

Sensory Design Guidelines

Inclusive Children's Treatment Centres

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Submitted to OCAD University in partial fulfilment of the requirements for
the degree of Master of Design in Inclusive Design.

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Abstract

The social model of disability recognizes that disability is caused by systematic barriers within society, not by an individual's impairments or difference, that result in a mismatch between an individual and their social environment. An inclusive environment is one where people of all differences can experience equitable participation and a sense of belonging. Children's treatment centres are integral in supporting special needs children and youth aged 0 to 19 to live at their full potential by providing specialized services, programs, and treatments. The design of these spaces can facilitate or impede the experiences, well-being, and treatment of the children that they serve. Although these treatment facilities seek to provide an inclusive environment, the diversity and complexity of special needs poses a challenge to designing spaces that provide equitable use while fostering diversity and inclusion. Current building codes and guidelines, which aim to improve access for all individuals with disabilities, place a large emphasis on physical accessibility throughout a building and its facilities. However, they fail to address less visible cognitive and sensory needs.

The *Sensory Design Guidelines: Inclusive Children's Treatment Centres* intends to address these challenges and propose guidelines for designing inclusive sensory environments in children's treatment centres with the goal of improving the experiences, well-being, and treatment of special needs children and youth. Specifically, through the development of a sensory environment matrix, it will address auditory, visual, tactile, olfactory, and proprioceptive design attributes within five main categories: wayfinding and navigation, public gathering spaces and amenities, recreational spaces, treatment spaces, and transitional spaces. Throughout the research process, there has been extensive consultation with children and youth, parents, therapists, staff, and architects to ensure that the voices and perspectives of both individuals with lived experiences and experts are represented in the research and development of the guidelines. In particular, the use of participatory research methods including interviews and co-design sessions provided opportunities for participants to share their experiences and imagine how future treatment centres might be designed.

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All participating children, youth, parents, therapists, staff, and architects

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MITACS

Mitacs Accelerate Program

Dedication

This research is dedicated to the children and youth at Grandview Kids who inspired this project.

Table of Contents

1	Chapter 1: Introduction	12
	Context of the Project	13
	Children and Youth with Special Needs	15
	Children's Treatment Centres	17
2	Chapter 2: Literature Review	20
	Experience Through the Senses	21
	How Environments Shape Us	24
	Design for Inclusion	27
3	Chapter 3: Methodology	31
	Approach to Research Design	31
	Observations	32
	Semi-structured Interviews	33
	Co-designs	34
4	Chapter 4: Discussion of Findings	42
	Framing Meaningful Spaces	43
	Understanding the Experiences and Needs of Special Needs Children and Youth	44

5	Chapter 5: Design Guidelines	53
	Guiding Design Principles	53
	Using the Guidelines	54
	Wayfinding & Navigation	56
	Information Systems	57
	Public Spaces & Amenities	62
	Waiting Room	63
	Washroom	69
	Transitional Spaces	73
	Hallway	74
	Elevator	80
	Treatment Spaces	84
	Treatment Room	85
	Recreational Spaces	92
	Sensory Garden	93
6	Chapter 6: Conclusion	99
	Limitations and Recommendations for Future Research	100
	References	104
	Appendix A: Semi-structured Interview Guide	108
	Appendix B: Co-design Session Facilitation Guides	113

List of Tables

Table 1. Table of Information Systems Sensory Profile. pp. 58-61

Table 2. Table of Waiting Room Sensory Profile. pp. 64-68

Table 3. Table of Washroom Sensory Profile. pp. 70-72

Table 4. Table of Hallway Sensory Profile. pp. 75-79

Table 5. Table of Elevator Sensory Profile. pp. 81-83

Table 6. Table of Treatment Room Sensory Profile. pp. 86-91

Table 7. Table of Sensory Garden Sensory Profile. pp. 94-98

List of Figures

- Figure 1. Model of Embodied Cognition. pp. 21
- Figure 2. Ranges of the Senses. (Malnar, et al., 2004). pp. 22
- Figure 3. Model of Action Setting. pp. 26
- Figure 4. Sensory Design Matrix. (Mostafa, 2008). pp. 29
- Figure 5. Bronfenbrenner's Ecological Model. (Eisenmann, et al., 2008). pp. 30
- Figure 6. Co-design prototype of a waiting room from co-design session one. pp. 35
- Figure 7. Co-design prototype of a multi-functional treatment room. pp. 36
- Figure 8. Conceptual plan of zones of activities and sensory qualities based on the room from co-design session two. pp. 37
- Figure 9. Ideation of zones of activities and sensory qualities from co-design session two. pp. 38
- Figure 10. Context plan setup for co-design session three. pp. 40
- Figure 11. Table activity setup for co-design session three. pp. 40
- Figure 12. Ideation of sensory features from co-design session three. pp. 41
- Figure 13. Sensory Profile Legend. pp. 54
- Figure 14. Diagram of Information Systems Sensory Profile. pp. 57
- Figure 15. Diagram of Waiting Room Sensory Profile. pp.63
- Figure 16. Diagram of Washroom Sensory Profile. pp. 69
- Figure 17. Diagram of Hallway Sensory Profile. pp. 74
- Figure 18. Diagram of Elevator Sensory Profile. pp. 80
- Figure 19. Diagram of Treatment Room Sensory Profile. pp. 85
- Figure 20. Diagram of Sensory Garden Sensory Profile. pp. 93

Collaboration

This research collaboration emerged as a response to Grandview Kids' interest in partnering with the Master of Design in Inclusive Design Program at OCAD University to develop design research and strategies for the new Grandview Kids building in Ajax, Ontario. As a result of the collaboration, the *Sensory Design Guidelines: Inclusive Children's Treatment Centres* (Pui Yee Nikkie To) and the *Transitional Support System for Children's Treatment Centres* (Grace Mendez) were developed to be complementary documents to aid in the development of new buildings, the renovations of existing buildings, and the implementation of support systems to better serve special needs children and youth.

This research is made possible with funding from Mitacs through the Mitacs Accelerate Program. The research presented here is the result of all of the participating communities and their continued dedication to supporting children and youth.

Chapter 1: Introduction

Children's treatment centres across Ontario serve children and youth with physical, neurodevelopmental, communication, and complex medical needs. Designing treatment facilities that respond to the diverse needs of every child and youth is essential to providing positive experiences, a sense of well-being, and effective treatment. This chapter outlines the context of this research project through a focus on understanding children and youth with special needs and the role of children's treatment centres.

Context of the Project

Problem Statement

Children's treatment centres across Canada provide essential services that support children and youth with special needs who seek to participate fully in all dimensions of everyday life. Understanding the diverse needs of the children and youth who are seeking services is a necessary part of addressing the needs of the community and providing excellence in pediatric rehabilitation. Yet the design of these environments often fail to respond to the complex sensory needs that are prevalent in this population. Although current building codes and guidelines aim to improve access for all individuals with disabilities, they largely emphasize physical accessibility throughout a building and its facilities, while falling short in addressing less visible cognitive and sensory needs (Canadian Commission on Building and Fire Codes, 2015; Accessibilities for Ontarians with Disabilities Act Alliance, 2020). Further, the diversity of special needs poses a challenge to designing spaces that provide equitable use while fostering diversity and inclusion. Treatment facilities that recognize and respond to diverse sensory needs help support mental health,

behaviour, social connection, concentration, motor coordination, access to information, and confidence.

Research Objective

This research aims to address these challenges and propose guidelines for designing inclusive sensory environments in children's treatment centres with the goal of improving the experiences, well-being, and treatment of special needs children and youth. It will address proprioceptive, auditory, visual, tactile, and olfactory design attributes through the development of sensory profiles for five main categories:

1. Wayfinding & Navigation

Systems of information that assist users to orient themselves and navigate through complex environments such as maps and signage.

2. Public Gathering Spaces and Amenities

Public spaces that offer communities with opportunities to gather, socialize, engage, and access essential facilities such as waiting areas and washrooms.

3. Transitional Spaces

Spaces used to connect different areas throughout a building such as hallways and elevators.

4. Treatment Spaces

Spaces used to provide essential services such as clinical therapy rooms and snoezelen rooms.

5. Recreational Spaces

Spaces used to facilitate physical activity, play, and leisure such as therapeutic playgrounds and sensory gardens.

This research is a collaboration with Grandview Kids Children's Treatment Centre in anticipation of the development of their new treatment centre in Ajax, Ontario, and will inform the centre's design, serving as a demonstration plan for the design guidelines. This research is made possible with funding from Mitacs through the Mitacs Accelerate Program. The research presented here is the result of all of the participating communities and their continued dedication to supporting children and youth.

Research Question

How can the design of children's treatment centres respond to the complex sensory needs of special needs children and youth to promote and support positive experiences, well-being, and treatment outcomes?

Children and Youth with Special Needs

In Canada, over 540,000 youth have one or more disabilities; developmental and learning disabilities account for 60% of disabled youth (Statistics Canada, 2018). Children and youth with special needs experience challenges or delays in their physical, intellectual, emotional, social, language or behavioural development (Ontario Ministry of Children, Community and Social Services, 2020). Conditions can include one or a combination of cognitive, sensory, and physical disabilities such as Autism (ASD), Attention Deficit Hyperactivity Disorder (ADHD), Obsessive Compulsive Disorder (OCD), Down Syndrome (DNS), Bipolar Disorder (BPD), Blind and Low Vision (BLV), Deaf and Hard of Hearing (HoH), Mutism, Speech and Language Delay, Cerebral Palsy (CP), Spina Bifida, Paraplegia, Quadriplegia, Muscular Dystrophy (MD), Multiple Sclerosis (MS), and Arthritis (DSM-5, 2013; Our Kids, 2020).

Among school-aged children, 44.8% with one or more disabilities report a speech disorder, almost 25% have vision problems, and 8% have hearing loss (Statistics Canada, 2008; NCVH, 2011; Statistics Canada, 2016). Additionally, 5-16% of neurotypical

children and over 90% of children with autism spectrum disorder experience sensory processing disorder that affect their sensory systems: auditory, visual, tactile, smell, taste, vestibular, proprioception, and interoception (Owen, et al., 2013; Chang, et al., 2014). There are over 260,000 different variations in which an individual can be affected by sensory processing disorder and therefore, the needs of each individual can vary drastically. Sensory processing disorder can result in difficulties regulating responses to sensory stimuli, balance and motor coordination, and interpreting sensory stimuli (Star Institute, 2020). Challenges experienced when responding to sensory stimuli can result in sensory over-responsiveness, sensory under-responsiveness, and sensory craving. Balance and motor coordination can be impacted by postural disorder which impairs the perception of the body's position, or dyspraxia which impairs cognitive processes related to executing skilled tasks (Star Institute, 2020). When special needs children and youth face systematic barriers and cannot access the resources that they need, they are likely to experience negative impacts in the major aspects of their lives. 15% of youth with mild disabilities and 31% of youth

with severe disabilities are not in school or employed. Moreover, persons with disabilities often experience: lower rates of employment, lower incomes, and higher rates of poverty (Ontario Ministry of Children, Community and Social Services, 2020).

The paradigm of neurodiversity recognizes variation in the human brain as natural differences and offers a way to think about cognitive disabilities as existing on a spectrum (Singer, 1999). Understanding the challenges that special needs children and youth face is integral to the design of inclusive environments that support their full participation in their communities at all stages of their life. In particular, there is a need to better serve disabilities that are less visible such as cognitive disabilities. The Diagnostic and Statistical Manual of Mental Disorders (DSM-5) developed by the American Psychiatric Association, now in its 5th edition, is used as a diagnostic tool for the identification of mental disorders in the United States and Canada (American Psychiatric Association, 2013). However, the revisions made to the DSM-5 since its inception show that the criteria for many diagnoses, such as Autism, are subject to change as new research becomes available (Grandin, 2013). Moreover, since the 1960s, there has been a general shift away from the medical model of disability that considers an individual's impairments

as something that should be "fixed", instead shifting toward a social model of disability that acknowledges disability as a result of negative attitudes, exclusionary practices, and societal barriers (Goering, 2015). In response to design of exclusionary environments that reinforce barriers as well as recognizing the shift from diagnosis-based toward a needs-based approach to providing therapy and services, this research seeks to address inclusive sensory access in children's treatment centres to align with the needs of children and youth across all conditions.

Children's Treatment Centres

Beliefs & Values: We believe all children and youth with special needs live their best lives when families are at the centre of care, when service providers collaborate and act upon evidence, and when public policy is in alignment. We act with integrity and value shared leadership, collaboration, and change that makes a real difference in the lives of families.

– Empowered Kids Ontario, 2020

In Ontario, Empowered Kids Ontario represents the province's child development and rehabilitation sector, which is publicly funded by the Ministry of Children, Community and Social Services. There are currently 21 children's treatment centres across the province which provide family-centred pediatric assessment, treatment, rehabilitation services and specialized programs. They serve children and youth aged 0 to 19 with physical, neurodevelopmental, communication, and complex medical needs. The core services that they provide include the following:

- Adaptive Augmentative Communication
- Adaptive Equipment
- Audiology
- Behavioural Therapy
- Blind and Low Vision Clinic
- Cleft Lip and Palate Clinic
- Community Pediatrics
- Consultation and Assessment
- Developmental Pediatrics
- Family Education
- Infant and Child Development
- Infant Hearing Program
- Occupational Therapy
- Orthotics and Prosthetics Service
- Physical Therapy
- Psychology
- Respite Support
- Seating and Mobility Services
- Service Coordination
- Social Work
- Special Services at Home
- Speech and Language Therapy
- Therapeutic Recreation
- Transition from Pediatric to Adult Care

(Empowered Kids Ontario, 2020)

In 2016, children's treatment centres across Ontario served nearly 75,000 children and youth, totalling over 750,000 individual visits. The amount of time children, youth, and their families spend at treatment facilities totals 5,525,321 hours. Of those children, 51% were aged 0 to 4, 42% were aged 5 to 14, and 7% were aged 15 to 19 years old. Among those who were referred for service, 90% received assessments within 3 months, and 60% of those assessed received initial services within 2 months. The most common services accessed include speech and language therapy, occupational therapy, physiotherapy, and social work (Empowered Kids Ontario, 2020). It is important for children to access services early because diagnosis and intervention is most effective for children from birth to three years of age. Early intervention is shown to provide long-term positive outcomes and skills development (National Institute of Child Health and Human Development, 2020; Guralnick, 2016). However, one of the biggest challenges is a lack of access. There are still over 15,000 children and youth waiting to access services and this number is expected to grow (Empowered Kids Ontario, 2020). In response to this, there have been initiatives for the development of new buildings or renovations to existing buildings to accommodate the growing demand for services. Most recently in 2018, ErinoakKids opened three

new facilities in Brampton, Mississauga, and Halton (ErinoakKids Centre for Treatment and Development, 2020). Grandview Kids is also approved to receive funding for a new building in Ajax which will replace its current main facility. In 2017/18, Grandview Kids cared for 65,000 child, youth, and family visits and this number is projected to increase to over 91,700 by 2027/28 with only a 50% reduction in the waitlist. The new Grandview treatment facility intends to increase its capacity to care for 80,700 of these visits in the future (Grandview Kids, 2018).

"We just continue to grow and the building doesn't grow with us, so we learn to share." (Research Participant 2)

The scope of children's treatment centres have transformed dramatically. Originally, they largely served children with communication and physical disabilities such as those with speech language difficulties, cerebral palsy, and spina bifida. Over time, they began to serve a wider range of clients, including children with cognitive disabilities such as autism.

Designing children's treatment centres to meet the diverse needs of clients can improve their well-being and support the delivery of treatment. Successful treatment can help children become more independent by developing new skills. In turn, this can enable

increased access for children who are waiting for treatment, thus freeing up limited space and resources. Considering the need to increase capacity and the amount of time children, youth, and their families spend in these facilities, the design of these buildings must continue to evolve with the new and changing demands of the communities that they serve.

“The hardest part is the children who don’t get to come because we’re limited by space. We celebrate the children that come. I’m so happy for them, but I’m so sad for the ones that don’t come. If you don’t make change, if you don’t offer services early, you will make some change later, but you’re not going to have the same impact. It is the dignity of the child.” (Research Participant 2)

The time that children and youth spend accessing services provided by children’s treatment centres is significant in shaping their growth. The process of designing these spaces provides a unique opportunity to examine the functions that these spaces perform in this growth so that they can be better designed for those functions.

Grandview Kids

Through this collaboration with Grandview Kids on this research project, it is intended that the guidelines will be referred to in the building’s design, and will act as the demonstration plan for how the guidelines can be applied. This research seeks to uphold Grandview Kids’ vision – for every child and youth to live life at their full potential. Their hope for the new children’s treatment centre is to “support the seamless and coordinated provision of family-centered care for children and youth with special needs and their families – an open, welcoming and inclusive community based facility supporting an integrated mix of rehabilitation and clinical services, education and research activities” (Grandview Kids, 2018).

Chapter 2: Literature Review

This chapter presents the theories and concepts that frame research about sensory environments and identifies its affordances in the design of inclusive children's treatment centres for special needs children and youth. The approach of the literature review places emphasis on theories of sensory perception, behaviour setting, and well-being in the context of the built environment, and provides a framework for examining how sensory environment design strategies can align with the functional objectives of treatment facilities.

Experience Through the Senses

Human experiences are fundamentally connected to their environments. The surrounding natural and built environments actively shape the way people perceive, think about, and experience the world (Goldhagen, 2017). Disciplines of study and theories that explore how environments influence human experiences provide insight into the ways healthcare settings can benefit the well-being of special needs children and youth. Since the late 1960s, ecological psychology, also known as environmental psychology, emerged as a cross-disciplinary field that examines the relationship between humans, behaviour, and environments with an emphasis on improving individual well-being within the broader societal context (Devlin, 2018). Embodied cognition emerged as a leading framework that supports concepts within ecological psychology. The

embodied model, depicted in Figure 1, is the theory that an individual's cognition, decision-making, and actions are shaped by their unique psychological and physical composition (Goldhagen, 2017). The term *embodied* refers to the view that cognition is grounded in the body and its sensorimotor capacities which are inherently situated in the surrounding environment (Varela, et al., 1992). The embodiment approach was in reaction to the Cartesian dualism that some philosophers of cognitive science observed during the early days of the cognitive revolution that treated cognition, sensation, and perception as less closely coupled. Through the process of dynamic interaction (perception-action) in an environment, an individual can acquire knowledge about a given situation and formulate actions based on that knowledge.

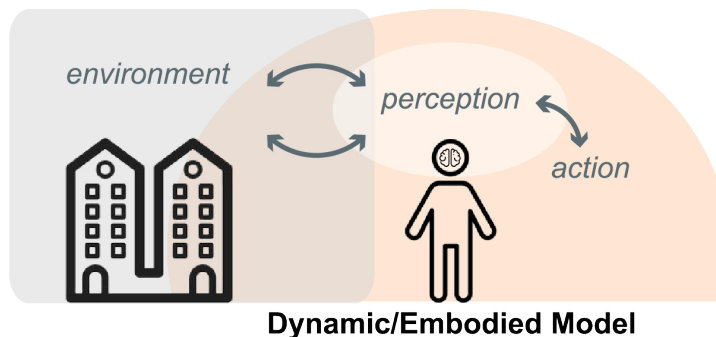
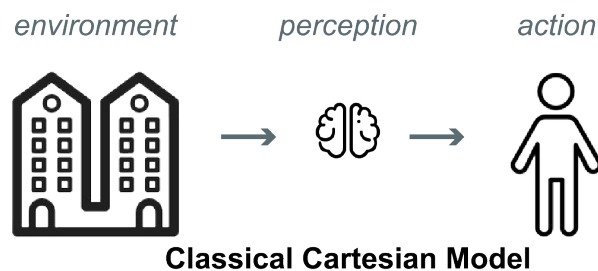


Figure 1. Classical Cartesian Model and Dynamic/ Embodied Model

The five basic senses – sight (visual), hearing (auditory), touch (somatosensory, tactile), smell (olfactory), taste (gustatory) – are the ways people engage with the world. Figure 2 illustrates the attributes of each sense. The sense of sight can detect shape, size, colour, space, depth, and motion. Hearing can give a sense of localization and distinguish pitch and volume. Passive or indirect touch is related to the sense in the atmosphere such as air pressure, temperature, and humidity whereas active or direct touch is related to the sense of contour, vibration, and surface quality such as temperature, roughness or softness, and hardness or softness. Smell can recognize complex scents such as floral, spicy, and pungent. The sense of smell is also closely connected to the sense of taste and works together to determine flavours such as sweet, sour, bitter, salty, and umami (savory) (Lupton, et al., 2017).

