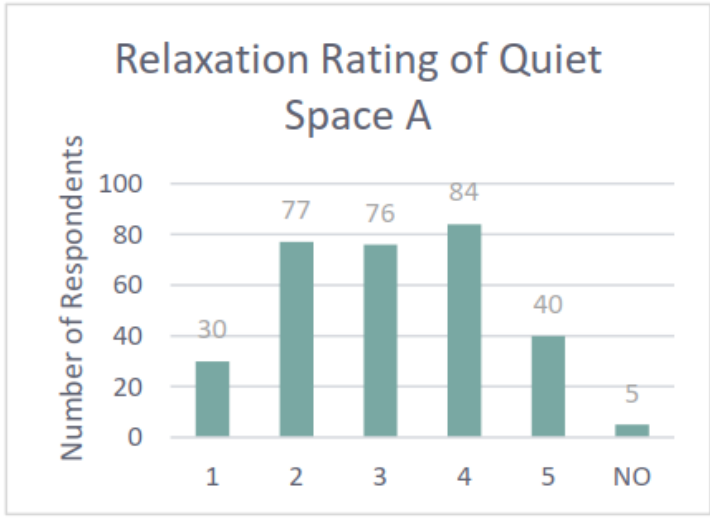




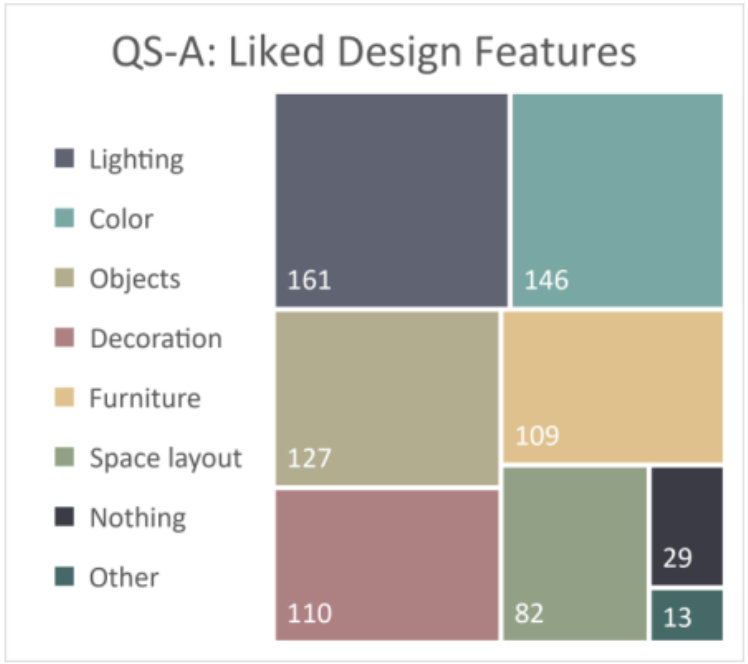
Survey Results

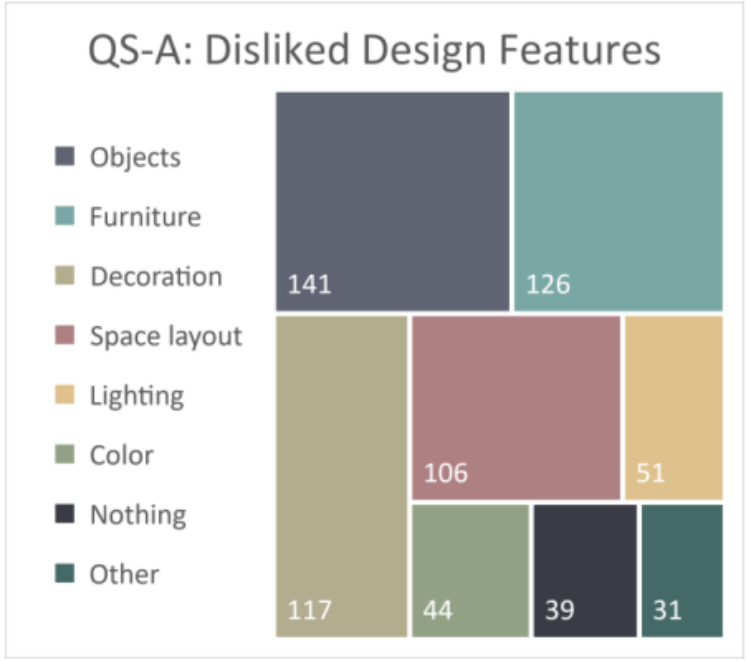
QUIET SPACE A





1 = Not at all relaxing; 5 = Very relaxing; NO = No Opinion

