

Designing a sensory yoga play kit for children with sensory differences

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Abstract

The study investigates designing a sensory yoga play kit for hypersensitive children with Sensory Processing Disorder (SPD). This research aims to improve the two senses: proprioception and vestibular sensory issues, by implementing sensory yoga as part of the children's daily routine. While there is currently no sensory yoga play kit available on the market, the study focuses on how yoga benefits sensory issues. It also explores how to design an inclusive sensory yoga play kit that encourages enjoyable sensory yoga, which has been tested and approved by occupational therapists. The research was conducted using qualitative research methods. Grounded upon Participatory Action Research and Inclusive Design, this study uncovers common themes, factors, and challenges hypersensitive children with SPD face in their everyday experiences. This investigation culminated in an inclusive sensory yoga play kit that motivates sensory yoga for children with SPD and autism-related sensory issues.

Keywords:

sensory processing disorder, sensory differences, inclusive design, yoga play kit, sensory yoga, children with sensory differences, occupational therapist

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Dedication

In the hopes that this work may in some way contribute to their exploration of design space, this is dedicated to designers, present and future; that when designing for the better, let's all consider designing for inclusion first.

Table of Contents

Table of Contents	Page
Chapter 1: Introduction	9
Overview	9
Purpose of the Study	11
Research Questions	12
Chapter 2: Literature Review	13
The Eight Senses	13
The Relationship Between Autism and Sensory Processing Disorder	16
Treatments for SPD	18
Occupational Therapy	18
Sensory Integration Therapy	19
Sensory Gym	20
Sensory Yoga	21
Chapter 3: Methodology	26
Theoretical Framework	26
Participatory Action Research	26
Inclusive Design	27
Prospective Participants and Stakeholders	28
Data Collection Method	30
Recruitment	31
Semi-structured interviews	31
Direct Observation	32
Co-design	32
Data Analysis	33
Thematic Analysis	33
Integration of Methods	34
Chapter 4: Results	35
Amendment and Pivoting Research	35
Participant Recruitment	37

Designing the Sensory Yoga Playkit	41
Existing Yoga Playkits Analysis	41
Yoga Mat	45
Yoga Block	48
Yoga Bench	48
Yoga Straps/Bands	50
Small Weights	51
Exercise Cards	52
Integrating co-design and interviews	54
Results of Integrative Methods with Major Themes	59
Yoga Play Kit Components	59
Differences in Terminology (SPD vs. SD)	59
Sensory Yoga Play Cards	60
Improving Proprioception and Vestibular Systems	62
Chapter 5: Discussion of Findings	65
Understanding Sensory Processing Disorder and Sensory Differences	65
Formulating an inclusive sensory yoga play kit	67
Limitations and Recommendations for Future Research	67
Participatory Action Research with the OTs	70
Chapter 6: Conclusion	72
References	74
Appendices	93
A Interview Guide	93
B Sensory Yoga Play Cards	95
C Recruitment Posters	97

List of Figures, Tables, and Acronyms

List of Figures	Page
Table 1: List of the name of the clinics/organizations contacted For Research participation	39
Table 2: Comparisons of existing yoga play kits	43
Table 3: Comparisons table of traditional yoga product for the play kit	45
Figure 1: First prototype of sensory yoga play cards	53
Figure 2: First prototype of sensory yoga playkit	54
Figure 3: Second prototype of sensory yoga playkit	57
Figure 4: Final prototype of sensory yoga playkit	58

List of Acronyms

SPD: Sensory Processing Disorder

ASD: Autism Spectrum Disorder

SI: Sensory Integration

OT: Occupational Therapists

PAR: Participatory Action Research

SD: Sensory Differences

ICD: International Classification of Diseases

DSM: Diagnostic and Statistical Manual

Chapter 1: Introduction

Overview

Sensory Processing Disorder (SPD) is a neurological disorder that impairs the processing of sensory information in the brain from our senses. It can cause an inability to properly orient the body, poor fine motor skills, hypersensitivity to sound for children, and difficulty processing incoming information (Bunim, 2013). Unlike visual impairment or hard of hearing, which is described as not receiving sensory input, an individual with SPD perceives senses abnormally (Singer, 2015). SPD affects the brain to process sensory information in a distressing and confusing way (Sicile, 2010). The prevalence of sensory processing issues is around 1 in 20 to 1 in 6.25 children in the US general population. A new study in Finland found the majority of sensory abnormalities to be approximately 8.3% in an epidemiological group of 8-year-old children (Crasta, Salzinger, Lin, Gavin, & Davies, 2020).

Sensory processing disorders affect 5 to 16 percent of school-aged children (Bunim, 2013). In the case of the child with SPD in a classroom, not only do they struggle during the class, but they will also likely have difficulty in other aspects of their daily lives. It could include struggling on the playground in terms of being frightened of equipment or sounds in the cafeteria, where the sounds and visual stimulations can cause emotional distress. SPD can affect an art class, where a student may exhibit clumsy behaviour or may appear uncoordinated and bang into peers and objects (SPD Foundation, 2021). Therefore, parents, teachers, and support workers need to consider aspects of surroundings that may not involve class time.

Sensory Processing Disorder, formerly referred to as sensory integration dysfunction, is not currently recognized as a distinct medical diagnosis around the world (Goodman, 2012). As we move further to the report, the report will discuss the therapies available as support for children with SPD. One of the less considered therapy and commonly researched therapy topic for SPD is sensory yoga therapy where personalized yoga activities are used to relieve psychological anxiety and cause stability to the body, breathing, and mind levels through physical posture, breathing, and relaxation techniques, consequently improving overall wellbeing (Woodyard, 2011). Although the practice of yoga has been shown to improve cognitive performance, some studies have examined the underlying neurological correlation (Gothe, Hayes, Temali, & Damoiseaux, 2018). Yoga is one of the widely used mind-body medicine for health promotion, disease deterrence, and a potential treatment modality for neurological disorders (Mooventhana & Nivethitha, 2017).