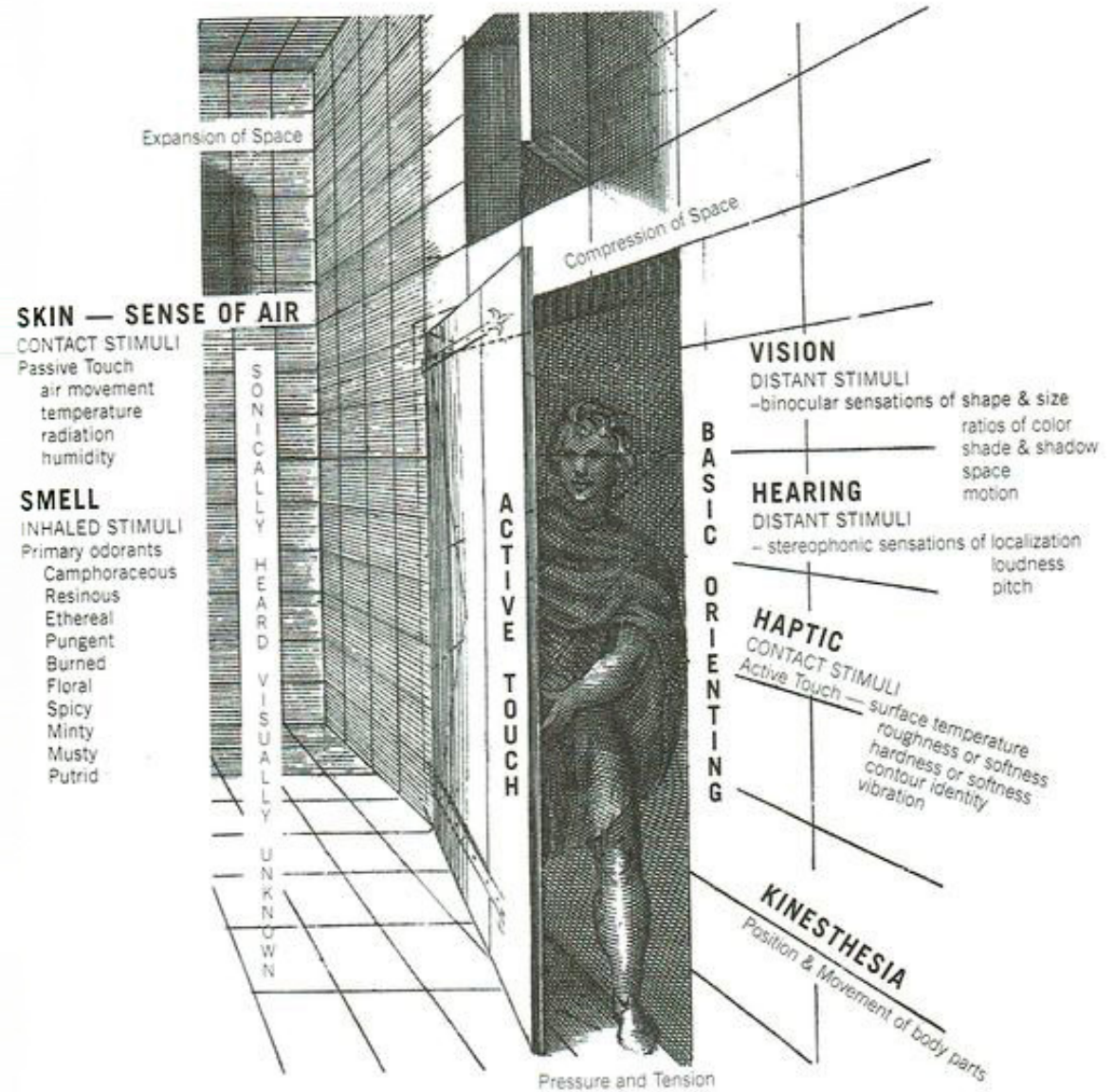


Figure 2. Ranges of the Senses. (Malnar, et al., 2004).

Sensory perception is the ability to receive information from the environment and form an understanding through one or a combination of the senses. It is knowing that a building is far away because you can visually perceive distance or knowing that an elevator is moving because of the vibrations. The senses are constantly engaged and receiving information both passively and actively. If there is music playing in a room, someone can passively listen to the music and hear it as a sound playing in the background, or they can actively listen to the music, focusing on the melody, rhythm, or lyrics. In addition to the five basic senses, the sense of proprioception or kinesthesia is equally important in the experience of an environment. Proprioception is the sense of understanding one's own position and movement of the body – this includes the sense of equilibrium and balance. A common example of proprioception is knowing that your hand is raised above your head without looking. Theories around environmental stimulation considers environmental sensory input as simple (i.e. light, colour, sound, noise, temperature) and complex (i.e. the combination of inputs as in a whole building or neighbourhood) which can vary in intensity, duration, frequency, and source (Gifford, 2007). Sensory cues can improve a person's experience such as exposure to natural sunlight to improve mood. It can also diminish a person's

experience such as constant exposure to the sound of heavy traffic contributing to stress and agitation.

How Environments Shape Us

Engagement through the senses with the world can be described through the perception-action cycle, which is the ongoing process of sensing the environment to inform actions and behaviours. J. J. Gibson, who developed Affordance Theory, shows that objects and environments are perceived beyond simply their form and spatial relationships, to having “affordances” that provide opportunities or the possibility for certain actions (Gibson, 1979). People perceive according to the available ambient, ecological information around them, wherein sensory cues indicate possibilities for certain action that are more likely than others. An environment or object can have multiple affordances for interaction, such as a fire which can afford a user warmth as well as produce light (Clark, et al., 2006). Moreover, an environment consists of both physical and social attributes which cannot be perceived separately. In an environment, physical attributes form the basic functional affordances in which an individual will interact with such as surfaces, greenery, and terrain (Clark, et al., 2006). Through affordance theory, objects and environments can be designed to provide social conditions in which humans will respond well and develop healthy behaviours that contribute to positive experiences.

Behaviour Setting Theory, developed by Baker in 1968 argues that human behaviour is situated in context, place, and time, wherein the environment presents a setting that influences the likelihood for certain behaviours to occur over others (Wohlwill, 1970; Barker, 1968). Building on Barker’s work, “action setting” emerged as a concept that the arrangement of a space, and how it interacts with an individual, constrains and directs the individual’s actions. An individual’s environment and its action setting has been shown to more accurately predict behaviour compared to the individual’s psychological profile alone. The human experience can be understood as being situated within an action setting, wherein the action setting is the boundary in which certain behaviours are more likely to occur. Figure 3 provides a model of an action setting that is made up of three components: (1) in the body – the individual’s psychological and physical profile i.e. their body (2) the natural world/ physical environment (3) the social world – which is made up of the social relationships, cultural milieu, and historical context (Goldhagen, 2017). These three components together form the conscious and nonconscious cognition and patterned behaviour of an individual. An action setting

can influence an individual's behaviour such as in the case of children playing on a jungle gym at a park. A child can engage with the jungle gym depending on the designed affordances of the structure – monkey bars allow children to swing and climb from them. Moreover, cultural practices may influence the types of games that the children play, such as a game of “tag” – the games played in one culture may differ from another's. Further, a child's physical body lets them understand and participate in the game – the child has an understanding of the rules of the game and can physically engage in the game through their body. The behavioural outcome is *play*.

The field of environmental psychology has also emphasized the importance of environments in establishing individual well-being. The dimensions of health and well-being of children include cognitive development, physical health and well-being, mental and emotional health and wellbeing, social relationships, and economic and material well-being. There are many ways in which an environment can positively contribute to these areas of a child's life. This can include places activated through public art that encourage informal learning for the cognitive development of children. Accessible and safe environments can also support an active lifestyle and

physical safety. Environments can also be designed to support self-regulation and therapeutic landscapes can aid in reducing stress and anxiety. Providing child-friendly public spaces that connect communities presents opportunities for children to develop social relationships. Lastly, access to adequate housing and resources is greatly important in terms of economic and material well-being and a healthy lifestyle (Child Health BC, 2013).

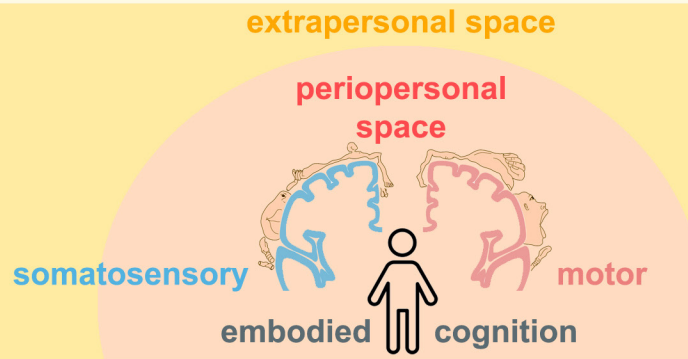
social world

*social relationships,
cultural milieus &
historical context*



human body

*individual psychological
& physical profile*



natural world

physical environment



action setting

*boundary of
appropriate behaviour*

Figure 3. Model of Action Setting

Design for Inclusion

Kat Holmes describes how simple choices in design can impact the usability of a designed object in a way that may pose a barrier to or meet the needs of its user (Holmes, 2018). In the same manner, there are also often mismatches between people and the places where they live, work, go to school, play, and so on. As described in the earlier section Experience Through the Senses, it is understood that people engage with the world through their basic senses; In considering this, it is important to acknowledge that all children are unique in their physical, sensory, and cognitive abilities. In designing environments that serve human diversity, we need to consider all the ways in which humans and their experiences through their senses vary. Sociologist Judy Singer first coined the concept of neurodiversity which recognizes the natural variance of the human brain which includes aspects of sociability, learning, attention, mood, and other mental functions. Moreover, approximately nine out of ten people with autism have one or more sensory disorders (Grandin, 2013). Sensory processing disorder is a condition of the brain to receive and respond to sensory stimuli. Special needs children and youth engage with the world in all the ways they can i.e. toes, eyes, tongue,

etc. The ways in which people perceive through their senses differs from person to person. For example autonomous sensory meridian response (ASMR) is the unintentional positive sensations on the skin often triggered by auditory and visual stimuli. Synesthesia is the cross-connection of senses such as relating numbers to colours, music to colours, or taste and colours. In contrast to a cross-connection of the senses, there individuals can also experience partial or full loss of one or more senses such as anosmia which is the loss of smell, colour blindness where an individual is unable to see certain colours such as colours with similar hues, blindness and low vision, deafness and hard of hearing, the loss of touch sensitivity, or challenges with speech and language (Lupton & Lipps, 2018). The heightened or partial to total loss of one or more senses in combination with the environmental context can make one's experience feel diminished or too much (hypo vs hyper). Sensitivity in one or more senses can make an environment threatening and intolerable, and impair the ability for a child to engage meaningfully in the world. For instance, it can make it difficult for a child to socialize if they can't practice recognizing the emotional meanings of facial expressions in

social settings because they can't stand to be in an environment like a restaurant (Grandin, 2013). In her book, *The Autistic Brain*, 2013, Temple Grandin offers practical tips for people experiencing sensory problems such as ways to reduce visual irritation from poor lighting, improve visual clarity and legibility, mitigate unpleasant sounds, and use deep pressure to help calm and desensitize an individual. In addition, the use of multisensory environments can support access through multiple sensory stimuli.

There has emerged several design approaches that aim to support accessibility to individuals with diverse sensory needs such as autism-friendly design that considers sensory needs, deafspace with a focus on visual access to support communication, tactile features in environments that support wayfinding for blind and low vision, and therapeutic landscapes that reduce stress and anxiety. Moreover, multisensory environments (MSEs) or snoezelen rooms which originated in the 1970s in the Netherlands have been widely used around the world as a therapy tool to provide a range of sensory stimulation for people with disabilities – autism, cerebral palsy, brain injury, dementia, mental health issues, and anxiety (Stephenson, et al., 2011). These rooms generally included objects that provide controlled

sensory stimulation through lights, sounds, tactile, and sometimes smell in a safe space (Fowler, 2008). Preliminary research has shown MSEs in clinical settings to reduce anxiety and challenging behaviours in patients with intellectual or developmental disabilities during clinical care, particularly those with sensory sensitivities in clinical settings (Breslin, et al., 2020). In a 2008 study, Magda Mostafa developed a guideline and sensory design matrix provided in Figure 4 that presents the relationship between sensory characteristics of the built environment and the variant spectrum of sensory issues found in autistic users. The research found that soundproofing in spaces used for autistic instruction helped attention span, response, and focus. Designated areas within learning spaces that allowed children to temporarily escape were also beneficial. These areas worked best when designed with a baseline neutral sensory environment that afforded additional stimuli to be accessed. Furniture arrangement also provided visual cues associated with specific activities. The evidence from this study demonstrates that the autistic user identifies the surrounding environment according to sensory zoning rather than conventional functional zoning (Mostafa, 2008).

		Sensory Issues															
		Auditory			Visual			Tactile			Olfactory			Proprioceptive			
		a	b	c	a	b	c	a	b	c	a	b	c	a	b	c	
ARCHITECTURAL ATTRIBUTE	Structure	A	1	2		1	2	1	2	1		1	2		2	1	1
		B	3	4	3	3	4								4	3	
		C	5	6	5	5	6	5	6	5					6	5	5
		D					7									7	7
		E	8			8										8	8
	Balance	F	9	10		9	10	9							9	10	9
		G					11									11	11
		H				12	13	13	12							13	13
		I				14	15	14							14		14
	Quality	J				17	16			18							
		K	19			19	20										
		L	21	21	21												
		M		22					22	23							
		N										24	25	24			
	Dynamic	O				26	26	26		26						26	26
P					27		27								27	27	
Q		28			28		28								28	28	

Figure 4. In the sensory design matrix, each architectural attribute, such as proportion, scale, symmetry, color, lighting and texture, is analyzed with respect to its capacity to respond to the various autistic sensory needs. (Mostafa, 2008)

Sensory Issues

a. Hyper b. Hypo c. Interference

Architectural Attributes

A. Closure

B. Proportion

C. Scale

D. Orientation

E. Focus

F. Symmetry

G. Rhythm

H. Harmony

I. Balance

J. Color

K. Lighting

L. Acoustics

M. Texture

N. Ventilation

O. Sequence

P. Proximity

Q. Routine

The social ecological model illustrates the ecological system of a child's development (Bronfenbrenner, U., 1979). In the model, adjacent to a child's family are direct external influences that exist in the exosystem – this is where a children's treatment centre exists in a child's life. Because of its proximity of influence, for a child who relies on the services provided by children's treatment centres, it becomes an important place in a child's development and should therefore seriously consider how the sensory design of its environments contributes to the treatment and well-being of the child. Considering the significance of sensory disorders to disrupt and impair the daily experience of many children, this research seeks to go beyond thinking about the design of sensory environments as specific to MSEs, to consider all environments as sensory – being experienced through the senses. Sensory environments are an environment's cumulation of features that contribute to providing a holistic sensory experience that engages the auditory, visual, tactile, olfactory, gustatory, and proprioceptive sensory systems. This research identifies guidelines for the design of these sensory environments to respond to the spectrum of human sensory needs.

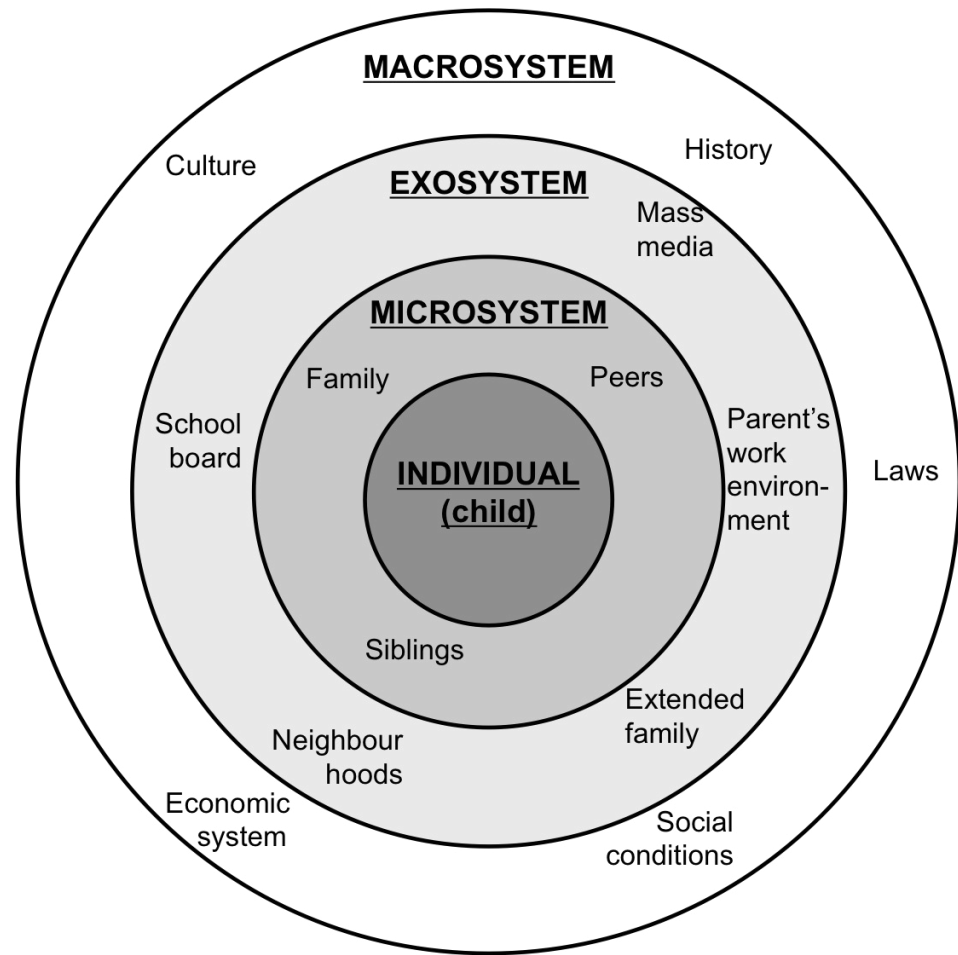


Figure 5. Bronfenbrenner's ecological model, showing all levels of the social world that affect the daily functioning of an individual. (Eisenmann, et al., 2008).

Chapter 3: Methodology

Approach to Research Design

At the core, is the idea people should design their homes, streets, and communities. This idea comes from the observation most of the wonderful places of the world were not made by architects, but by people.

– Alexander, et al., 1977

This research study implemented qualitative methods which were chosen to ensure that the voices and perspectives of individuals with lived experiences and experts were represented in the research and development of the design guidelines. Individuals with lived experiences and experts included children and youth, families, therapists, staff, and architects. The information gathered from observations, semi-structured interviews, and co-design sessions helped inform the development of the design guidelines for sensory environments of children's treatment centres. Grandview Kids and OCAD University Research Ethics Board reviewed and approved this research study. The OCAD University REB reference number is 101551. All participant data has been anonymized to ensure confidentiality. The interview guide and co-design facilitation guides are included in Appendix A and B.

Research Stages

1. Literature Review
2. Observations at 6 Locations
3. Semi-structured Interviews with 9 Participants
4. 3 Co-design Sessions

Observations

This was a staged research study. The first stage of the study consisted of secondary research with a literature review on the relationship between environments and wellbeing, the sensory experiences of special needs children and youth, and existing approaches to sensory design. Following the literature review, the primary collection stage began with observations.

Observations were conducted to gain a better understanding of how the various types of spaces within children's treatment centres are used. These observations took place at six locations across the Greater Toronto and Hamilton Area and included Grandview Children's Centre and Campbell Children's School, Oshawa; Grandview West, Ajax; Abilities Centre, Whitby; Ron Joyce, Hamilton; Holland Bloorview, Toronto; and Surrey Place, Toronto. In addition, there was a site visit to the proposed Grandview Kids site in Ajax.

Due to the sensitive nature of these places, observations included a combination of guided tours by staff members and therapists who work closely with children and youth, and extended observations for one to two hours in length in select public spaces. The types of spaces

observed included public spaces and amenities (front entry areas, waiting areas, washrooms), transitional spaces (indoor hallways, outdoor pathways, arrival and drop-off areas, parking lots, elevators), treatment spaces (clinical therapy rooms, classrooms, snoezelen rooms), and recreational spaces (indoor playrooms, outdoor therapeutic playgrounds, sensory gardens, therapy pools). During these observations, attention was paid to the people, objects, physical space and interactions within the environment. Data collection included note-taking and photographs of the physical spaces without people. The observations showed that families generally spend under 15 minutes in waiting areas. Waiting areas often lack a variety of toys and where there are toys, they are often not a main feature, but are placed aside by the walls. Children tend to seek opportunities for play and use their imagination when engaging with furniture, art, murals, and other features in their environment.