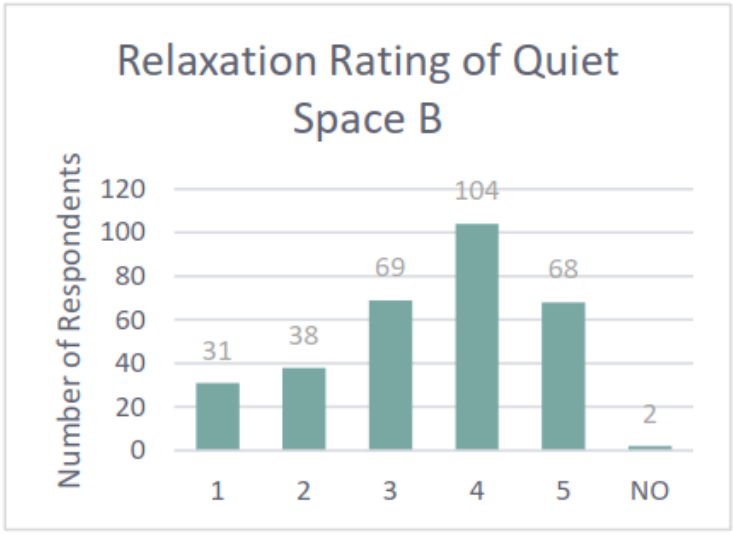




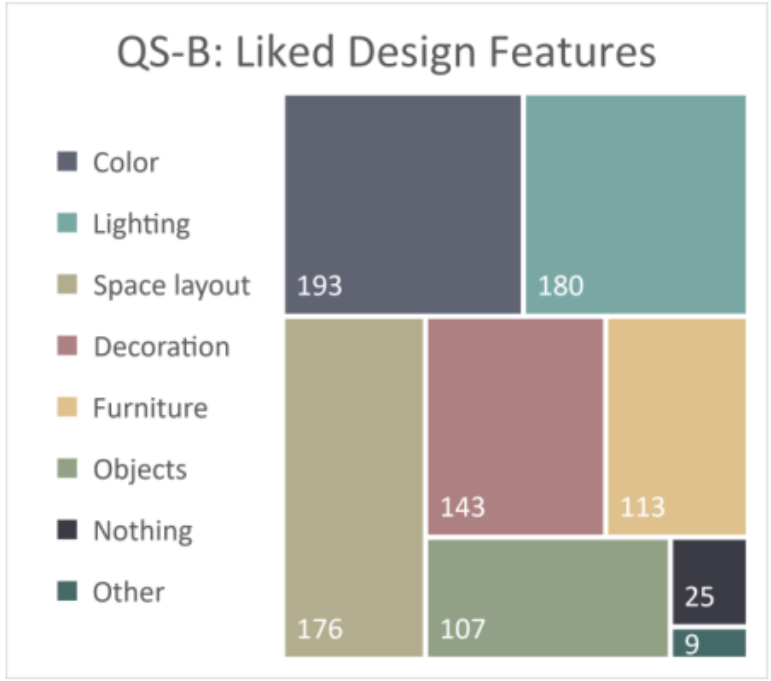
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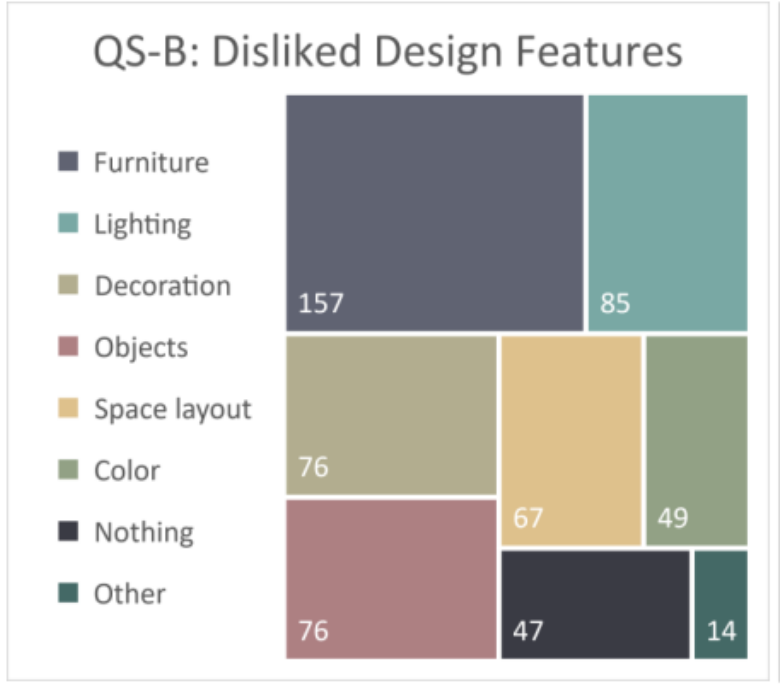
QUIET SPACE B