Semi-structured Interviews

The third stage of the study was a series of semi-structured interviews. The purpose of these interviews was to gain a better understanding of the experiences, challenges, and goals of the children and youth, parents, therapists, staff, and architects. The semi-structured interview format allowed participants to expand on the questions.

Overall, there were nine interviews conducted which included two children aged 5 and 7 with speech and language delays and challenges with mobility, one parent, two occupational therapists, one physiotherapist, five staff in various administrative and management roles, and three architects with experience in the design of children's treatment centres and who were involved in the preliminary planning of the new Grandview Kids building. Participants were recruited with support from Grandview Kids and colleagues from OCAD University. The length of each interview ranged from 60 to 90 minutes. The interviews encouraged participants to talk about insights including their experience of children's treatment centres, environments that presented challenges or supported a child's experience and well-being, preferences related

to sensory inputs, and what they would like to see in the new Grandview Kids building. The interview questions can be found in Appendix A. The data was collected through note-taking and audio recordings. The main themes that arose from these interviews included the negative impact of unwanted sounds travelling throughout a building that result in stress, poor concentration, and compromise confidentiality; the importance of visual and tactile elements throughout a building, especially in transitional spaces, to facilitate therapy and wayfinding; and the design of accessible environments that mimic aspects of everyday situations to help develop life skills that support the independence of children and youth as they grow up. The ideas and recommendations from the interviews helped to structure the co-design sessions of the research study.

Co-designs

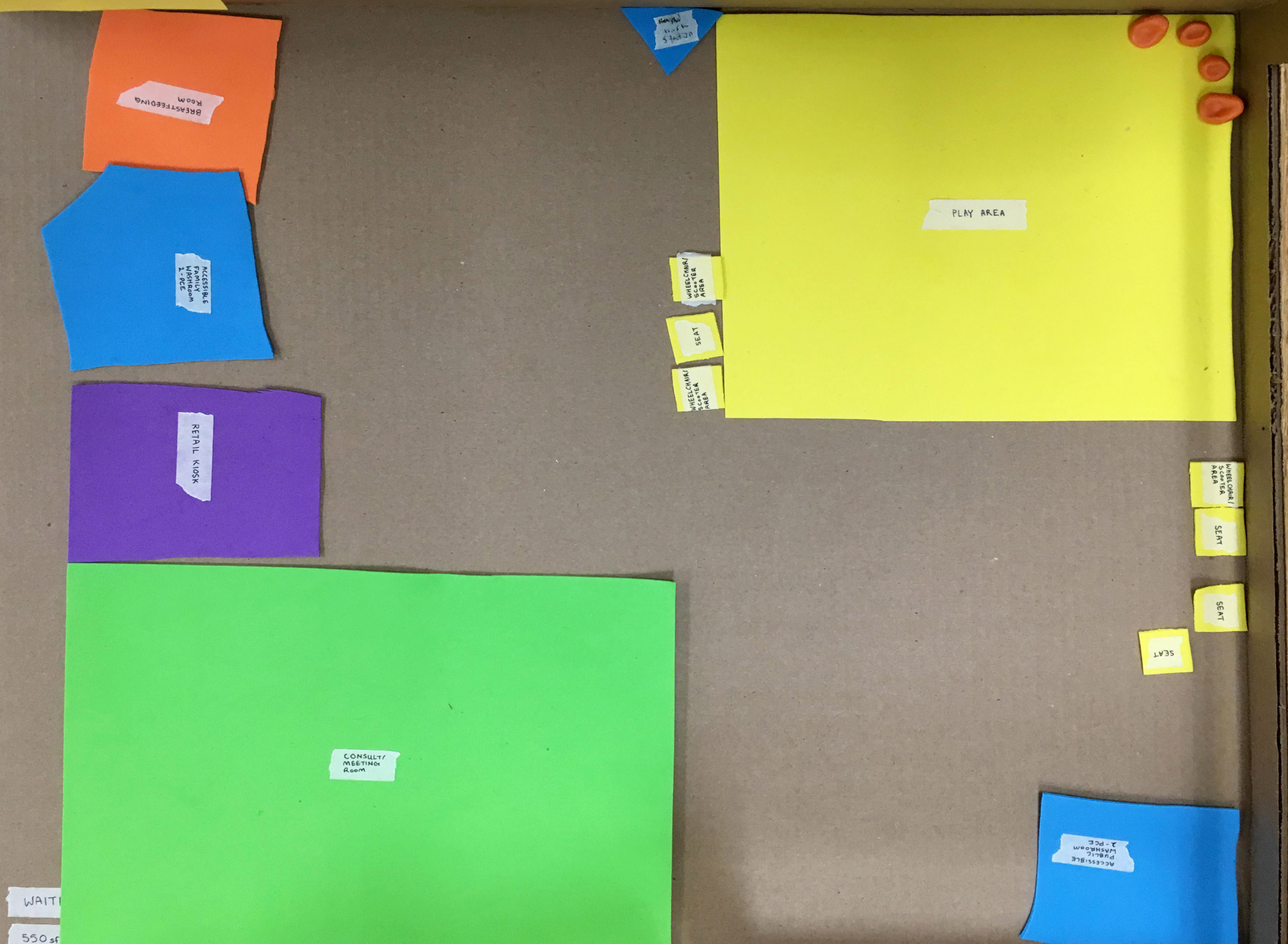
The fourth stage of the study consisted of three co-design sessions, where each co-design session informed the structure of the subsequent session. Co-design is a method of designing with participants and enables participants to make creative contributions based on their personal knowledge and lived experiences.

Session One

The first co-design session was developed based on findings from the initial literature review, observations, and semi-structured interviews. The purpose of the first session was to engage and encourage participants to represent their ideal of a children's treatment centre.

Participants included three youth aged 14 to 16 and two adult staff members (3 females and 2 males), all of whom were active members in many areas of the Grandview Kids community. The co-design session was 90 minutes in length and took place at Grandview Children's Centre in Oshawa. Participants were recruited with support from Grandview Kids. The materials provided included two general cardboard floor plans of one waiting room and one

multi-functional treatment room, foam sheet cutouts that represented required furniture and features of those rooms, and an assortment of legos and crafts materials. Participants were set up around one large table and were divided into two groups, each working on the design of either the waiting room or the multi-functional treatment room. Both groups were encouraged to use the materials provided to imagine and prototype their ideal design of these rooms. The session concluded with a discussion about the outcome of each prototype. The co-design facilitation guide for session one can be found in Appendix B. The data was collected through note-taking and video recordings. The main themes that arose from this co-design included the importance of multi-functional, adjustable, and rearrangeable furniture and equipment to reduce setup time between therapies; and the need for an array of features that could be implemented to engage with the senses and put away when not in use.



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Figure 6. Co-design prototype of a waiting room from co-design session one.

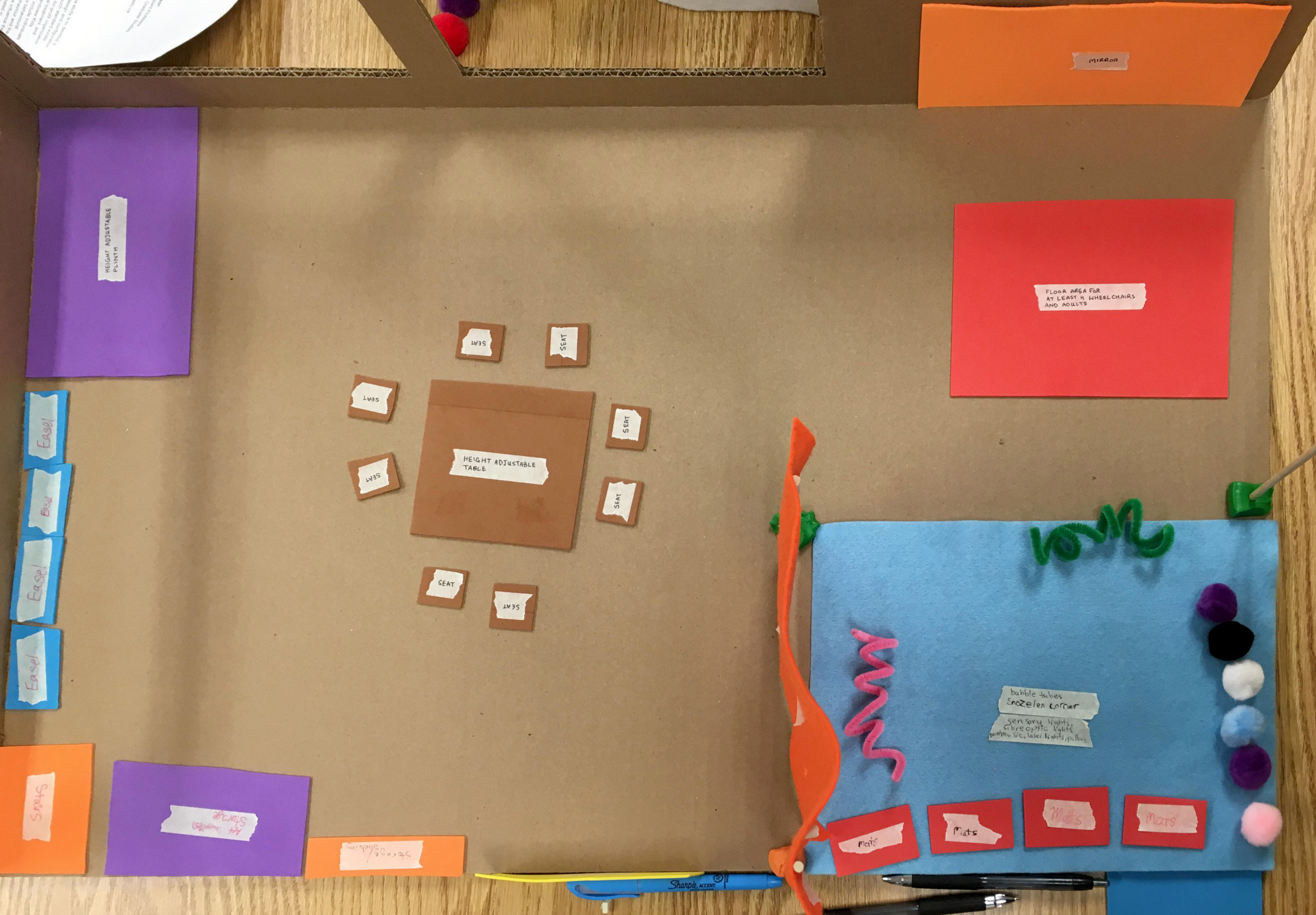


Figure 7. Co-design prototype of a multi-functional treatment room from co-design session one.

Session Two

The second co-design session was conducted to address the limitations of session one by developing prompt cards specifically related to the sensory experience of environments. The prompt cards developed from this session were then used as co-design materials in session three.

The co-design session involved seven members of OCAD University's Perceptual Artifacts Lab with experience in various fields of inclusive design. The length of the session was 60 minutes. The room was set up with five large sheets of paper taped to the wall with the following categories: zones of activity, auditory, visual, tactile, and olfactory. Participants were provided with post-it notes and markers to identify potential zones of activities that might be expected in a children's treatment centre as well as features within the sensory categories that are important to the design of an environment. The session concluded with a discussion about the activities and features that were identified. The co-design facilitation guide for session two can be found in Appendix B. The data was collected through photographs and the notes generated during the session.

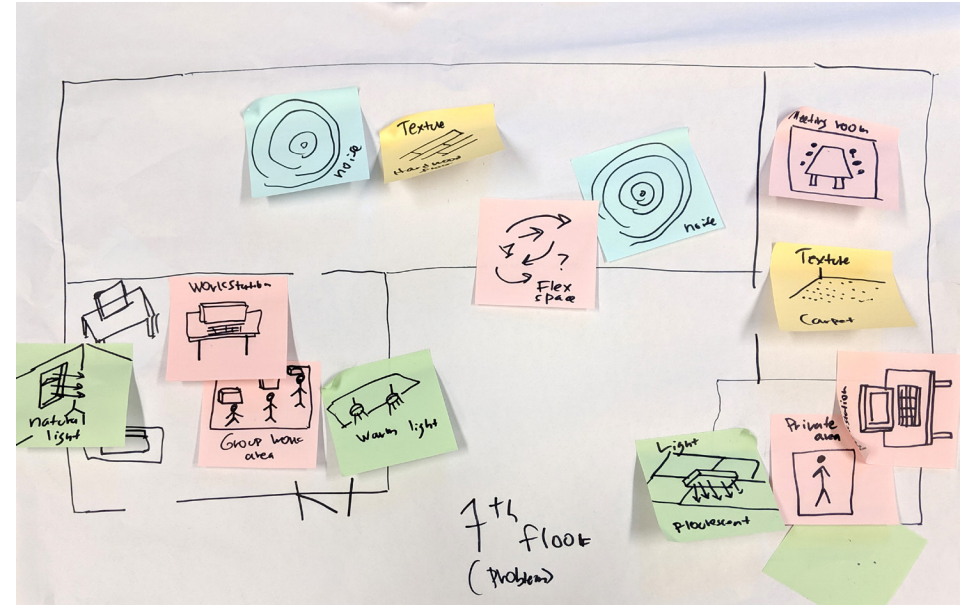


Figure 8. Conceptual plan of zones of activities and sensory qualities based on the room from co-design session two.

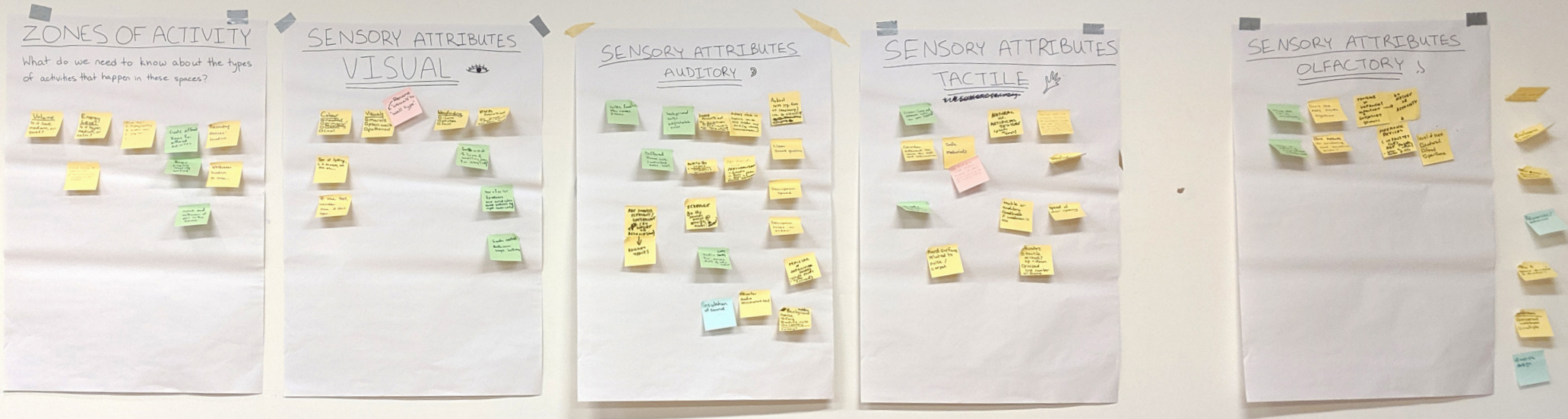


Figure 9. Ideation of zones of activities and sensory qualities from co-design session two.

Session Three

The third session of the co-design applied insights from the preceding literature review, observations, semi-structured interviews, and co-designs to gain a deeper understanding of the sensory considerations of special needs children and youth and to generate designs of sensory environments for the various types of spaces within children's treatment centres.

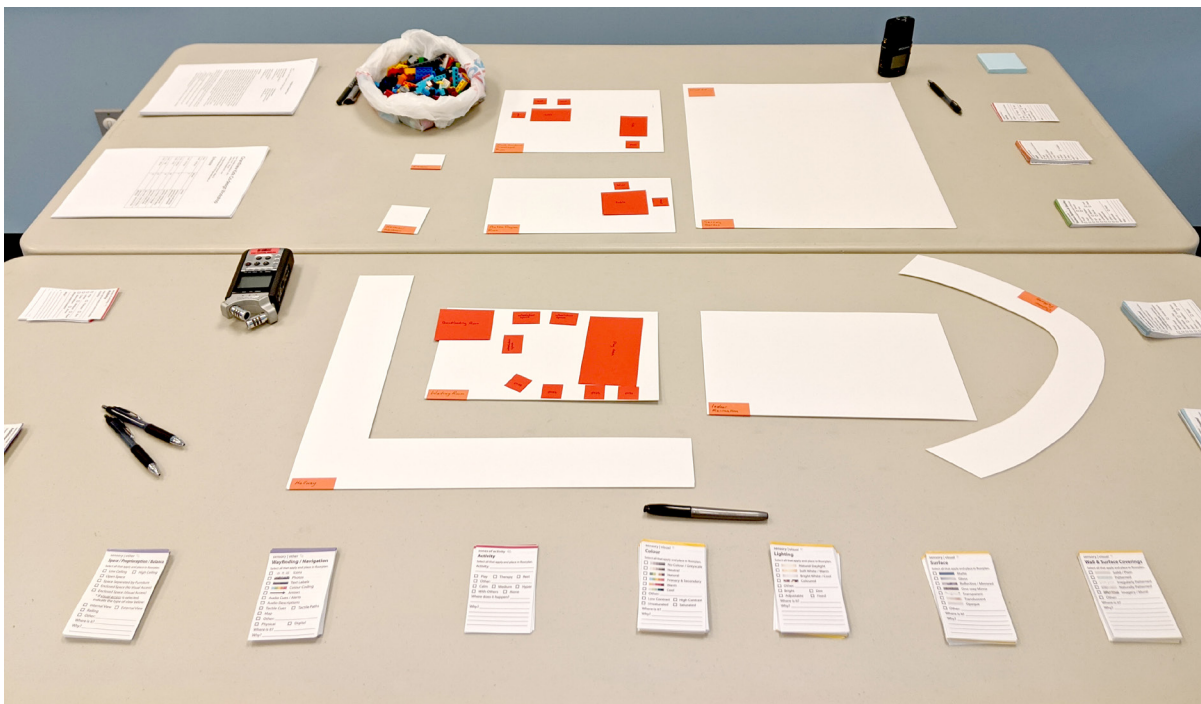
There were six participants overall which included one occupational therapist, one physiotherapist, two speech-language pathologists, one social worker, and one staff member who provides support to children and youth at Grandview Kids. The co-design session was 60 minutes in length and took place at Grandview West in Ajax. Participants were recruited with support from Grandview Kids. The materials provided included labelled cardstock cutouts that represented the four main types of spaces within children's treatment centres (1) public spaces and amenities (waiting area, washroom); (2) transitional spaces (indoor hallway, outdoor pathway, elevator); (3) treatment spaces (autism program room, multi-functional therapy room); (4) recreational spaces (indoor recreation area, outdoor sensory garden), and a large map of the proposed site. Several of the spaces also included paper cutouts

that represented required furniture and features of those rooms. Participants were provided with prompt cards developed from session two, post-it notes, and markers to indicate their sensory preferences for each of the spaces. The co-design facilitation guide for session three can be found in Appendix B. The data was collected through note-taking, photographs, audio recordings, video recordings, and the materials generated during the session. The main themes that arose from this co-design reinforced prior findings and included the need for clear and simple multi-sensory wayfinding features; noise as the primary sense that can impact the children the most; and the importance of multi-sensory features that engage children and youth throughout the building to support their experiences, well-being, and therapies.



Figure 10. Context plan setup for co-design session three. (top)

Figure 11. Table activity setup for co-design session three. (bottom)



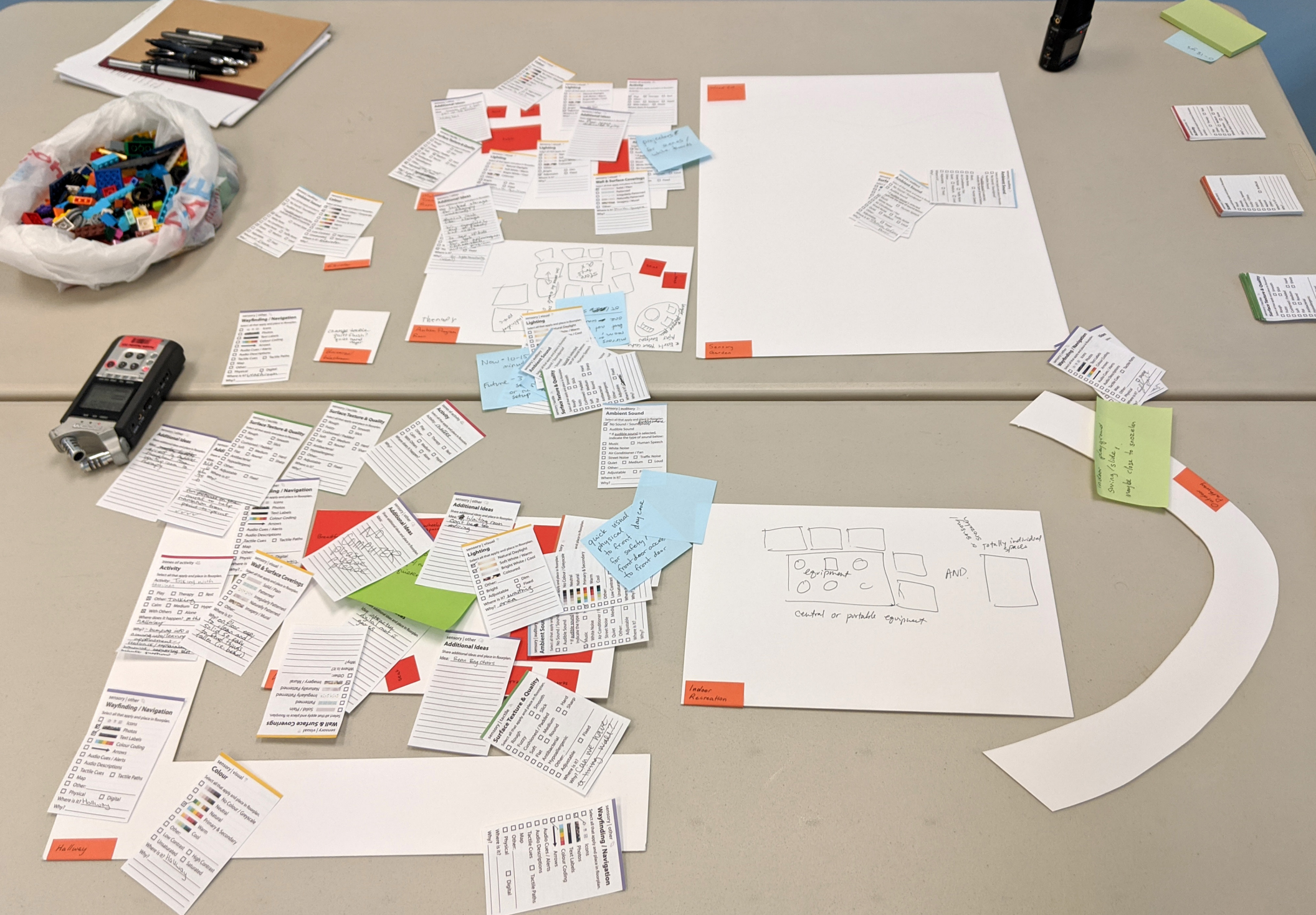


Figure 12. Ideation of sensory features from co-design session three.

Chapter 4: Discussion of Findings

This chapter presents the aggregation of the data collected from the observations, semi-structured interviews, and co-design sessions to inform the sensory design of children's treatment centres. This analysis will present the perspectives, experiences, and needs of participants and their community, and help to identify sensory design opportunities throughout the building to support positive experiences, well-being, and treatment.

Framing Meaningful Spaces

Well-being is an individual's state of comfort, health, and happiness and involves the positive emotional, physical, behavioral, social, and cognitive health of a child and youth (Devlin, 2018). The data collected underlines the importance of well-designed sensory attributes in the environment to support mental health, behaviour, social connection, concentration, motor coordination, access to information, and confidence in children and youth. From the response of all participants, a common theme that arose was the desire to empower children to live independently, be recognized and supported in their strengths, feel included, and to have opportunities for meaningful engagement in all aspects of their life. Participants identified the 6 F words derived from the World Health Organization's International Classification of Functioning, Disability and Health framework that are at the foundation of a child's goals and motivation throughout treatment (Rosenbaum & Gorter, 2011; Knowledge Hub, 2020).

Function: refers to what people do in their own unique way

Family: represents the essential 'environment' of all children that is founded on communication and trust

Fitness: refers to how children stay physically active

Fun: includes particular activities children are involved in or enjoy participating in

Friends: refers to social development and the friendship established with peers

Future: refers to parents' and childrens' expectations and dreams for their future

Therapists use these 6 F words to frame a child's therapy goals by seeking to understand what is most important and motivating for the child. This may be a child's desire to play with their peers, to go somewhere independently, or their aspirations for the future. It is important to align these concepts with the design of a treatment facility so that there are opportunities to grow and develop at every moment.

"My hope would be that the design of the new building would really reflect the values of the 6 F words. We should have family areas, fitness areas, fun areas, areas we can just chill out with your friends, and ways to talk about the future." (RP8)

Understanding the Experiences and Needs of Special Needs Children and Youth

Wayfinding & Navigation

The children, youth, and families who go to children's treatment centres come from a wide range of backgrounds, including ability, age, gender, culture, and language, and wayfinding systems need to provide information in many ways to serve the diversity of users. During the observation at the 6 various locations across Ontario, it was clear that each treatment facility used a different system for wayfinding and navigation. There are many cases in which children and youth may transfer between different treatment facilities, whether it is because they have moved or require a particular service not offered at their home location. Most children, when they first arrive at the treatment facility will be accompanied to their appointment from the waiting room by their family and/or their therapist. Further, staff commented that many new families frequently got lost and felt embarrassed or frustrated looking for where they needed to go (RP2; RP3). However, as many children and youth go to the treatment facilities more frequently, they often become familiar with the layout

of the building. During the first co-design session, many of the youth were happy to mention that they are very good at navigating the building independently (COD1). Older treatment facilities tended to have wayfinding systems that were adapted over the years and required prior knowledge of the centre to understand. Some of the adaptations included the use of colour and shorthand coding systems that were mounted on doors such as "Yellow Room 1" to refer to the conference room, which led to many users getting lost in the building (OBS1). Overhead signage was difficult for users to notice, even if they were installed at the main entrance (RP2). Many treatment facilities relied on staff at the front desk to support visitors with wayfinding. Alternatively, newer treatment facilities tended to have more integrated wayfinding systems that used a combination of colour coding, signage, and arrows placed at eye-level, which made navigation more intuitive and effective (OBS 4; OBS5).

The journey to and from therapy can sometimes be challenging, especially if the child is feeling frustrated,

uncomfortable, or is having difficulty communicating. These feelings and communication gaps can sometimes lead to outbursts in children. Picture exchange communication systems (PECS) is a widely used tool to help children communicate and bridge this gap. It associates concepts and words with icons that children can point at to communicate. They are usually printed on communication boards or used in assistive technology. At Grandview, these icons are made available in some therapy rooms, classrooms, and in the hallways that allow children to go up to the icons to point to them (OBS1). Incorporating PECS into a treatment facility's wayfinding system can support the communication needs and independence of children and youth.

Wayfinding systems also need to consider the diversity of families who come from different cultural backgrounds and speak a wide range of languages. Some treatment facilities provide access to translation services (OBS5; RP2). However, wayfinding in treatment facilities is usually provided in English only (OBS 1; OBS6). There also needs to be tools to support users with sensory impairments such as those with vision or hearing loss. Auditory cues such as a simple tone, verbal cues such as an announcement, well-placed tactile maps, and braille signage can provide important

information for those users who are visually impaired (OBS3; OBS5). Legible high contrast signs, icons, and photos can also help users who are hearing impaired, have partial sight loss, or rely on image systems to navigate. Multilingual and multi-sensory wayfinding systems can make navigation accessible and inclusive to users of all backgrounds and abilities.

Public Spaces & Amenities

Public spaces and amenities such as waiting rooms and washrooms offer families a place to gather and prepare for therapy, as well as to access essential facilities. The observations included a range of children's treatment centres with varied sensory features and layouts. Children, youth, and their families usually spend approximately ten to fifteen minutes in a waiting room when they first arrive at the treatment facility before their therapy appointment (OBS4; RP2; RP3). In waiting rooms that offered a variety of accessible and flexible activities, children often played together or with their families. Children appeared to interact with their surroundings more when there were features that actively responded to their senses such as interactive digital games, tactile walls, fish tanks, and toys with a range of tactile, visual, and auditory qualities. Staff and therapists also frequently mentioned that visually and tactically interesting features in the waiting room

activate the space and create fun opportunities for children to play and practice important skills learned during their therapy (RP2; RP5).

Artwork made by the children and displayed on the walls made them feel recognized and proud when they saw them (OBS5). Incorporating bright primary and secondary colours also made waiting rooms feel more lively and friendly. Interest in adding music in the waiting rooms were divided. Some staff members thought calm quiet music could help some children feel good while waiting for their therapy, while other therapists commented that this may cause discomfort for some children (RP2; RP3; COD3). Children were also extremely resourceful, imaginative, and creative. When there were limited activities to engage with, children would sometimes play on low tables, chairs, and couches by climbing and jumping on them to engage with their proprioceptive and tactile senses. However, some therapists also noted that a waiting room that is too fun or has too many toys can make it difficult for children to want to leave the waiting room for their therapy and may result in an outburst (RP3; COD3). Within the waiting room, games should be short in duration, easy to start, and easy to stop playing at any time. There also needs to be flexibility to put toys away when needed.

In contrast, waiting rooms that had few activities or limited toys that were mounted on walls were often dismissed by children (OBS6). Waiting rooms that were open concept and had no distinction between other spaces such as the hallway also caused confusion for children who sometimes wandered into other areas without knowing (RP2). Visual zoning, clear views of thresholds, and clear distinction between spaces can ensure safety for children. Further, observations highlighted the importance of intimate, personal spaces as well as views of nature that are quieter and calming from waiting rooms to help with challenging behaviours related to stress, anxiety, and discomfort (OBS5; RP1; RP2).

Treatment facilities generally all have accessible universal washrooms that accommodate independent and family use for individuals of all abilities. Most are equipped with narrower toilet seats, lowered toilets and sinks, change tables, and other equipment. Additionally, some washrooms have wheelchair accessible showers and ceiling tracks for (OBS3). However, in some smaller treatment facilities, staff and therapists have mentioned that there are not enough washrooms and that they are not well-placed which lead to long waits or people wandering the building to find another available washroom (RP2). Locking

the doors is also a challenge in some washrooms. Many barrier-free washrooms use a lock system with a button that can be pressed. When the button lights up, it indicates that it is locked. However, it is often not clear that a lit up button means that the door is locked and there are frequent issues with people accidentally opening the door (PR2). For many, washrooms also act as a place of refuge. Sometimes, families may be receiving difficult news or experiencing a challenging day, and washrooms are often a place where people can go to take a moment for themselves. When designing washrooms, they should be strategically placed throughout the building where users can access them easily, all equipment and systems inside should have clear instructions presented in an accessible way, and they should feel comfortable and secure.

Transitional Spaces

Transitional spaces include hallways and elevators that are essential for children, youth, and families to get from place to place in the treatment facility. For some families, transitions may be difficult and unmotivating, especially if children are engaged in a particular activity or pass by something that they want to engage in. This could be playing with a toy in the waiting room or passing by a vending machine where the child may want a snack (RP3; RP4). Features incorporated

in hallways that engage with the senses can help with transitions. Colourful murals, tactile walls, floor markings, and art are ways to activate hallways that make the journey through them fun and interesting by creating opportunities for natural checkpoints that can break down the steps to get from place to place. At Grandview Kids' main Oshawa location, the hallways have painted murals from floor to ceiling with Jungle Book themed animals which Grandview staff and therapists hope to see in the future building (OBS1). An important consideration when incorporating murals is that spaces should acknowledge and respect the different stages of growth of all the children and youth. Staff and therapists mentioned that many youth feel they have outgrown the imagery aimed toward younger children and want to be in an environment that reflects their interests (RP2; RP8). The imagery depicted should be popular, lasting, and span a broad age group such as local sports teams or streetscapes that do not change often (RP8).

Moreover, therapists use opportunities presented throughout the children's treatment centre to work on developing skills with the child. Formal and informal therapy happens inside the therapy rooms as well as outside in the hallways, waiting rooms, and recreational areas. Speech language pathologists may use murals

during transitions to practice new words with children through storytelling and counting. Occupational therapists and physiotherapists also use different animals on the walls as checkpoints, asking children to go to the next step by finding a certain animal (RP2; RP8). Hallways with handrails also expand the areas that a child can access and receive physiotherapy as an alternative to training stairs and balance bars that can be unmotivating. Handrails along hallways improves accessibility by helping children and youth who need support with mobility to travel through the building with increased independence and balance. Hallways are also places in which informal conversations happen such as a parent speaking with a therapist after an appointment, often due to limited space. Therapists have noted that in many cases, the discussions are confidential and stress the need for private areas or spaces where they can step aside to talk (RP2; RP4). Designing recessed areas or alcoves throughout the hallway can ensure that these conversations can take place.

Elevators are another transitional space that needs reliable and accessible information to support users moving between floors. Some older treatment facilities have smaller elevators that are challenging for users with mobility devices to access (OBS6). A lack of

information about what services are provided on each floor can also make it difficult to know when to get off (OBS6). Elevators that are soundproof and provide auditory, visual, and tactile cues and information can help users with different abilities easily know where to go.

Transitions are an integral part of everyday life. The spaces where children and youth spend time have a significant influence on their growth and development. As such, the ability to transition between spaces can mean greater access in all areas of their life from home to school. Providing safe spaces to practice transitions and develop important skills along the way can support children as they grow and transition out of children's treatment centres.

Treatment Spaces

As therapy is shown to be the most effective when provided early in a child's development and the number of children and youth waiting to access services continue to grow, there is an urgency to ensure that goals are met within the determined timeframe. There are high expectations for children and youth to meet their goals which have been set with the families and therapists (RP2). These goals are regularly evaluated and new ones are set once previous ones have been met. Sometimes, children are in the treatment

centres for a whole day because they have multiple appointments to see specialists throughout the day. A child might receive several types of therapies, and sometimes go from being a client of the treatment centre to a student of the attached school, such as from Grandview Kids to Campbell Children's School (RP2).

Most of the therapies and learning happen through a play-based model where children learn and develop skills through play (RP2). This is in line with research that shows children learn by being active and doing. Some children learn through very physical activities such as learning numbers by counting the number of times they jump up and down. Other children learn by verbally saying words out loud or building blocks. Activities are structured around a child's goals; learning numeracy by counting things in their environment, practicing physical movements to improve range of motion and mobility by travelling a certain distance, or developing communication skills by learning new words through PECS. Learning can happen everywhere and therapists frequently use the advantages of all environments in the treatment facility to provide therapy both inside and outside treatment spaces. Further, there is a push to create safe opportunities to develop skills in ways that reflect real life (RP2). All spaces should provide many aspects that resemble

real life spaces that children can expect to encounter. In treatment facilities, there are usually life skills rooms such as a skills kitchen and/or apartment to learn aspects of independent living (OBS1; OBS 3). Designing spaces that reflect real life throughout the building will help children and youth make the transition from skills learned during therapy and apply them in different contexts and environments.

Exposure to different sensory inputs in a safe environment helps children with sensory processing disorders adapt. Many occupational therapists who work closely with children with sensory processing disorder note that an environment, especially in multisensory rooms, should start with low sensory inputs and add to it, so that exposure to new stimuli are gradually introduced (RP6). Throughout the journey from home, to their appointment, and back, a child may encounter sensory challenges that can be stressful and upsetting, and that can sometimes result in physical or emotional behaviours and outbursts. These behaviours are more likely to occur in children who are younger, around 4 years of age and under, or those who are new to the treatment centre and are not familiar with the environment (RP2). It can include discomfort from difficulty regulating responses to sensory stimuli such as a noise or texture and feeling agitation. These

behaviours can include distress behaviours such as soiling their pants, refusal to eat, hiding under tables, crying, screaming, or lashing out physically with a hand, foot, or sometimes a bite (RP2). It is important that there are many flexible areas available throughout the building that provide options to change or reduce the sensory experience for children (COD3).

As children become more used to the different sensory stimuli, these stimuli can also help certain things like with stress, agitation. Therapists generally introduce new sensory stimuli gradually in safe comfortable environments that resemble what the child should expect in real life. At Grandview, they go outside in all weather where there are different stations that offer more physical play, areas that offer places to be loud and play makeshift instruments like percussion, and areas that are calmer and allow children to relax under a shade of a tree or in the garden area (RP2). Stimuli is introduced gradually; for example a child might be scared of swimming and of being in water. The therapist might use techniques from exposure therapy where on the first day they sit with the child outside the pool area but with a view inside. Then, they may move closer into the pool room and sit afar on a bench. Then they will dip their feet in the pool, and finally go into the pool (RP2). The ability for a child

to be exposed to new sensory stimuli and to have a better understanding is essential for children to feel comfortable and in control. When children and youth receive botox, mirrors also prove to help children know what to expect (RP2; RP8). This can help them feel calmer during a difficult treatment. Treatment rooms must have opportunities to facilitate the introduction of sensory stimuli through multiple steps of exposure and provide elements such as mirrors to help give children a sense of understanding and control. This means having accessible sight lines from a safe and comfortable area, especially with visual access in treatment rooms, and to waiting rooms and recreational spaces that offer many options to engage with the senses.

Challenging behaviours can also be a result of difficulty communicating a child's needs, wants, or feelings. It is important to understand that children do not develop these behaviours because they are poorly behaved, rather there needs to be empathy around what the child is experiencing and feeling (RP2). Many children at the treatment centres have challenges with speech, language, and communication. Often, they have been trying to communicate something, but are misunderstood and become frustrated (RP4). Therapists and parents noted that there can be many things that happen throughout the day that cause discomfort

and stress and include difficulty communicating and expressing things such as a child being thirsty or hungry after a long commute, something that happened with their family prior to their therapy session, or it may even be something exciting that happened on the bus that they want to tell someone about (RP2; RP3; RP6). Moreover, these are children who often have fewer opportunities to engage with their peers socially because of stigma and/ or inaccessible environments, and therefore miss out on learning important social cues and behaviours that other children typically learn through interactions with their friends (RP2).

It can be frustrating for children to be unable to communicate, so a goal for many is to bridge this gap. Therapists use many tools to help children communicate in whichever way suits them, whether it's verbal or through other means. A therapist will often use the environment as prompts for teaching communication skills. Objects in the room can be used to practice counting or images on the wall to learn new words through storytelling (RP2). Another important tool that is used is the picture exchange communication system (PECS) that utilizes icons to help children learn strategies to communicate ideas (RP7). Once children have the tools to communicate and express themselves, family and therapists can

better understand the child's needs and challenging behaviours begin to reduce. Challenging behaviours can come out in many different ways, but mostly it comes from a frustration that they cannot communicate (RP2). Clear organization is also important for independence, focus, and self regulation. Resources such as snacks and toys are made accessible to children to promote independence and self regulation (RP2). On the other hand, therapists mentioned that they also often place therapy materials and toys in sight, but out of reach so the child has to practice asking for the toy to get it (COD3). Underlying the design of treatment spaces must be the ability for children and youth to feel empowered in the environment to learn, engage, and participate. Incorporating prompts in the environment that children can see and address, and that offer information that can be heard or touched can support children in practicing communication.

Special needs children and youth are extremely strong, resilient, and adaptive. When given the opportunity and support, they can thrive and accomplish many of their goals. However, barriers to care can significantly impede development. When learning and care environments are too under or over-stimulating, it can be difficult to focus, engage, feel comfortable, or confident. The design of treatment spaces that are conducive to

learning and receiving care can ensure that services are provided efficiently and with ease. Learning to manage sensory challenges, develop positive behaviours, and strengthen communication skills in everyday life is integral to living a full life that reflects the values of function, family, fitness, fun, friends, and future.