1 = Not at all relaxing; 5 = Very relaxing; NO = No Opinion

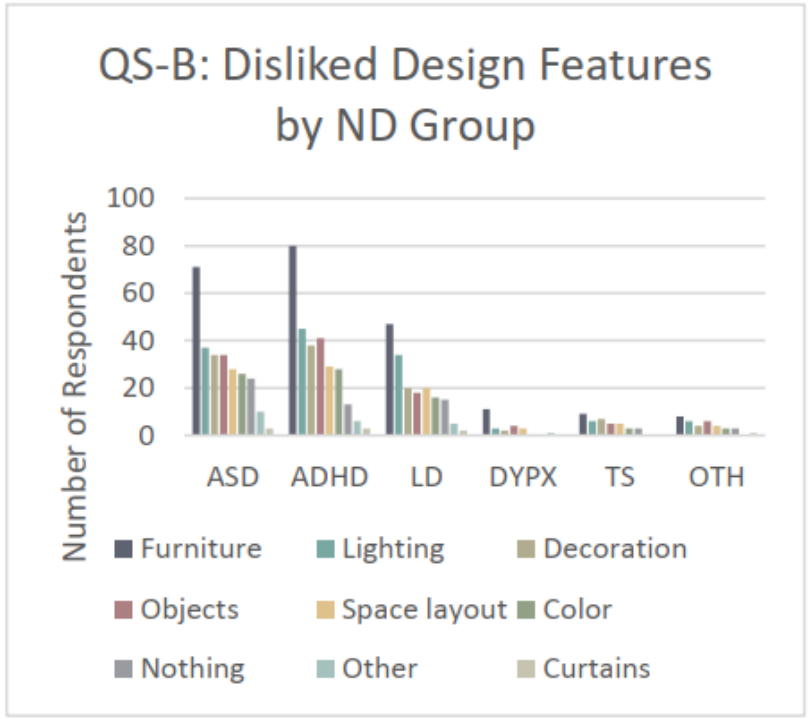


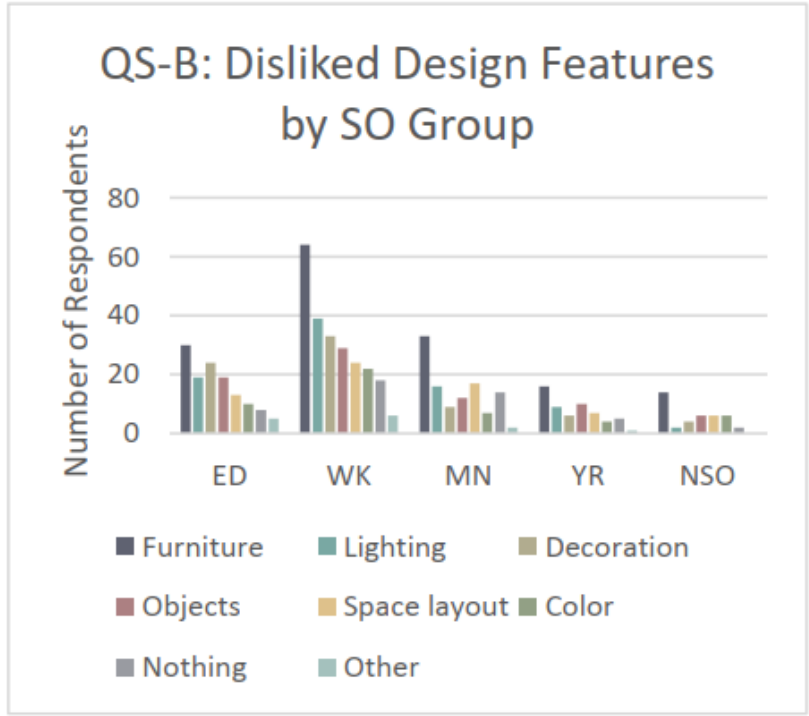


Survey Results

QUIET SPACE B



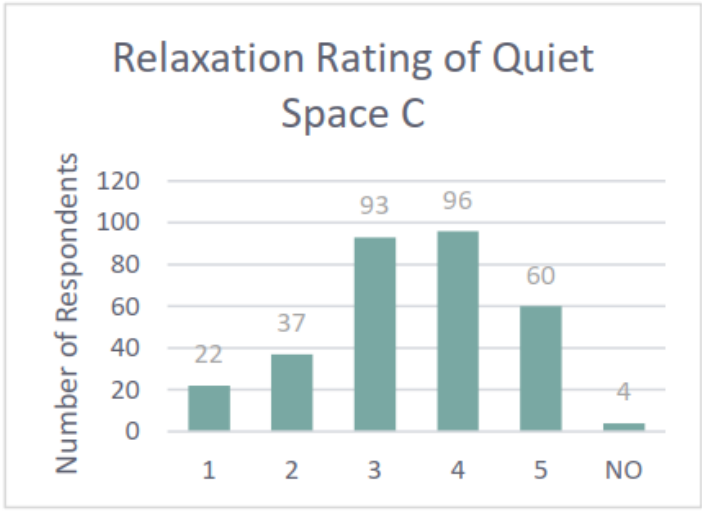




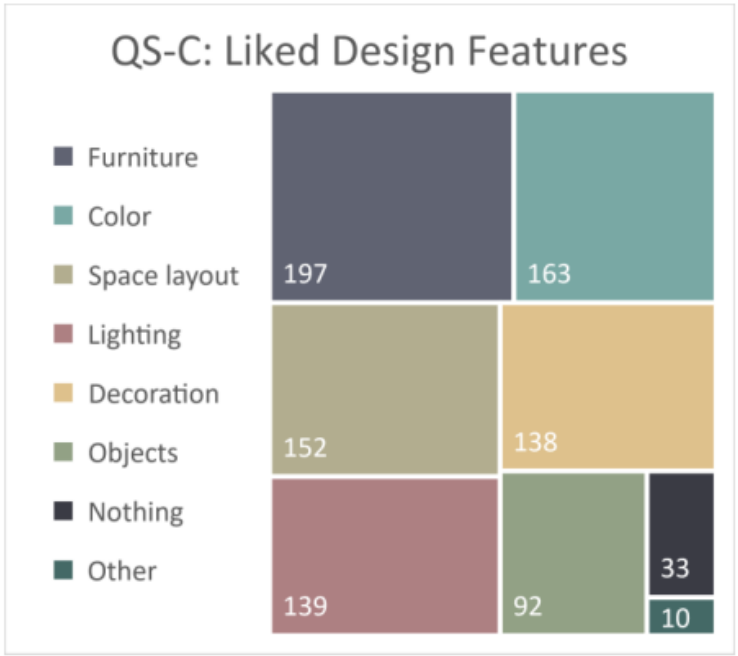
Survey Results

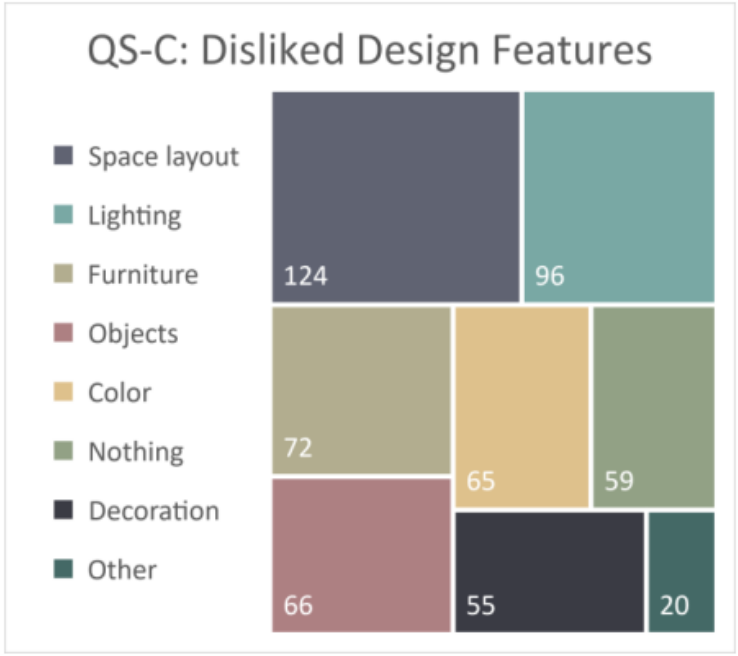