Recreational Spaces

Recreational spaces are essential to supporting children and youth to live an active life. Some treatment centres have accessible pools, gyms, playgrounds, and sensory gardens to engage children and youth in physical activities (OBS1; OBS3; OBS5). Sensory Gardens in particular are widely used to provide a range of spaces where families can play and find respite (OBS4; OBS5). These spaces offer connection to nature which can help alleviate stress and anxiety. The wide open space also means that children are free to play in a safe environment. Firm and spongy pathways that have clear circulation also make it easy for children with mobility and cognitive needs to navigate through the garden and be safe in the case of a fall (RP8). Shade and water features are essential to ensuring that children do not overheat and are comfortable on sunny days (OBS1; RP2). In playgrounds where there is a lack of shade, water features, and equipment that is fixed to fences, therapists note that children tend to have

low engagement (OBS 6). Alternatively, playgrounds with accessible jungle gyms and equipment dispersed in visually clear zones, and plenty of shade throughout, had much higher engagement (OBS1; OBS 5).

Children and youth stay active and play in many different ways and recreational spaces are vital in fostering these areas of development to stay healthy. More importantly, these spaces are opportunities for the social development of many children who are otherwise frequently excluded from play in other areas of their life. This exclusion can take the form of stigma, and inaccessible playgrounds and facilities. The design of friendly, inclusive, and accessible recreational spaces can help ensure the regular maintenance of a healthy physical and social lifestyle.

The context of each children's treatment centre varies greatly in their strengths, needs, and identity. This research analysis identifies common themes from the perspective of various stakeholders and provides insight into how treatment facilities can be designed to meet the needs of children and youth.

Chapter 5: Design Guidelines

This chapter builds upon the findings in the data analysis to propose sensory design guidelines for children’s treatment centres. It presents three guiding design principles that are applied throughout the guidelines. In addition, this chapter addresses the auditory, visual, tactile, olfactory, and proprioceptive design attributes in five main categories of spaces: wayfinding and navigation, public gathering spaces and amenities, transitional spaces, treatment spaces, and recreational spaces.

Guiding Design Principles

1. **Promote Independence, Diversity & Respect**

Designs should promote the independence of children and youth, and respect diversity including but not limited to ability, age, gender, language, and ethnicity to support positive experiences and well-being, rather than simply meeting regulatory compliance or providing accommodations.

2. **Design for Engagement, Play, and Learning**

Therapy happens everywhere and is often delivered through a play-based approach. Designs should provide opportunities to engage, play, and learn by incorporating design features throughout the treatment facility that helps children and youth develop critical skills.

3. **Create Flexible Cross-sensory Interaction**

Children and youth with special needs have different physical, cognitive, and sensory abilities and the design of environments should respond to all the ways they may engage with their environment. All environments should offer interactions with flexible height and mobility options, as well as incorporating auditory, visual, and tactile information feedback when possible.

Using the Guidelines

The guidelines are divided into five main categories and subcategories of systems and spaces:

- **Wayfinding & Navigation**
 - Information Systems
- **Public Gathering Spaces & Amenities**
 - Waiting Room
 - Washroom
- **Transitional Spaces**
 - Hallway
 - Elevator
- **Treatment Spaces**
 - Treatment Room
- **Recreational Spaces**
 - Sensory Garden

Each subcategory includes a conceptual diagram that offers guidance on how the sensory design recommendations can be implemented in the context of each specific system or space. The diagrams show an overview of the design recommendations, and their suggested placement such as at a junction or by a window. The diagrams should not be interpreted as floor plans, but rather a demonstration of how the sensory elements should interact within the environment to support the needs of users. In addition, a table is provided for each subcategory that includes the overarching theme associated with the space, the design recommendations, the corresponding icons that match those used in the diagram, and the description and rationale for each recommendation. The design recommendations are colour coded according to the type of sensory element as shown in the legend below.

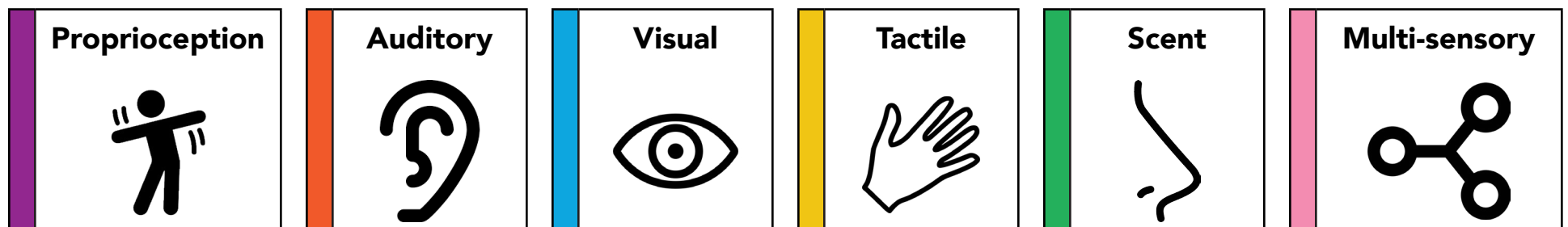


Figure 13. Sensory Profile Legend

For example, the information systems under wayfinding and navigation include sensory design recommendations that correspond to auditory, visual, tactile, and multi-sensory interactions. The information systems sensory profile illustrates an overview of the recommendations through the use of colour-coded icons in orange (auditory), blue (visual), yellow (tactile), and pink (multi-sensory). Colour-coded lines further show suggestions for the effective placement of recommendations within an environment such as by entrances and junctions. The following table describes the major themes of information systems (orientation, navigation, mobility), and provides descriptions and rationales for each design recommendation. The design guideline recommends the use of multi-sensory interactive interfaces for wayfinding and navigation information systems that include auditory cues, braille signage, and clear intuitive visual cues to support users of all sensory abilities.

Wayfinding & Navigation

Wayfinding comprises systems of information that assist users to orient themselves and navigate through complex physical environments such as maps and signage (Gleave, 2012). Wayfinding connects the separate spaces throughout a building so users can get from point to point. The use of multi-sensory wayfinding features improves access to navigation for users of all abilities and supports an individual's autonomy. Users can engage with wayfinding features in several two ways:

- **Passive wayfinding** is when the user unconsciously recognizes that they are in a particular place without the need to seek additional information.
- **Active wayfinding** involves the active engagement of the user with their surroundings by looking, hearing, and touching the features that are available to them. In addition, caregivers may use the broader environment or other tools to support transitions between spaces such as with a game or through storytelling by interacting with murals, tiles, bubbles, and other visual, auditory, and tactile elements.

Information Systems

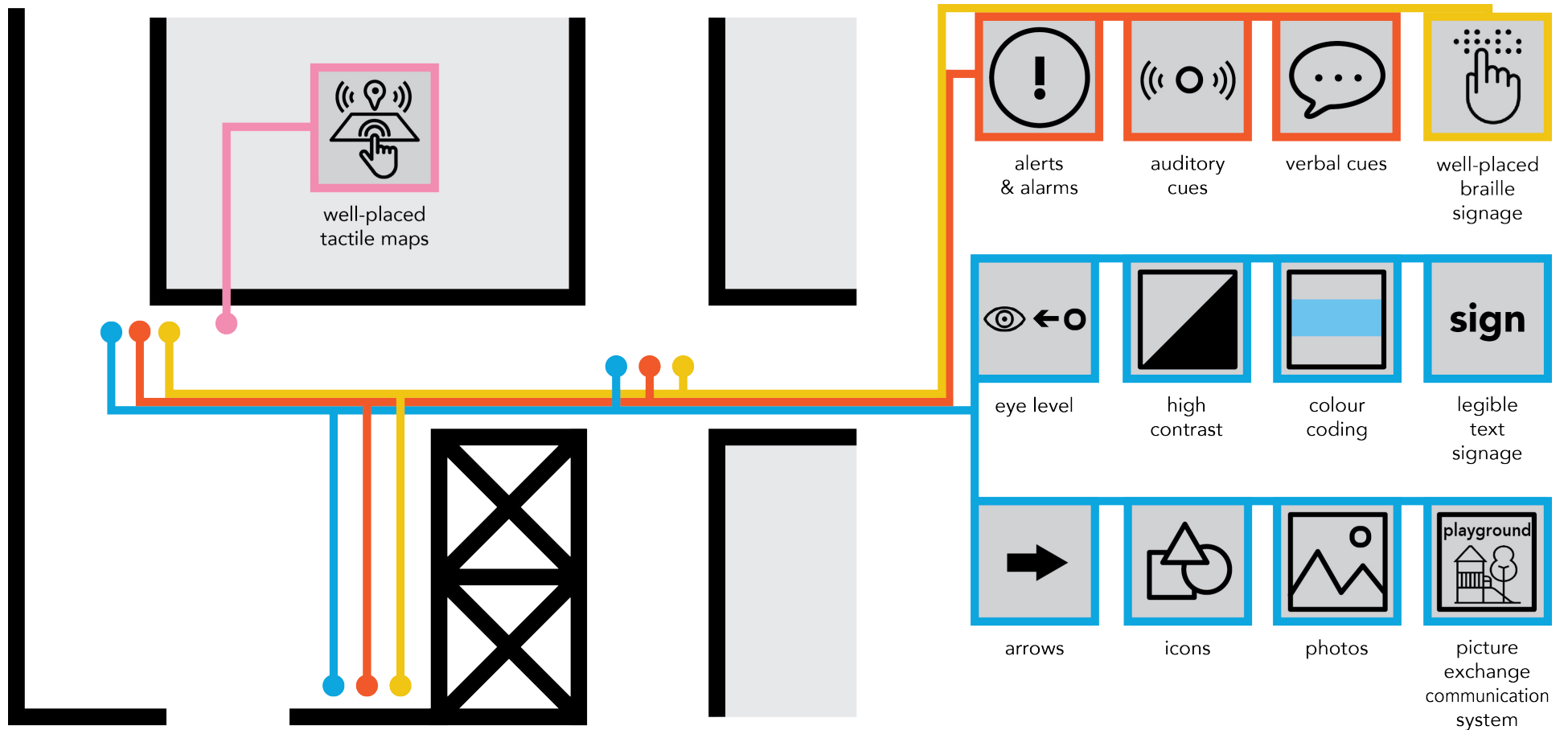





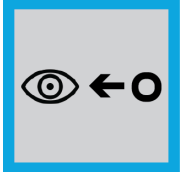





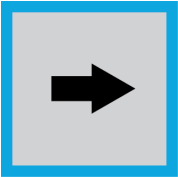




Figure 14. Diagram of Information Systems Sensory Profile

Information Systems

Theme: Orientation, Navigation, Mobility

Auditory		Informational sounds such as alerts and alarms, auditory cues, and verbal cues should only be available or activated upon the user engaging with the features that require these cues or during an emergency. Informational sounds that are triggered out of context can cause confusion and stress.	
	Icon	Design Recommendation	Description & Rationale
		Alerts & Alarms	Alerts and alarms should not only indicate an emergency and provide information regarding the type of emergency and the procedures for evacuation when necessary. This ensures that everyone can respond to emergencies effectively and stay safe.
		Auditory Cues	Auditory cues should be distinct, easily identifiable and indicate a specific input or output such as the case of an elevator door being opened or closed.
	Verbal Cues	Verbal cues should provide information about directions and instructions. This information should be broken down into simple steps and based on the perspective of the user. Verbal cues informing the users which direction to go in should start from the user's current position and use directional words such as left, right, and forward. It should also use distinct visible landmarks and identifiable intersections to indicate checkpoints or arrival at the destination.	

Visual		Visual wayfinding information should be placed throughout all transitional spaces including at entrances, exits, and junctions. Visual information should be connected by a clear communications system, and easy to identify and understand to help users navigate from point to point. Visual elements should include maps, colour-coding, text signage, arrows, icons, photos, and picture exchange communication systems to provide access for children and youth at all literacy levels.	
	Icon	Design Recommendation	Description & Rationale
		Eye Level	All visual information should be placed at eye level with no visual obstruction so that users can easily find and use the information. Signs hanging from the ceiling can easily be missed.
		High Contrast	Visual information should be high contrast to create distinction between elements and improve legibility.
		Colour Coding	Colour coding should be used to identify different zones and areas within the building. This makes it easy for users to know which area of the building they should go to.
	Legible Text Signage	Text signage should be legible from a distance by using large font sizes and fonts without serifs. Signage should use simple language and clearly describe what it is identifying. Signage should include labels in different languages in addition to English.	

		Arrows	Arrows should be positioned in relation to the user such as an arrow pointing to the left or right from where the user is facing.
		Icons	Icons should be based on widely used conventions and celebrate diversity. Where appropriate, they should also indicate what is available in a given place rather than who can use it, as in the case of a washroom.
		Photos	Photos of places within the building accompanied with directions placed with other wayfinding information can help users know which place they are looking for and when they have arrived.
		Picture Exchange Communication System	Picture Exchange Communication Systems (PECS) are widely used to support children and youth who are non-verbal to communicate by pointing to pictures. PECS are usually provided on portable boards that therapists can carry or on the walls of therapy rooms and classrooms. Placing PECS throughout a building can support non-verbal children and youth to easily indicate where they want to go.
Tactile		Tactile wayfinding elements should include tactile maps and braille signage for non-visual users.	


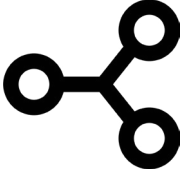

		Icon	Design Recommendation	Description & Rationale
			Well-placed Braille Signage	Braille signage should be well-placed and easy to find. This includes directly on the wall next to each door and elevator.
	Multi-sensory		The use of multi-sensory wayfinding elements improves access to navigation for users of all abilities.	
		Icon	Design Recommendation	Description & Rationale
			Well-placed Maps	Maps should be placed throughout the building, particularly in high traffic areas, entrances, exits, and junctions. Maps should include auditory, visual, and tactile elements that offer various opportunities for users of all abilities to interact with the information. Sensory elements should be based on widely used conventions and allow users to orient themselves.

Table 1. Table of Wayfinding and Navigation Sensory Profile

Public Spaces & Amenities

Public spaces and amenities are open and accessible places that offer communities with opportunities to gather, socialize, engage, and access essential facilities. Waiting rooms are spaces where clients may spend a short time prior to and/ or following their appointment. Creating a warm and welcoming environment with soft lights, comfortable furniture, and engaging activities can help children and youth prepare for their therapy and reduce stress and anxiety. Moreover, by mimicking some of the tools and environments used during therapy, waiting rooms can support children and youth to practice and develop important skills outside of treatment rooms. Washrooms, in addition to being a place where people can wash and relieve themselves, can also become a place of private refuge. In treatment centres, families may receive difficult news that can be upsetting, and some individuals may use the washroom as a safe space to process and express those emotions.

Waiting Room

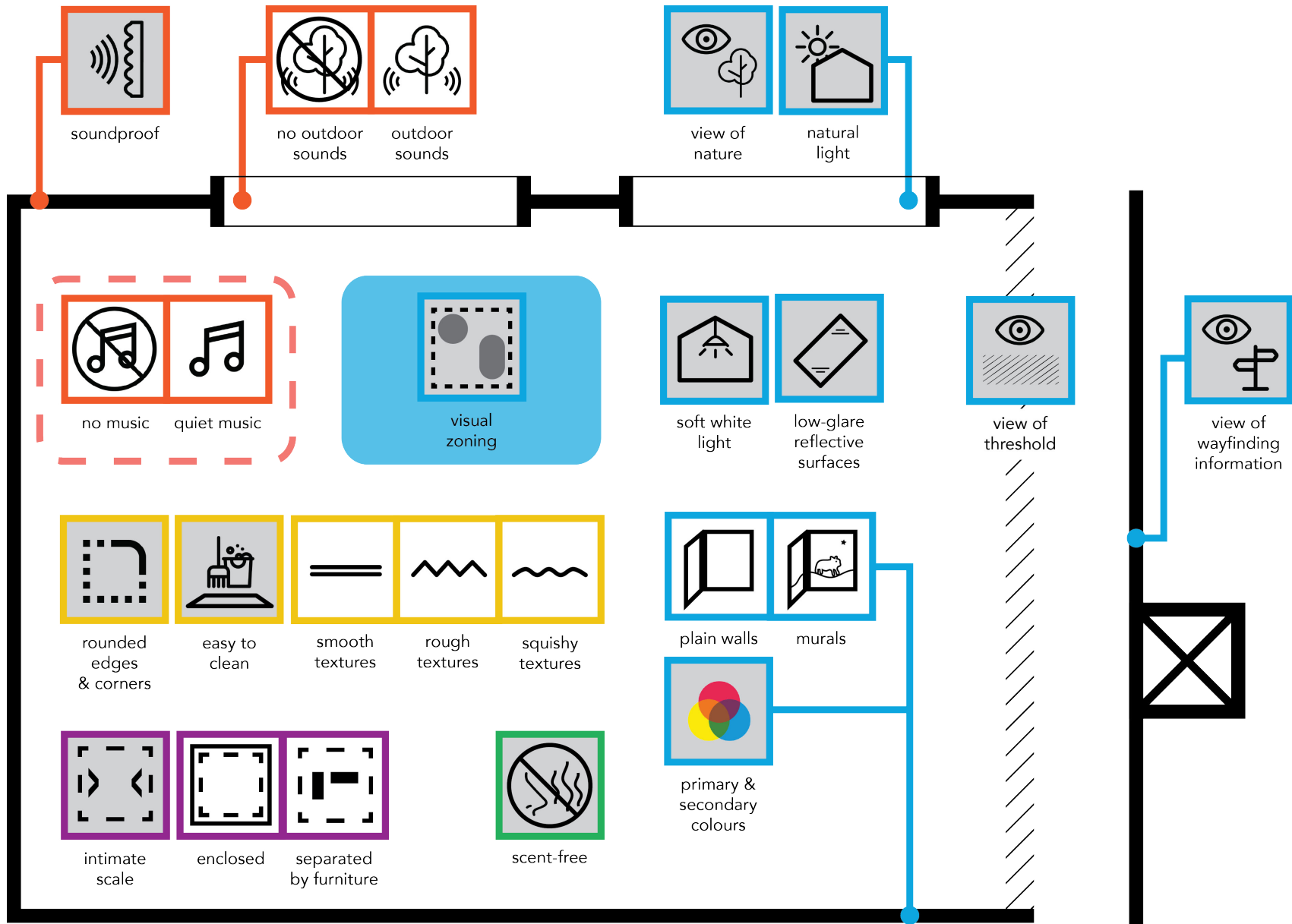

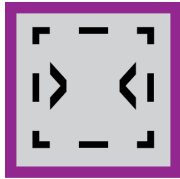
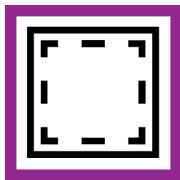
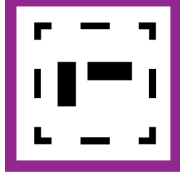










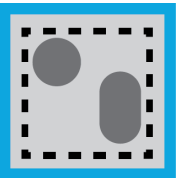




Figure 15. Diagram of Waiting Room Sensory Profile

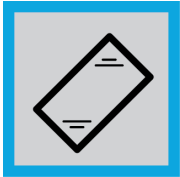

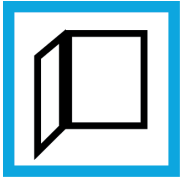


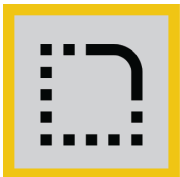
Waiting Room

Theme: Play, Respite, Waiting

Proprioception		The scale and organization of space within a waiting room should provide a sense of balance and safety, while supporting children to feel comfortable and play freely.	
	Icon	Design Recommendation	Description & Rationale
		Intimate Scale	Waiting rooms designed at an intimate scale with moderate proportions can promote a sense of balance and security. The use of an intimate scale can reduce echoes, create a controllable and manageable space for visual stimuli, and increase tactile stimulation within the boundary.
	 	Enclosed; Separated by Furniture	Waiting rooms should be enclosed by walls or furniture to maintain safety and identify areas of activity.
Auditory		Waiting rooms should be designed to minimize excessive sounds and provide privacy. However, auditory elements can provide a sense of calm for some children and youth. Auditory elements in a waiting room should be minimal and zoned in designated areas with the option to adjust or turn it off when needed.	

	Icon	Design Recommendation	Description & Rationale
		Soundproof	All waiting rooms should be soundproof to ensure privacy and provide a conducive environment for sensory overstimulation from noise and echo. In addition, it can minimize distraction and protect client confidentiality.
	 	No Music; Quiet Music	Quiet adjustable music options can be available in designated zones that have additional soundproofing. Designated zones can allow for individuals to listen to quiet music when desired and turn it off when not in use. Quiet music can help with under-stimulation and offer a sense of engagement. Music can include relaxing music and ambient sounds.
	 	No Outdoor Sounds; Outdoor Sounds	Wall openings such as windows that can be opened either partially or fully, while still ensuring safety, provide options to connect the waiting room with sounds from the outdoors that can give a sense of calm and reduce stress.
Visual			Visual elements in a waiting room can provide important information about wayfinding, identify zones designated for different activities, and support social interactions. In addition, certain visual elements can also provide a sense of calm or engagement.

Icon	Design Recommendation	Description & Rationale
	View of Wayfinding Information	Views of wayfinding information in the waiting room helps individuals find their way quickly and with ease. Wayfinding information should be placed near the entrance of the waiting room.
	Visual Zoning	Visual zoning helps identify areas designated for specific activities such as play or rest.
	View of Threshold	A clear view and distinction between the waiting room's threshold and adjacent areas including hallways, entrances, and exits can make it easier to ensure safety.
	View of Nature	Waiting rooms with a view of nature can provide a sense of calm and relieve stress. It can also create focus and engagement for those who need visual stimulation.
	Natural Light	Waiting rooms with natural light can provide a sense of calm, alertness, and relieve stress.
	Soft White Light	Waiting rooms with soft white light can provide a sense of calm, comfort, and relieve stress.

		Low-glare Reflective Surfaces	Some low-glare reflective surfaces in waiting rooms such as on the walls and floors can provide important information about an individual's surroundings, and can be particularly helpful for children and youth with hearing loss.
		Primary & Secondary Colours	Primary and secondary colours in waiting rooms can activate the space and increase visual stimulation and engagement.
	 	Plain Walls; Murals	Waiting rooms can use murals to activate the space and engage children and youth in their imagination. Murals can also support communication through storytelling. Murals should reflect the diverse age groups of clients. On the other hand, plain walls offer places for lower visual stimulation and can support communication by clarifying gestures and movements, which can be beneficial for children and youth with hearing loss.
Tactile		Tactile elements in waiting rooms should ensure safety, health, and engagement.	
	Icon	Design Recommendation	Description & Rationale
		Rounded Corners & Edges	Furnishings and equipment with rounded corners and edges provide a safe environment for children and youth while reducing chances of injury.







		Easy to Clean	All surfaces should be easy to clean, antibacterial, and hypoallergenic to ensure a safe and healthy environment for all.
		Smooth Textures; Rough Textures; Squishy Textures (soft and spongy)	Waiting rooms that provide a variety of smooth, rough, and/or squishy textures can promote interest, engagement, and increase tactile stimulation. This can include furniture and toys.
			
			
Scent		Waiting rooms should have no scents to ensure that the environment is inclusive to all.	
	Icon	Design Recommendation	Description & Rationale
		Scent-free	All areas should be scent-free to ensure an accessible and comfortable environment for individuals with sensitivity to scents.

Table 2. Table of Waiting Room Sensory Profile

Washroom

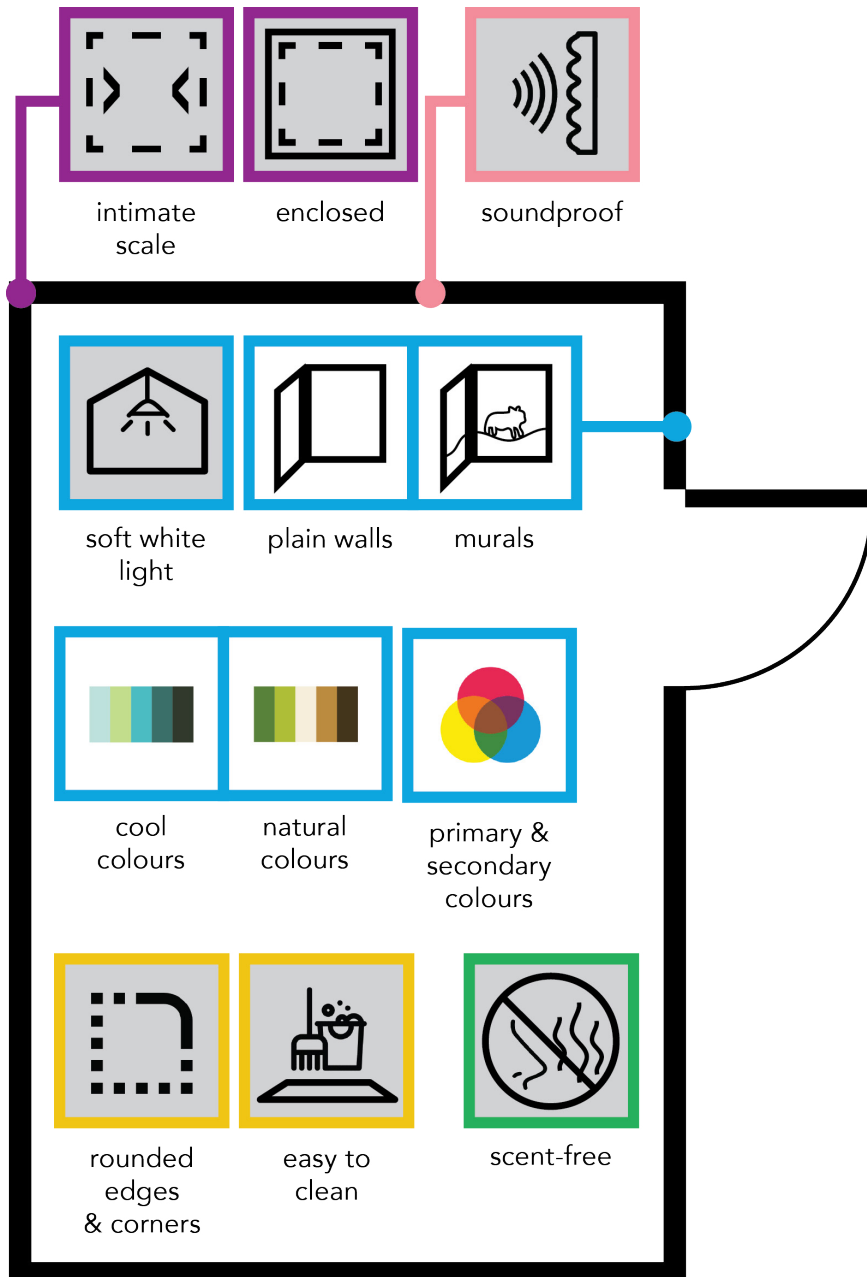

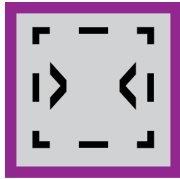
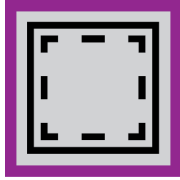







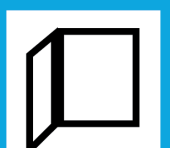



Figure 16. Diagram of Washroom Sensory Profile

Washroom

Theme: Privacy, Dignity

Proprioception		All washrooms should be universal washrooms that are enclosed and free of barriers. This ensures that it is accessible to all users and that user privacy and dignity is respected.	
	Icon	Design Recommendation	Description & Rationale
		Intimate Scale	Design washrooms at an intimate scale with moderate proportions to promote balance and ease of use. The use of an intimate scale can increase the ease of reaching equipment for users who need support with mobility.
		Enclosed	Enclosed washrooms provide respect, privacy, security, and offer respite when individuals are experiencing something challenging at that moment.
Auditory		All washrooms should be designed to provide as much privacy as possible. This includes sound separation between the washroom and adjacent areas. Sounds inside the washroom should be minimal.	
	Icon	Design Recommendation	Description & Rationale
		Soundproof	All washrooms should be soundproof to ensure privacy and provide a conducive environment for sensory overstimulation from noise and echo. In addition, it can minimize distraction and protect client confidentiality.

Visual		Visual elements in washrooms can provide a sense of calm or engagement.	
	Icon	Design Recommendation	Description & Rationale
		Soft White Light	Washrooms with soft white light can provide a sense of calm, comfort, and relieve stress.
	  	Primary & Secondary Colours; Cool Colours; Natural Colours	Primary and secondary colours in washrooms can activate the space and increase visual stimulation and engagement while cool and natural colours can provide a sense of serenity and calm. In addition, natural colours can provide a feeling of connection to nature.
	 	Plain Walls; Murals	Washrooms can use murals to activate the space and engage the imagination. They can also support communication through storytelling. Murals should reflect the diverse client age groups. Alternatively, plain walls offer lower visual stimulation and can support communication by clarifying gestures and movements, which can be beneficial for children and youth with hearing loss.






Tactile		Tactile elements in washrooms should ensure safety and health.	
	Icon	Design Recommendation	Description & Rationale
		Rounded Corners & Edges	Furnishings and equipment with rounded corners and edges provide a safe environment for children and youth while reducing chances of injury.
		Easy to Clean	All surfaces should be easy to clean, antibacterial, and hypoallergenic to ensure a safe and healthy environment for all.
Scent		Washrooms should have no scents to ensure that the environment is inclusive to all.	
	Icon	Design Recommendation	Description & Rationale
		Scent-free	All areas should be scent-free to ensure an accessible and comfortable environment for individuals with sensitivity to scents.

Table 3. Table of Washroom Sensory Profile

Transitional Spaces

Transitional spaces are used to connect different areas throughout a building. Hallways connect users to different rooms on the same floor of a building. Activating the hallways with visual and tactile sensory stimulation can support transitions between rooms such as from the waiting room to therapy room. Elements that can activate the hallways include materials embedded into the infrastructure such as murals with interesting imagery, tactile walls with reliefs or different materials such as tiles, and access to fun toys for therapists such as bubble makers to encourage children to get from point-to-point. Elevators connect users to the different floors of a building. Elevators that are accessible and provide clear information about each floor can help users move through spaces with ease.

Hallway

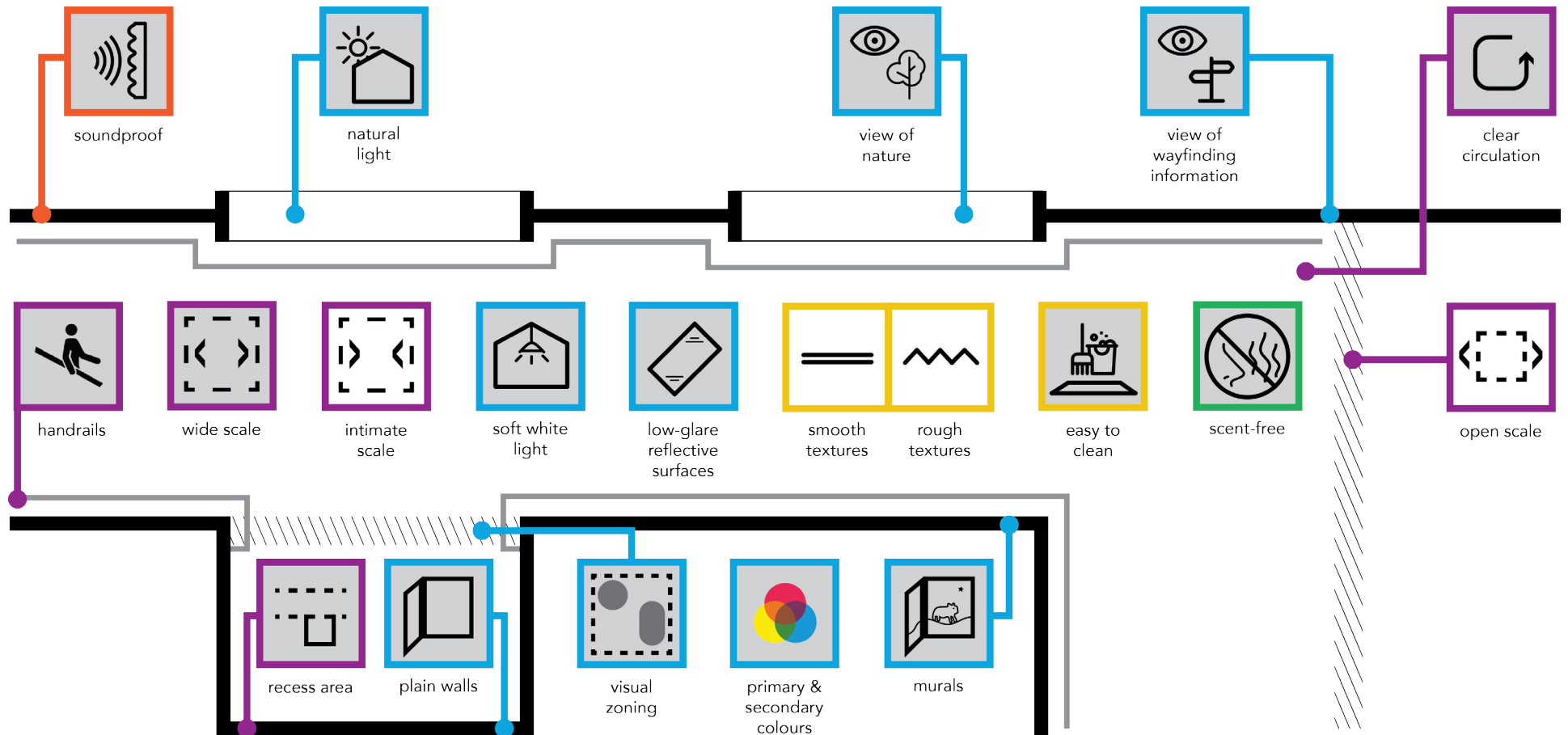

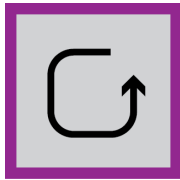
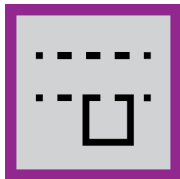

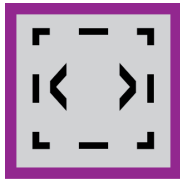
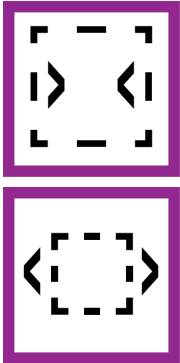






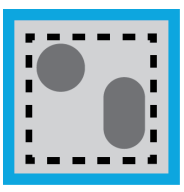



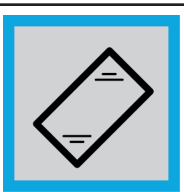
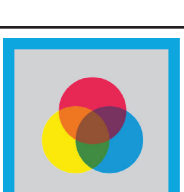
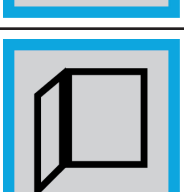
Figure 17. Diagram of Hallway Sensory Profile




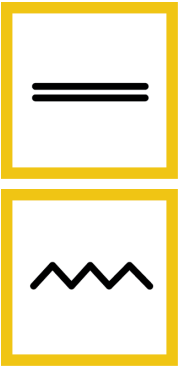

Hallway

Theme: Mobility, Conversation, Therapy

Proprioception		Hallways should be accessible for all users, provide a clear path of travel, provide places of refuge, and support physical rehabilitation.	
	Icon	Design Recommendation	Description & Rationale
		Clear Circulation	Clear one-way circulation in hallways helps present simple and straightforward pathways to orient users. In addition, it decreases visual confusion and distraction.
		Recess Area	Hallways should have recess areas throughout such as alcoves that allow users to stand aside away from foot traffic. Recess areas can provide a place of respite in a transitional space. In addition, it provides opportunities to have informal conversations with more privacy.
		Handrails	Handrails along hallways improves accessibility by helping children and youth who need support with mobility to travel through the building with increased independence and balance. Handrails also expand the possibility of spaces that a child or youth can access while going through physical rehabilitation as an alternative to training stairs and balance bars used in physiotherapy.
	Wide Scale	A wide hallway ensures accessibility for all users. It also allows children to test out mobility devices and work on range of motion and walking or practicing physical rehabilitation.	

			Intimate Scale; Open Scale	Hallways can be intimate or open in scale depending on the need of the specific area. Intimate hallways are typically straight corridors that can provide a clear and efficient means to travel while open scale hallways provide a clear pathway for travel while having open access to a public space such as a waiting room.
Auditory			All hallways should be designed to minimize excessive sounds and provide privacy. This includes reducing loud noises and sounds from multiple sources.	
	Icon	Design Recommendation	Description & Rationale	
		Soundproof	All hallways should be soundproof to ensure privacy and provide a conducive environment for sensory overstimulation from noise and echo. In addition, it can minimize distraction and protect client confidentiality.	
Visual			Visual elements in hallways can provide important information about wayfinding, identify zones designated for different activities, and support social interactions. In addition, certain visual elements can also provide a sense of calm or engagement.	
	Icon	Design Recommendation	Description & Rationale	
		View of Wayfinding Information	Views of wayfinding information in the hallway helps individuals find their way quickly and with ease. Wayfinding information should be placed at corners and junctions in hallways.	

	<p>Visual Zoning</p>	<p>Visual zoning in hallways can help distinguish areas of travel and areas of respite.</p>
	<p>View of Nature</p>	<p>Hallways with a view of nature can provide a sense of calm and relieve stress. It can also create focus and engagement for those who need visual stimulation.</p>
	<p>Natural Light</p>	<p>Hallways with natural light can provide a sense of calm, alertness, and relieve stress.</p>
	<p>Soft White Light</p>	<p>Hallways with soft white light can provide a sense of calm, comfort, and relieve stress.</p>
	<p>Low-glare Reflective Surfaces</p>	<p>Some low-glare reflective surfaces in hallways such as on the walls and floors can provide important information about an individual's surroundings, and can be particularly helpful for children and youth with hearing loss.</p>
	<p>Primary & Secondary Colours</p>	<p>Primary and secondary colours in hallways can activate the space and increase visual stimulation.</p>
	<p>Plain Walls</p>	<p>Hallways should use plain walls, particularly in recess areas, to offer places for lower visual stimulation and support communication by clarifying gestures and movements, which can be beneficial for children and youth with hearing loss.</p>

			Murals	Hallways should use murals to activate the space and engage children and youth in their imagination, particularly along the path of travel. Murals can also support communication through storytelling, and assist with transitions by providing unique and identifiable checkpoints throughout a journey. Murals should reflect the diverse age groups of clients.
Tactile			Tactile elements in hallways should ensure safety, health, and engagement.	
	Icon	Design Recommendation	Description & Rationale	
		Easy to Clean	All surfaces should be easy to clean, antibacterial, and hypoallergenic to ensure a safe and healthy environment for all.	
		Smooth Textures; Rough Textures	Hallways that provide a variety of smooth and/or rough textures can promote interest, engagement, and increase tactile stimulation. This can include a variety of tactile walls using different materials.	
Scent			Hallways should have no scents to ensure that the environment is inclusive to all.	


		Icon	Design Recommendation	Description & Rationale
			Scent-free	All areas should be scent-free to ensure an accessible and comfortable environment for individuals with sensitivity to scents.