QUIET SPACE C





1 = Not at all relaxing; 5 = Very relaxing; NO = No Opinion

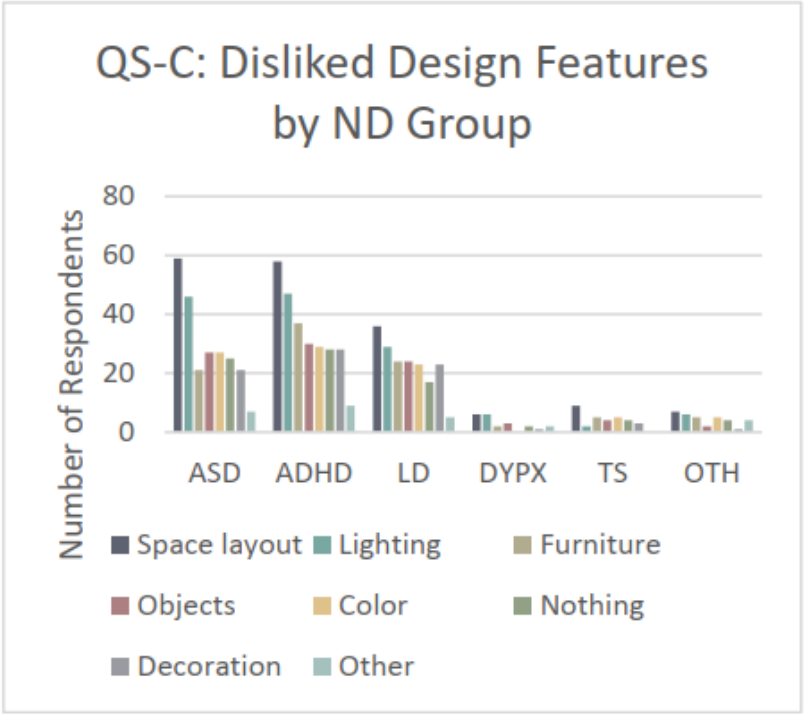


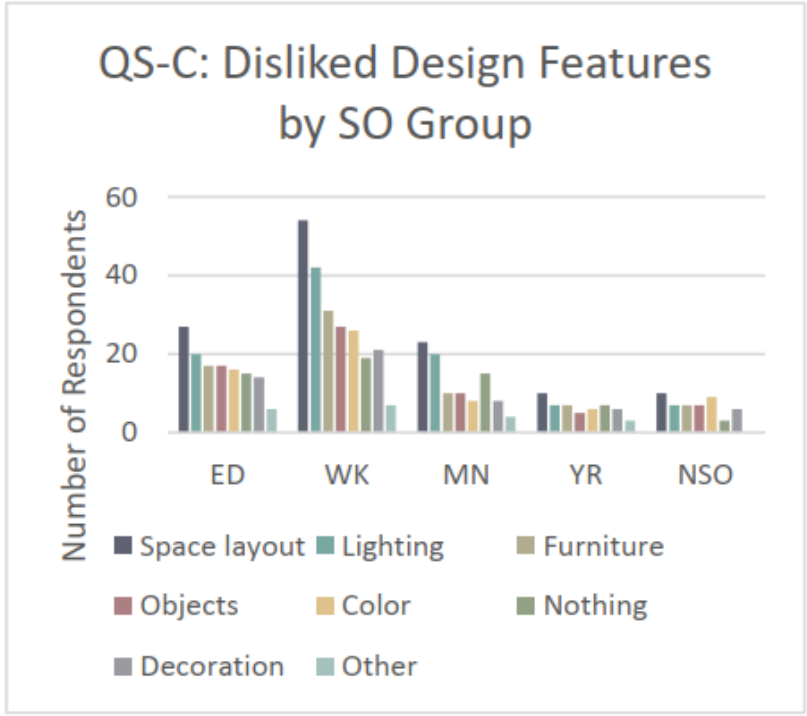


Survey Results

QUIET SPACE C

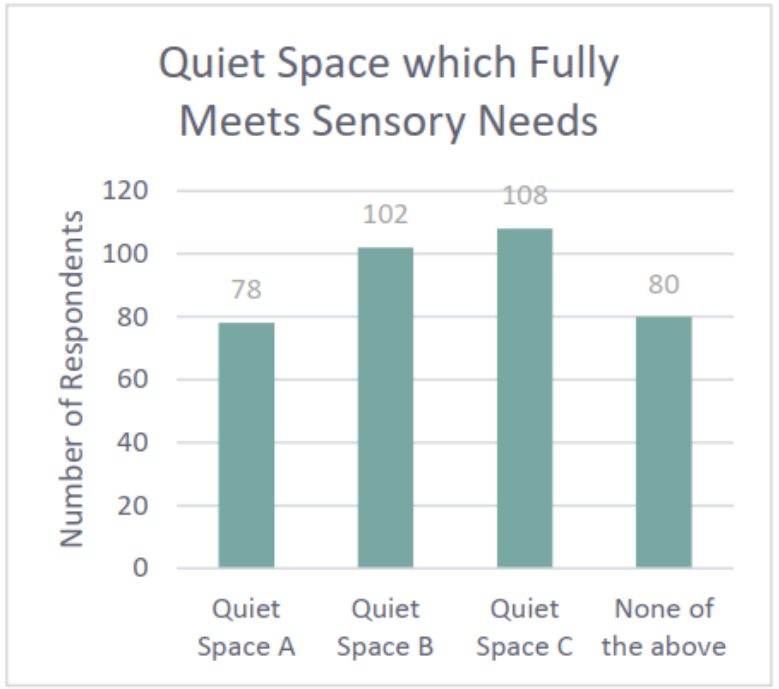


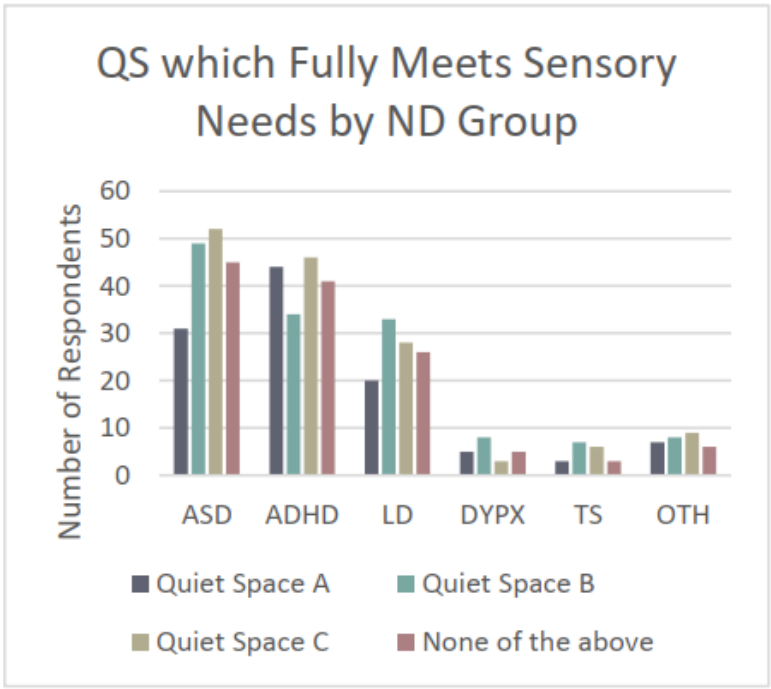




Survey Results