Table 4. Table of Hallway Sensory Profile

Elevator

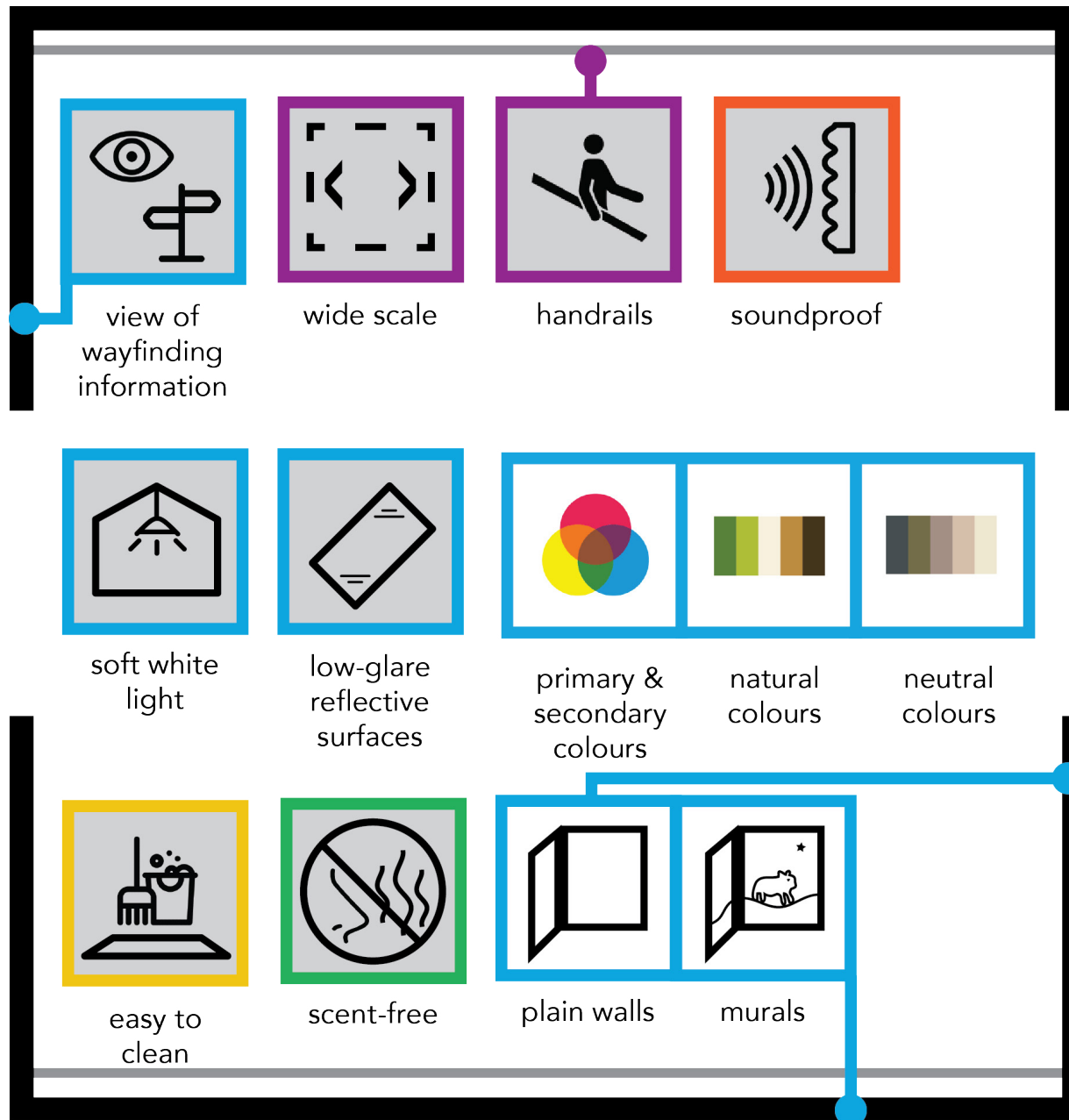

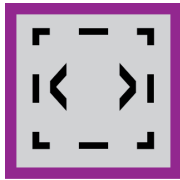






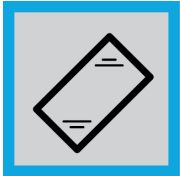





Figure 18. Diagram of Elevator Sensory Profile

Elevator

Theme: Navigation, Reliability

Proprioception		Elevators should be accessible for all users, and support mobility and balance when moving from place to place.	
	Icon	Design Recommendation	Description & Rationale
		Wide Scale	A wide elevator ensures accessibility for all users and reduces the sense of claustrophobia.
		Handrails	Handrails along the edge of the elevators improve accessibility by helping children and youth who need support with mobility to use the elevators with increased independence and balance. Handrails also expand the possibility of spaces that a child or youth can access and connect to different floors within a building.
Auditory		Elevators should be designed to minimize excessive sounds. However, auditory and verbal cues for wayfinding can provide important information about which floor the elevator is on and when to enter and exit. Auditory elements should only be used only to help users find their way.	
	Icon	Design Recommendation	Description & Rationale
		Soundproof	All elevators should be soundproof to ensure privacy and provide a conducive environment for sensory overstimulation from noise and echo. In addition, it can minimize distraction and protect client confidentiality.

Visual		Visual elements in elevators can provide important information about wayfinding and support social interactions. In addition, certain visual elements can also provide a sense of calm or engagement.	
	Icon	Design Recommendation	Description & Rationale
		Views of Wayfinding Information	Views of wayfinding information in the elevator helps individuals find their way quickly and with ease. Wayfinding information should identify the main services provided on each floor and be placed near the door of the elevator.
		Soft White Light	Elevators with soft white light can provide a sense of calm, comfort, and relieve stress.
		Low-glare Reflective Surfaces	Some low-glare reflective surfaces in elevators such as on the walls and floors can provide important information about an individual's surroundings, and can be particularly helpful for children and youth with hearing loss.
	  	Primary & Secondary Colours; Natural Colours; Neutral Colours	Primary and secondary colours in elevators can activate the space and increase visual stimulation and engagement while natural and neutral colours can provide a sense of serenity and calm. In addition, natural colours can provide a feeling of connection to nature.







		 	Plain Walls; Murals	Elevators can use murals to activate the space and engage the imagination. Murals can also support communication through storytelling. Murals should reflect the diverse client age groups. Alternatively, plain walls offer lower visual stimulation and can support communication by clarifying gestures and movements, which can be beneficial for children and youth with hearing loss.
Tactile			Tactile elements in elevators should ensure safety and health.	
	Icon	Design Recommendation	Description & Rationale	
		Easy to Clean	All surfaces should be easy to clean, antibacterial, and hypoallergenic to ensure a safe and healthy environment for all.	
Scent			Elevators should have no scents to ensure that the environment is inclusive to all.	
	Icon	Design Recommendation	Description & Rationale	
		Scent-free	All areas should be scent-free to ensure an accessible and comfortable environment for individuals with sensitivity to scents.	

Table 5. Table of Elevator Sensory Profile

Treatment Spaces

Treatment spaces are used to provide essential therapies and services that can include occupational therapy, physiotherapy, and speech language pathology, among others. They can be dedicated to a specific therapy or service, or they can be multi-functional and serve many purposes. The spatial and sensory qualities in treatment spaces can aid in the delivery of therapies and help children and youth reach their goals by improving focus, providing opportunities to practice skills, and providing opportunities to develop positive behaviours. Occupational therapy including Intensive Behavioural Intervention (IBI) and Applied Behavioural Analysis Intervention (ABA) can utilize visual and tactile zoning to associate activities to specific places. Direct access to outdoor spaces such as playgrounds can offer children and youth receiving physiotherapy to practice range of motion exercises beyond traditional training stairs and balance bars. The placement of mirrors also helps children receiving injections such as with botox to feel a greater sense of understanding, control, and calm during their treatment. Treatment spaces must be easily adjustable and well-organized to anticipate quick changes to the space when needed. In addition, treatment spaces should provide easy access to sensory areas and outdoor spaces for a variety of sensory environments that children can receive therapy in.

Treatment Room

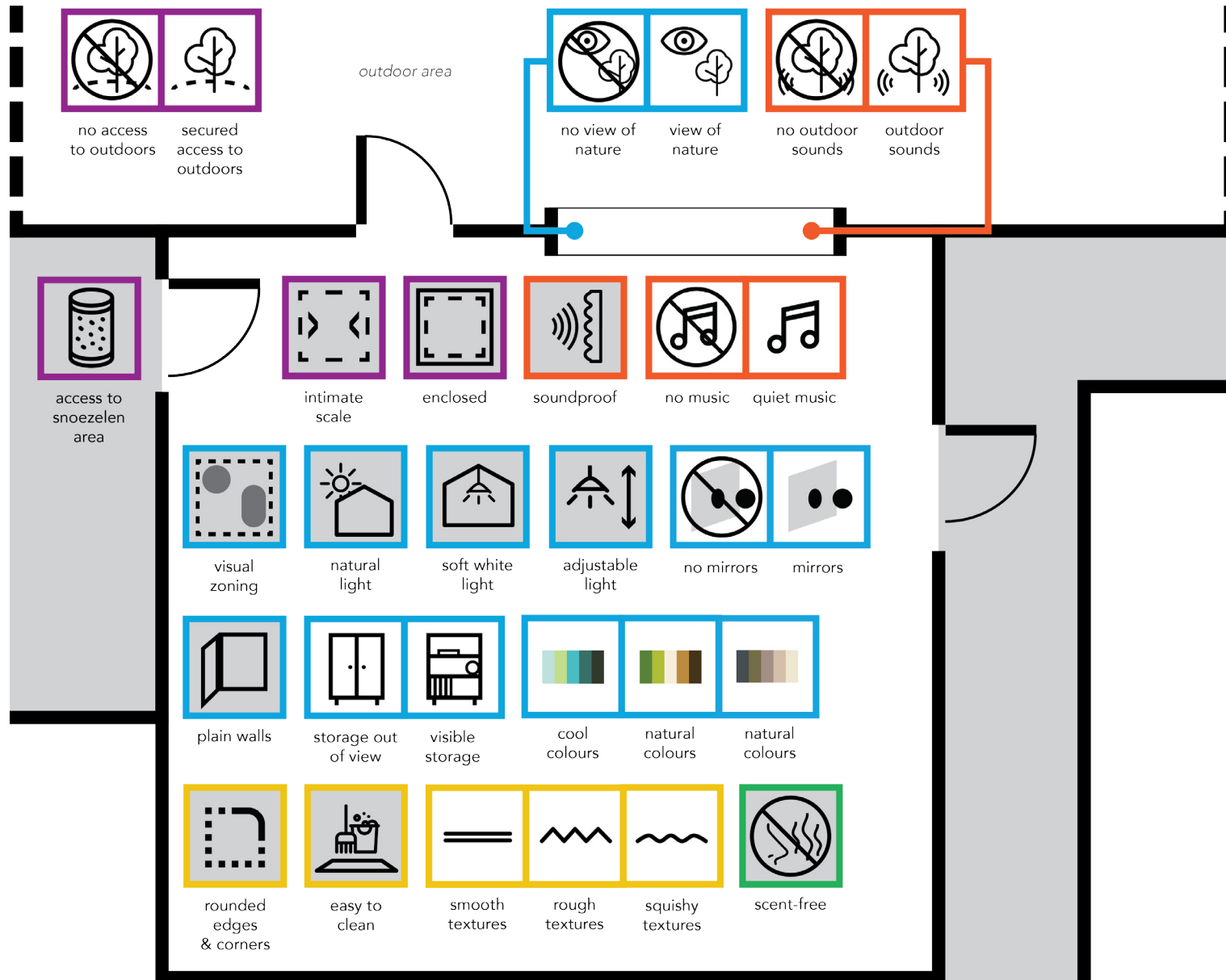


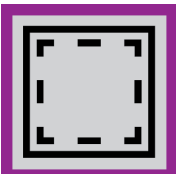












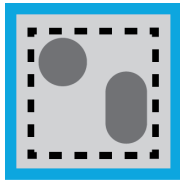


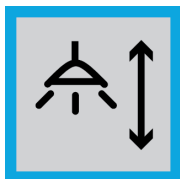

Figure 19. Diagram of Treatment Room Sensory Profile






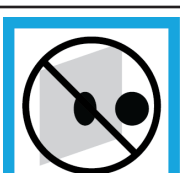
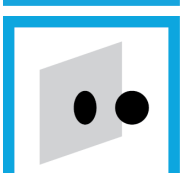
Treatment Room






Theme: Therapy, Learning, Play

Proprioception		The scale and organization of space within a treatment room should provide a sense of balance and safety, while supporting children to feel comfortable while receiving treatment and therapy.	
	Icon	Design Recommendation	Description & Rationale
		Intimate Scale	Treatment rooms designed at an intimate scale with moderate proportions can promote a sense of balance and security. The use of an intimate scale can reduce echoes, create a controllable and manageable space for visual stimuli, and increase tactile stimulation within the boundary.
		Enclosed	Treatment rooms should be enclosed to maintain safety. In addition, it can further create smaller enclosed areas to identify areas for specific activities.
		Access to Snoezelen Area	Treatment rooms should have access to a snoezelen area or snoezelen room with sensory objects so children and youth may use them when needed. Snoezelen areas or rooms can help provide a sense of calm and reduce stress.
	 	No Access to Outdoors; Secured Access to Outdoors	When possible, all treatment rooms should have secured access to outdoors such as to an enclosed playground or sensory garden. This ensures that children have quick and easy access to go outdoors when needed, especially for those who have challenges with mobility. Access to outdoors and nature from treatment rooms can help expand the possibility of spaces a child can receive therapy. In addition, nature can provide a sense of calm and reduce stress.

Auditory		Treatment rooms should provide a low sensory environment that minimizes excessive sounds to support treatment and therapy. Therapists should have opportunities to add, adjust, and remove music and natural sounds when desired.	
	Icon	Design Recommendation	Description & Rationale
		Soundproof	All treatment rooms should be soundproof to ensure privacy and provide a conducive environment for sensory overstimulation from noise and echo. In addition, it can minimize distraction and improve a child's focus during therapy.
	 	No Music; Quiet Music	Treatment rooms should be designed to allow for music to be played and support children to engage with instruments and other musical objects if needed. Music can help with understimulation and can encourage engagement. Relaxing music and ambient sounds can also provide a sense of calm.
	 	No Outdoor Sounds; Outdoor Sounds	Wall openings such as windows that can be opened either partially or fully, while still ensuring safety, provide options to connect treatment rooms with sounds from the outdoors that can give a sense of calm and reduce stress.

Visual		Visual elements in treatment rooms can identify zones designated for different activities, support social interactions, provide information about an individual's surroundings, and provide options for adjustability to create conducive environments for therapy. In addition, certain visual elements can also provide a sense of calm or engagement.	
	Icon	Design Recommendation	Description & Rationale
		Visual Zoning	Visual zoning helps identify areas designated for specific activities such as therapy, play, or rest.
		Natural Light	Treatment rooms with natural light can provide a sense of calm, alertness, and relieve stress.
		Soft White Light	Treatment rooms with soft white light can provide a sense of calm, comfort, and relieve stress.
		Adjustable Light	Adjustable lighting in the treatment rooms allow therapists to create a conducive environment for receiving therapy.
	Plain Walls	Treatment rooms should use plain walls that provide low visual stimulation and support communication by clarifying gestures and movements, which can be beneficial to improve focus during therapy as well as to support children and youth with hearing loss.	

	<p>No View of Nature; View of Nature</p>	<p>Treatment rooms with a view of nature can provide a sense of calm and relieve stress. It can also create focus and engagement for those who need visual stimulation. Curtains or blinds can be used to block views of nature when needed to decrease visual stimulation.</p>
		
	<p>Cool Colours; Natural Colours; Neutral Colours</p>	<p>Cool, natural and neutral colours in treatment rooms can provide a sense of serenity and calm. In addition, natural colours can provide a feeling of connection to nature.</p>
		
		
	<p>No Mirror; Mirror</p>	<p>Some treatment rooms will require mirrors to help children see what is happening and have a better understanding of their surroundings. This is particularly important for children receiving physiotherapy to see their movements or for children receiving botox injections to see and understand the process.</p>
		

		 	<p>Storage Out of View; Visible Storage</p>	<p>Depending on the needs of therapists to provide therapy, storage can either be out of view or visible. Storage that is out of view encourages children to practice asking for objects such as toys, while well-organized visible storage encourages children to take the objects that they need and be independent.</p>
	Tactile		<p>Tactile elements in treatment rooms should ensure safety, health, and engagement.</p>	
<p>Icon</p>		<p>Design Recommendation</p>	<p>Description & Rationale</p>	
		<p>Rounded Edges & Corners</p>	<p>Furnishings and equipment with rounded corners and edges provide a safe environment for children and youth while reducing chances of injury.</p>	
		<p>Easy to Clean</p>	<p>All surfaces should be easy to clean, antibacterial, and hypoallergenic to ensure a safe and healthy environment for all.</p>	






			<p>Smooth Textures; Rough Textures; Squishy Textures (soft and spongy)</p>	<p>Treatment rooms that provide a variety of smooth, rough, and/or squishy textures can promote interest, engagement, and increase tactile stimulation. This can include furniture and toys.</p>
				
				
Scent			<p>Treatment rooms should have no scents to ensure that the environment is inclusive to all.</p>	
		Icon	Design Recommendation	Description & Rationale
			<p>Scent-free</p>	<p>All areas should be scent-free to ensure an accessible and comfortable environment for individuals with sensitivity to scents.</p>

Table 6. Table of Treatment Room Sensory Profile

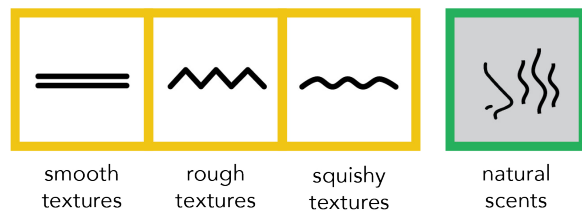
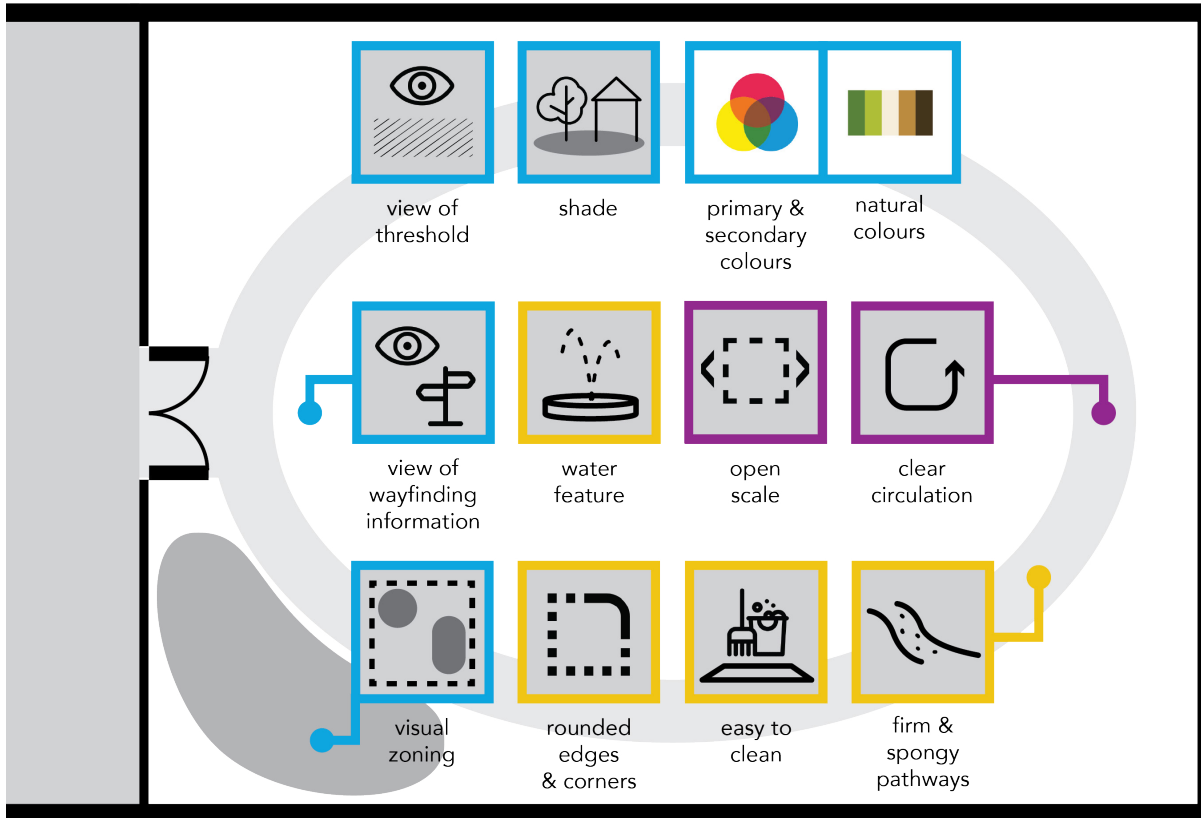
Recreational Spaces

Recreational spaces facilitate physical activity, play, leisure, and therapy. Children and youth engage in activities and play in many different ways. High intensity activities include running, swimming, dancing, playing on the junglegym, playing ball, and riding a bike. Medium intensity activities include walking, making art, and gardening. Low intensity activities include sitting, stretching, and yoga. Sensory gardens that provide clear circulation, visual zoning, areas for high energy activities, and areas for respite, create many opportunities for children and youth to connect with nature and explore different sensory stimuli.

Sensory Garden


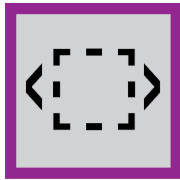
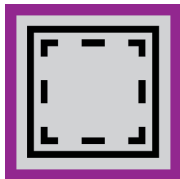
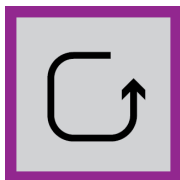








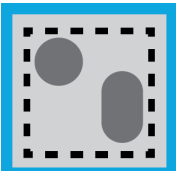

Figure 20. Diagram of Sensory Garden Sensory Profile















Sensory Garden

Theme: Respite, Play

Proprioception		The scale and organization of space within a sensory garden should provide an open and safe space where children and youth can find respite and play freely.	
	Icon	Design Recommendation	Description & Rationale
		Open Scale	Sensory gardens with open spaces creates increased opportunities for auditory and visual stimulation. It can also provide relief from tactile overstimulation by having large spatial boundaries.
		Enclosed	Sensory gardens should be enclosed to maintain safety and identify areas of activity.
		Clear Circulation	Clear one-way circulation in sensory gardens helps present simple and straightforward pathways to orient users. In addition, it decreases visual confusion and distraction.
Auditory		Natural sounds and music in the sensory garden can provide many opportunities for children to engage with the environment. In addition, these sounds can provide a sense of calm.	
	Icon	Design Recommendation	Description & Rationale
		Outdoor Sounds	Natural sounds from the sensory garden can help individuals feel connected to nature, encourage engagement, provide a sense of calm, and reduce stress.