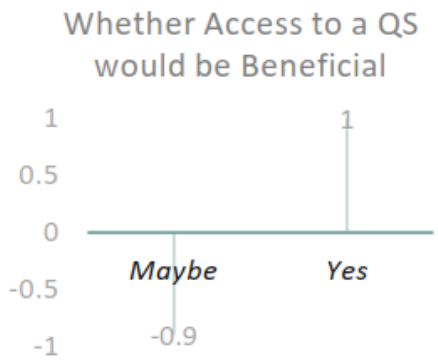
QUIET SPACES A-C

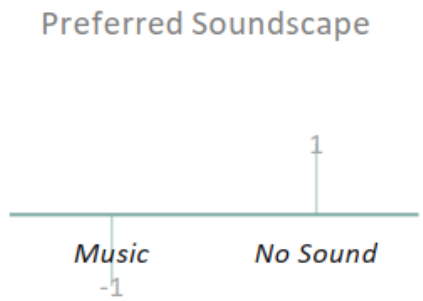


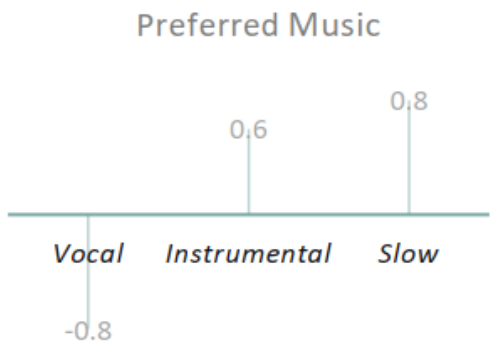


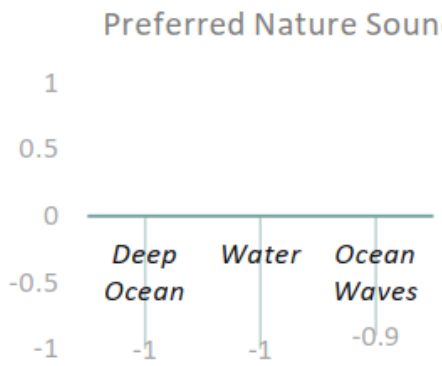
Correlations

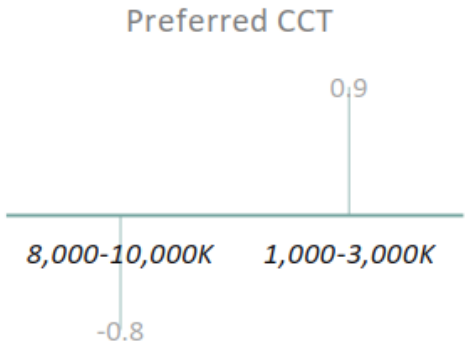
Correlation coefficients between the SO frequency of respondents and the percentage of them who selected a certain response

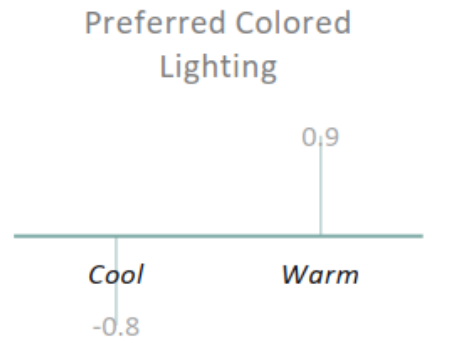


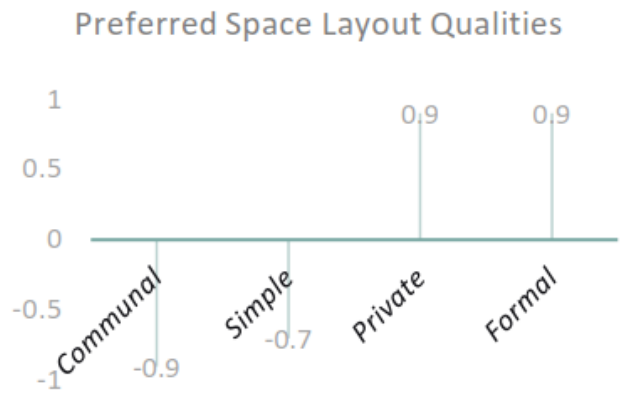


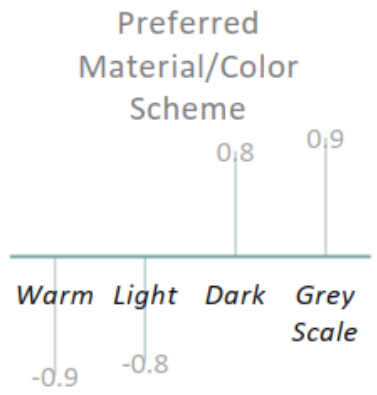


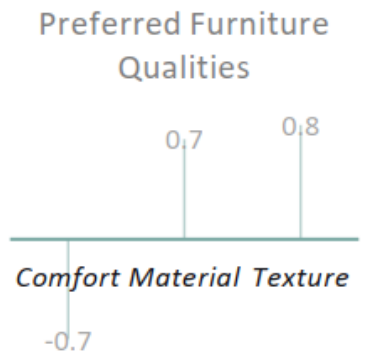












Conclusion

All neurodivergent and sensory overload frequency groups agreed:
Education is the most important location for implementing quiet spaces
Sound and lighting are the most important design features to consider
Comfort is the most important furniture quality
Fabric and wood are the preferred furniture materials
Plants are the preferred decorative elements
Nature is the preferred image type