		 	No Music; Quiet Music	Sensory gardens should allow for music to be played and support children to engage with instruments and other musical objects if needed. Quiet adjustable music options can be available in designated zones that allow for individuals to listen to quiet music when desired and turn it off when not in use. Music can help with under-stimulation and can encourage engagement. Relaxing music and ambient sounds can also provide a sense of calm.
	Visual		Visual elements in sensory gardens can provide important information about wayfinding, identify zones designated for different activities, support social interactions, and provide comfort. In addition, certain visual elements can also provide a sense of calm or engagement.	
Icon		Design Recommendation	Description & Rationale	
		Views of Wayfinding Information	Views of wayfinding information in the sensory garden helps individuals find their way quickly and with ease. Wayfinding information should be placed near the entrance and at junctions in the sensory garden.	
		Visual Zoning	Visual zoning helps identify areas designated for specific activities such as play or rest.	
	View of Threshold	A clear view and distinction between the sensory garden's threshold and adjacent areas including entrances and exits can make it easier to ensure safety.		

		Shade	Sensory gardens with shade can provide comfort and shelter from the sun, rain, and snow. Shade can be provided by trees, canopies, or other overhead structures dispersed throughout the sensory garden.
		Primary & Secondary Colours; Natural Colours	Primary and secondary colours in sensory gardens can activate the space and increase visual stimulation and engagement while natural colours can provide a sense of serenity and calm. In addition, natural colours can provide a feeling of connection to nature.
			
Tactile		Tactile elements in sensory gardens should ensure safety, health, comfort, and engagement.	
	Icon	Design Recommendation	Description & Rationale
		Rounded Edges & Corners	Furnishings and equipment with rounded corners and edges provide a safe environment for children and youth while reducing chances of injury.
		Easy to Clean	All surfaces should be easy to clean, antibacterial, and hypoallergenic to ensure a safe and healthy environment for all.

		Firm & Spongy Pathways	Sensory gardens should use firm and spongy pathways to ensure children have a safe space to practice a range of movements and to prevent injuries from falls. In addition, it creates a smooth surface for children using mobility devices.
		Water Feature	Sensory gardens should have water features to provide interest and engagement. In addition, water features can help children and youth stay cool while playing outdoors in warmer weather.
	  	Smooth Textures; Rough Textures; Squishy Textures	Sensory gardens that provide a variety of smooth, rough, and/or squishy textures can promote interest, engagement, and increase tactile stimulation. This can include furniture, equipment, and toys.
Scent		Sensory gardens should have minimal scents to ensure that the environment is inclusive to all.	


		Icon	Design Recommendation	Description & Rationale
			Natural Scents	Sensory gardens should have minimal scents to ensure an accessible and comfortable environment for individuals with sensitivity to scents. Light natural scents in the sensory garden can include woody, green, and floral scents.

Table 7. Table of Sensory Garden Sensory Profile

Chapter 6: Conclusion

The intention of the research study and the development of the design guideline is to demonstrate the positive influence of an environment's sensory conditions on children and youth with special needs and to introduce design opportunities within children's treatment centres that support user experiences, well-being, and treatment. Providing environments that respond to diverse sensory needs helps treatment facilities build capacity and resilience as the need for services continue change and grow.

Understanding the ways in which sensory environments in the context of treatment facilities can support users with special needs, particularly individuals with sensory impairments and sensory processing disorders, is imperative to the improvement of access and inclusion. The literature review and research study support the application of both controlled and flexible sensory features throughout a building to positively impact mental health, behaviour, social connection, concentration, motor coordination, access to information, and confidence.

Limitations and Recommendations for Future Research

This research includes insights, perspectives, and recommendations from the communities of children's treatment centres that include children, youth, their families, staff, therapists, and architects. Although the research prioritized close collaboration with these communities, the observations, semi-structured interviews, and co-design sessions were met with constraints around security and conflicts in scheduling. Most observations were done through staff or therapist-led tours around select spaces within the facilities, which limited access and the amount of time to observe how treatment rooms are used. Observations that were not staff or therapist-led were restricted to public spaces such as waiting rooms and hallways. Insight into how treatment rooms functioned therefore relied heavily on the semi-interviews and co-design sessions. Further, due to limitations in scheduling and recruitment, only two children participated in the semi-structured interviews and three youth participated in the co-designs. This research would benefit from more involvement of a wide range of children and youth that have varying experiences and needs. The data provided are heavily based on the accounts of parents, staff, therapists, and architects.

Additional limitations include challenges in testing the proposed design guidelines on a large scale with stakeholders. Prior to the new Grandview Kids building being completed to enable a better understanding of the benefits of the sensory design recommendations, technology such as virtual reality can create environmental simulations to test the implementation of certain sensory features.

Designing environments for the senses creates an opportunity to actively approach the design of a space through the perspective of human experiences and the many ways people of all differences engage with their surroundings. It allows the design to consider what people have access to, what they might do in a given space, and how they might feel while being in those spaces. Further, by considering the complexity of special needs children and youth, the design of children's treatment centres can build capacity to respond to the changing needs of their clients. An inclusive children's treatment centre is one that promotes independence, diversity, and respect so that all children and youth feel a sense of belonging and empowerment. It is recognizing that every environment

can provide opportunities for engagement, play, and learning that is essential to development. It also means ensuring that there are flexible, cross-sensory ways in which children and youth can interact with their environment no matter their physical, cognitive, or sensory ability.

Children, youth, and their families rely on accessible wayfinding systems to navigate throughout the building. Current challenges with wayfinding systems include the lack of consistency between and within buildings, poor visibility, heavy reliance on user's visual perception and personal literacy level, and a lack of alternative modes of accessing information. In treatment facilities where these challenges persist, staff and therapists note that many newcomers get lost during their visit. Further, youth have a strong desire to be independent which includes navigating environments on their own. Design recommendations that can improve wayfinding systems include well-placed multi-sensory maps at entrances, exits, and junctions; using visible, legible, high-contrast signs; using icons, arrows, photos and PECS; incorporating auditory and verbal cues; and using well-placed braille signage. By providing important multi-sensory information and cues about the different spaces within the treatment facility, users can get to their destination

with ease.

The observations included a range of children's treatment centres with varied sensory features and environments. Children in waiting rooms appeared to interact with their surroundings more when there were features that actively responded to their senses such as interactive digital games, tactile walls, fish tanks, and toys with a range of tactile, visual, and auditory qualities. Visually and tactically interesting features in waiting rooms activate the space and create fun opportunities for children to play and practice important skills learned during their therapy. In waiting rooms that offered a variety of accessible and flexible activities, children often played together or with their families. In contrast, waiting rooms that had few activities or limited toys that were mounted on walls were often dismissed by children. The display of artworks made by children can provide a feeling of pride and recognition. Options to listen to music in a zoned and soundproofed area can be calming. Games that have short durations and toys that can be put away when needed can make transitions easier. In addition, waiting rooms with views of nature, quieter personal areas, and clear views of thresholds can help the waiting rooms feel comfortable, calming, and safe. Amenities such as washrooms require barrier-free

access at many points throughout the building. They can further benefit users by ensuring the interfaces and functionality of equipment are intuitive, such as knowing when the washroom door is locked.

Washrooms also become places of refuge when families need a moment to themselves and should be designed to be comfortable and calming.

Transitional spaces such as hallways and elevators are used to get from place to place within the treatment facility. Transitions can sometimes be challenging for numerous reasons whether it's because a child feels upset, uncomfortable, fixated on a specific task, or is unmotivated. Sensory design features in hallways such as murals can make transitions easier for children by making the journey more enjoyable and breaking it down to simple steps using checkpoints. These features are also used as tools for therapy such as for learning new words through storytelling. Murals and handrails in hallways can also motivate children receiving physiotherapy by providing more accessible and interesting places to go. Therapists mentioned that due to limits in space, they often have conversations that may be confidential in the hallways. Creating recessed areas or alcoves throughout hallways can protect privacy and confidentiality, as well as provide various points to take a break. Moreover, there is a

need for elevators to be reliable and accessible by providing multi-sensory information about services on each floor as well as cues related to the functioning of the elevator.

The outcome of the interviews indicated that therapists and care providers use many spaces within the treatment facility to deliver therapy and care. This means that therapy can happen everywhere, both inside and outside treatment rooms. Most therapies are delivered through play-based models and treatment rooms that include zoned areas for different activities, access to snoezelen areas, and access to the outdoors can be conducive environments for learning. Further, simulating environments that children and youth can expect to encounter in their daily life can help with the transition of skills outside of treatment facilities. Exposure to sensory inputs can be challenging for children with sensory processing disorders. To help children adapt, environments should be designed to allow for gradual exposure to different sensory stimuli in safe and comfortable settings. Challenges in communication can also lead to children feeling stressed and frustrated. Placing tools and prompts that support communication such as the use of PECS that children can point to can help children express themselves. The organization of space and

equipment is also important in helping children develop independence, self regulation, and social skills. Toys and snacks that are clearly visible and easy to reach allow children to get the things that they need and put them away by themselves. Alternatively, toys that are in view, but out of reach can prompt children to learn to practice asking for the things that they need.

Recreational spaces such as pools, gyms, playgrounds, and sensory gardens provide opportunities for children and youth to engage in physical activities. Sensory gardens connect users to nature and a wide range of sensory inputs that include increased opportunities for auditory and visual stimulation, natural scents from the garden, as well as relief from tactile overstimulation. Firm and spongy pathways with clear circulation can make the journey throughout the sensory garden safe and easy to navigate. Shade and water features can ensure that children and youth are comfortable and can find relief and respite from the weather when playing outside, especially on sunny days. Finally, visually clear zones of activities can create safe spaces to engage in different levels of activities.

As children and youth grow and move through the different stages in their life, all of the environments that they use and engage with shape their development and their sense of well-being. Having access and feeling a

sense of belonging in all aspects of their life, including where they live, play, and go to school means that they can participate fully and engage meaningfully. The outlined sensory design guidelines reinforce the importance of including the perspectives of children, youth, families, and care providers, and provide strategies that can be implemented in children's treatment centres to support children and youth in living life to their full capacity. The recommendations proposed here are aimed at children's treatment centres as these are places that play a significant role in the development of children and youth with special needs, yet the insights can prompt further consideration into how sensory environments beyond treatment facilities can be designed inclusively. The efforts of this research is an expression of commitment by the communities dedicated to supporting children and youth to foster environments that celebrate diversity and inclusion.

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Appendix A: Semi-structured Interview Guide

Semi-structured Interview Questions (Therapists and Staff)

About the Interviewee (15 minutes)

1. Can you describe your role at _____ Children's Treatment Centre and what a typical day looks like for you?
2. What resources do you rely on the most?
3. Do you have a set of personal goals and/or milestones? How do you celebrate those? What are you the most proud of in your experience?

About the Children (15 minutes)

4. What are the diagnoses of the children and youth that the treatment centre serves? What are the most common diagnoses?
5. What are the major challenges you face? How do you manage those challenges?
6. What services and therapies that children and youth receive?
7. How would you describe the behaviour of the children and youth?
8. What are the most challenging behaviours?
9. Are there things that children and youth enjoy and how do they engage with those things?

About the Children's Treatment Centre (20 minutes)

10. What is the journey of a typical visit from beginning to end?
11. What are the greatest barriers for you and the children and youth at the treatment centre?
12. How do you picture the new facility? (i.e. amenities, facilities, feeling, or quality of experience)

About Wayfinding (20 minutes)

13. Are you able to find rooms and services quickly?
14. Is signage intuitive and does it help you find information to reach your destination?
15. Do children and youth rely on guidance to transition between spaces?

About Experience of Spaces (20 minutes)

16. Do children and youth have any sensory sensitivities?
17. Are there any environmental factors that cause agitation or stress?
18. Are there any environmental factors that alleviate agitation and stress? What are methods, tools, or environments that help children and youth to cope?
19. Are there any environmental factors that cause distraction?
20. Are there particular types of furniture that children like?
21. Are there particular types of materials or surface textures that children like?

Semi-structured Interview Questions (Parents and Family)

About the Interviewee (15 minutes)

1. Can you describe a typical visit to the treatment centre?
2. What resources do you rely on the most?
3. Do you have a set of personal goals and/or milestones? How do you celebrate those? What are you the most proud of in your experience?

About the Children (15 minutes)

4. What is your child's diagnosis?
5. What are the major challenges you face? How do you manage those challenges?
6. What services and therapies does your child receive?
7. How would you describe your child's behaviour?
8. What are the most challenging behaviours?
9. Are there things that your child enjoys and how do they engage with those things?

About the Children's Treatment Centre (20 minutes)

10. How often do you visit the treatment facility?
11. What are the greatest barriers for you and your child at the treatment centre?
12. How do you picture the new facility? (i.e. amenities, facilities, feeling, or quality of experience)

About Wayfinding (20 minutes)

13. Are you able to find rooms and services quickly?
14. Is signage intuitive and does it help you find information to reach your destination?
15. Does your child rely on your guidance to transition between spaces?

About Experience of Spaces (20 minutes)

16. Does your child have any sensory sensitivities?
17. Are there any environmental factors that cause agitation or stress?
18. Are there any environmental factors that alleviate agitation and stress? What are methods, tools, or environments that help your child to cope?
19. Are there any environmental factors that cause distraction?
20. Are there particular types of furniture that your child likes?
21. Are there particular types of materials or surface textures that children like?

Semi-structured Interview Questions (Children and Youth)

About the Children and Youth (60 minutes)

1. What are the things that you enjoy? (i.e. animals, colours, shapes, activities)
2. What kinds of games do you like to play with? How do you play?
3. Do you use digital devices? What do you use?
4. Do you like art? What kind of art do you like?
5. Are there places in the treatment centre you like the most?
6. Are there places in the treatment centre you don't like?
7. When you come to the treatment centre, do you know where to go or do you have to ask someone for help?
8. Have you been lost at the treatment centre before? Can you tell me about it?
9. When you feel upset or stressed, what do you do to feel better?

Appendix B: Co-design Session 1

Facilitation Guide

Co-design Session One Schedule		
Time	Minutes	Activity
10:00 – 10:05am	5 minutes	Introduce project and sign consent form
10:05 – 10:15am	10 minutes	Introduce schedule and activities; Divide into teams
10:15 – 10:45am	30 minutes	Co-design activity
10:45 – 11:00am	15 minutes	Break
11:00 – 11:30am	30 minutes	Discussion: prototypes of model 1 and model 2

Materials Checklist

- Co-design schedule
- 2 audio recording devices; 1 video recording device
- Refreshments (juice boxes, granola bars, etc.)
- Crafts materials (pens, markers, legos, popsicle sticks, tape, scissors, etc.)
- Model 1: waiting room
- Model 2: multi-functional treatment room

Appendix B: Co-design Session 2

Facilitation Guide

Co-design Session Two Schedule		
Time	Minutes	Activity
1:00 – 1:05pm	5 minutes	Introduce project and sign consent form
1:05 – 1:10pm	5 minutes	Introduce schedule and activities
1:10 – 1:30pm	20 minutes	Co-design activity
1:30 – 2:00pm	30 minutes	Discussion: proposed zones of activity and sensory attributes for co-design materials

Materials Checklist

- Co-design schedule
- Markers
- Large sheets of paper
- Post-it notes

Appendix B: Co-design Session 3

Facilitation Guide

Co-design Session Three Schedule		
Time	Minutes	Activity
12:00 – 12:05pm	5 minutes	Introduce project and sign consent form
12:05 – 12:10pm	5 minutes	Introduce schedule and activities; Divide into teams
12:10 – 12:30pm	20 minutes	Co-design activity
12:30 – 12:40pm	10 minutes	Discussion: orientation of spaces in context of site plan
12:40 – 12:50pm	10 minutes	Discussion: zones of activity
12:50 – 1:00pm	10 minutes	Discussion: sensory attributes and other design features

Materials Checklist

- Co-design schedule
- 2 audio recording devices; 1 video recording device
- Refreshments (juice boxes, granola bars, etc.)
- Crafts materials (pens, markers, legos, popsicle sticks, tape, scissors, etc.)
- Model 1: public gathering spaces and amenities (waiting room, washroom)
- Model 2: treatment spaces (multi-functional treatment room, separate ABA & IBI autism therapy room)
- Model 3: recreational spaces (gym, playground, sensory garden)
- Model 4: transitional spaces (indoor hallways, outdoor pathways, parking lot, elevator)
- Prompt cards

Prompt Cards

zones of activity 

Activity

Select all that apply and place in floorplan.

Activity: _____

- Play Therapy Rest
- Other: _____
- Calm Medium Hyper
- With Others Alone

Where does it happen? _____

Why? _____

sensory | other 

Additional Ideas






Share additional ideas and place in floorplan.

Idea: _____

sensory | other 

Wayfinding / Navigation

Select all that apply and place in floorplan.

-  Icons
-  Photos
-  Text Labels
-  Colour Coding
-  Arrows
- Audio Cues / Alerts
- Audio Descriptions
- Tactile Cues Tactile Paths
- Map
- Other: _____
- Physical Digital

Where is it? _____

Why? _____

sensory | other 

Space / Proprioception / Balance

Select all that apply and place in floorplan.

- Low Ceiling High Ceiling
- Open Space
- Space Separated by Furniture
- Enclosed Space (No Visual Access)
- Enclosed Space (Visual Access)

* If visual access is selected,
indicate the type of view below:

- Internal View External View
- Railing
- Other: _____

Where is it? _____

Why? _____

sensory | auditory 

Ambient Sound

Select all that apply and place in floorplan.

- No Sound / Soundproof
 - Audible Sound
- * If audible sound is selected,
indicate the type of sound below:
- Music Human Speech
 - White Noise
 - Air Conditioner / Fan
 - Street Noise Traffic Noise
 - Quiet Medium Loud
 - Other: _____
 - Adjustable Fixed

Where is it? _____

Why? _____

sensory | auditory 

Informational Sound

Select all that apply and place in floorplan.

- No Sound / Soundproof
 - Audible Sound
- * If audible sound is selected,
indicate the type of sound below:
- Speaker Announcements
 - Verbal Cues Sound Cues
 - Alerts / Alarms
 - Quiet Medium Loud
 - Other: _____
 - Adjustable Fixed



Where is it? _____

Why? _____

sensory | visual 

Colour

Select all that apply and place in floorplan.

-  No Colour / Greyscale
-  Neutral
-  Natural
-  Primary & Secondary
-  Warm
-  Cool
- Other: _____
- Low Contrast High Contrast
- Unsaturated Saturated




Where is it? _____

Why? _____

sensory | visual 

Lighting

Select all that apply and place in floorplan.

-  Natural Daylight
-  Soft White / Warm
-  Bright White / Cool
-  Coloured
- Other: _____
- Bright Dim
- Adjustable Fixed

Where is it? _____

Why? _____

sensory | visual 

Surface

Select all that apply and place in floorplan.

-  Matte
-  Gloss
-  Reflective / Mirrored
-  One-way Mirror
-  Transparent
-  Translucent
-  Opaque
- Other: _____



Where is it? _____

Why? _____

sensory | visual 

Wall & Surface Coverings

Select all that apply and place in floorplan.

-  Solid / Plain
-  Patterned
-  Irregularly Patterned
-  Naturally Patterned
-  Imagery / Mural
- Other: _____

Where is it? _____

Why? _____

sensory | tactile 

Surface Texture & Quality

Select all that apply and place in floorplan.

- Rough Smooth
- Fuzzy Slick
- Cushioned / Padded
- Soft Medium Hard
- Flat Round Sharp
- Antibacterial
- Hypoallergenic
- Other: _____
- Adjustable Fixed

Where is it? _____

Why? _____

sensory | olfactory 

Scent

Select all that apply and place in floorplan.

- Floral
- Woody
- Green (i.e. leaves)
- Fruity / Citrus
- Spicy
- Oceanic
- Natural Artificial
- Other: _____

Where is it? _____

Why? _____