Design Feature	Variety, Flexibility & Control
Sound	Provide optional sounds on an individual basis Provide earplugs or noise cancelling devices Provide individual capsules where people can select their desired soundscape
Lighting	Provide shades to control daylight and outside views Provide a variety of artificial lights for personal control (without the disturbance of others) Provide artificial lighting controls including dimmers and colour tuning
Space Layout	Provide individual capsules for increased optional privacy
Colour	Create visual separation if introducing colours or textures that may be too bright, too distracting or too rough for the most sensitive
Furniture	Provide a variety of furniture options including furniture with movement for self-regulation Provide furniture which is easy to move Provide access to items such as books and office supplies
Decoration	If providing decoration other than plants, make sure it is not visible from some areas of the quiet space
Thermal Comfort	Provide cool and warm objects to touch (ensure they do not influence the room temperature) Provide means of warming such as blankets
Olfactory	Provide objects with natural fragrance (ensure they do not spread the scent)

How to implement variety, flexibility and control by design feature

Conclusion

Design Feature	Baseline Design (Neutral)		Optional Additions by Choice*	
	Attributes	**Comments**	**Attributes**	**Comments**
Sound	No Sound	But not anechoic	Nature Sound	Avoid if simulated, monotonic or repetitive Preference for water sounds
	Good Acoustics	Low reverberation No audible echoes; use soft absorptive materials	Music	Provide a variety of options If in main space: soft, instrumental & slow
Lighting	Artificial Lights	Avoid fluorescent lights Provide low level indirect lights with warm CCT	Artificial Lights	Provide options for brighter lights and/or cooler CCT
	Daylight & Windows	Provide access to daylight & outside views	Coloured Lights	Preference for cool colours
Space Layout	Simple, Private, Informal & Cosy	Use attributes as guides in space layout design	Spacious & Communal	Provide more spacious and/or communal options
Colour	Natural	Use natural materials and colours abundant in nature (e.g. browns, greens, blues)	Light Colours (including White)	May be too bright for neutral space
	Few Colours / Muted Colours	May use for coloured walls Ensure space is not too bright, avoid glare Maintain low contrast & smooth colour transitions	Textures	May be too rough for neutral space
	Dark Colours (optional)	For a separate section of the quiet space May assist in providing visual relief	Warm Colours	May be too distracting for neutral space
Furniture	Comfort & Texture	Most important furniture qualities to consider	Variety	Provide a variety of furniture options
	Chairs, Pillows, Bean Bags, Tables & Blankets	Ensure comfortable & accessible seating options	Books & Office Supplies	Provide access to these optional items
	Fabric or Wood	Preference for these furniture materials	Movement in Furniture	Provide furniture with movement (e.g. bouncing, rocking, swinging) Ensure no visual disturbance
Decoration	Plants	Avoid extreme elements (e.g. spikes, sharp edges, strong contrast patterns)	Images	Provide images of nature Consider images of abstract art
Thermal Comfort	Cool Environment	For regulating body temperature	Cool Materials or Objects, Warming Objects	E.g. cool stone to touch, cold or warm water to drink, blankets
Olfactory	Avoid Scents	Avoid introducing scents into the space	Objects with Natural Fragrance	Objects with natural fragrance which do not emit fragrance to the space
	*Optional additions by choice should either be available in a space that is visually and if possible, acoustically separate from the main space or upon individual request or choice. It should be ensured that their use does not disturb other users of the space.			

Summary table of design features to consider when designing a quiet space. The baseline design caters for hypersensitive needs whereas optional additions by choice cater to hyposensitive needs.

Future Research

- Confirm study results in a physical experiment with physiological data (e.g. blood pressure, heart rate, cortisol levels)
- Include additional design features (e.g. olfactory)
- Investigate the design preferences of additional populations which may be susceptible to sensory overload, for instance people who suffer from migraines, Generalized Anxiety Disorder (GAD) or Posttraumatic Stress Disorder (PTSD).

Contribution

BSI PAS 6463:2021 *Design for the mind – Neurodiversity and the built environment - Guide*