Research on the influence of yoga for people with special needs and relevant to SPD difficulties exist. However, more research is needed, with SPD being the main focus of the study. Existing research focus on the effect of yoga therapy on the symptoms of a sensory processing disorder in autistic individuals with SPD. Various yoga studies have shown promising improvement in autism spectrum disorder symptoms through improved sensory processing, overall motor skills, balance and coordination, cognition, imitation skills, and ability to communicate in relationships (Gulati et al., 2020). However, many existing studies about these aids are directed at parents or yoga instructors with hardly any SPD awareness. Little research has been conducted to create a sensory play kit that

promotes sensory yoga and accommodates SPD issues that encourage children with SPD to participate in fitness routines while having fun. There is a gap in designing a sensory yoga kit that enables sensory yoga as part of SPD therapy for children with SPD. Further research directed by children with SPD for SPD children accommodates yoga as a therapeutic tool, which is a fun and enjoyable experience while beneficial to them is needed.

For this research study's purpose, inclusion is understood as creating an enjoyable sensory yoga for children with SPD. It is an assertion of this report that genuinely inclusive sensory yoga play kit and sensory yoga activities should make everyone feel safe and able to experience self-care. As yoga becomes a common part of our daily routine, when designing yoga play kits that serve human healing and mindfulness, we need to consider how inclusively we can design for individuals by acknowledging wide variation in their sensorial experiences.

Purpose of the Study

The study aims to design a sensory yoga play kit that encourages sensory yoga as part of SPD therapy for children with SPD. As there is not much research on how yoga benefits sensory issues, it is required to have research directed by children with SPD, for children with SPD that accommodates yoga as a therapeutic tool that is an enjoyable, fun experience while its benefits their well-being is needed. A sensory yoga play kit that encourages sensory yoga directed toward children with SPD has not been conducted before.

Research Question

The following research questions will guide the study: How can a sensory yoga kit for children with sensory processing disorders be designed to promote yoga activities? Can the play kit be used as an informative guide that parents can use with children with SPD to promote and support parent-kid bonding playtime?

Chapter 2: Literature Review

The following is a literature review to support the designing of a sensory-inclusive yoga play kit that promotes yoga activities for hypersensitive children with SPD (sensory processing disorder) and autism related sensory issues. This literature review aims to identify ways to create a sensory yoga play kit that encourages sensory yoga that works as an enjoyable experience for children with SPD. The research aims to investigate best practices for making yoga enjoyable for children with SPD. The literature review also aims to identify research that examines the relationship between critical design factors in the existing fitness environment and sensory issues which might arise or co-exist.

The Eight Senses

SPD is a neurological disorder that causes complexities in processing information from their eight senses: Visual, Auditory, Tactile, Gustatory, Olfactory, Vestibular, Proprioception and Interoception (Seeberger, 2020). According to Children's Home Society & Lutheran Social Service of Minnesota, CHLSS (2018), sight, sound, touch, taste, and smell are widely known as the five traditional senses that help us navigate the world around us. However, there are eight senses in our sensory nervous system. The vestibular sense refers to balance and orientation in space (Your 8 Senses, 2021). The vestibular system works with auditory and visual processing related to balance, attention, eye control, and coordination. According to the seven senses:

Dysfunction in this system may manifest itself in poor physical coordination; poor memory (due to difficulty with auditory processing or

receiving and understanding auditory stimuli as it is transmitted to the brain) with difficulty with sequencing and timing (understanding the steps required to perform a certain action); and difficulty with understanding language, especially nonverbal social language such as body language of self and others (SPD Australia, 2021).

On the other hand, proprioception is similar to the vestibular system. However, it addresses muscle and/or joint movements. It refers to how humans interpret the relationship and energy between each individual's body part, our body awareness. Children with SPD have difficulty navigating where their muscles and joints are located, if their body parts are relaxed or intensions, and how different body parts respond to external stimuli (Arky, 2022). Finally, interoception, known as the "hidden sense," is the most recent discovery. The Interoceptive system gives us the ability to experience what is happening in our bodies. It contains specialized nerve receptors in our body, including our internal organs, bones, muscles, and skin. These receptors send information to the brain, which is used to determine how it feels. The interoceptive system aims to help our body stay in a state of optimal balance called homeostasis. The interactive system is also responsible for letting us feel our emotions. When a person has inter-conceptual difficulties, they may not be aware that they are hungry, thirsty or need to go to the bathroom (Mehling et al., 2012). These are the eight senses that help us interpret the world around us and organized how we respond to sensory signals.

Sensory Processing Disorder/ Sensory Differences

Children with sensory processing disorder are often incorrectly diagnosed and misunderstood. Sensory processing issues are often discovered at an early

age when parents become aware that their child has an unusual dislike of noise, light, shoes that are considered too tight, and irritating clothing. They may also find that the child is experiencing clumsiness and difficulty climbing stairs or having minor motor skills problems such as holding a pencil or pressing a button (Arky, 2020).

A person with SPD has difficulty processing and acting on appropriate responses with information received through the senses, which creates challenges in performing simple everyday tasks (Centre for Inclusive Childcare, 2021). Sensory processing disorders come in two types, under- and over-sensitivity, although it is common for one child to experience both kinds. Hypersensitive kids are incredibly reactive to sensory stimulation and can find it overwhelming, while Hyposensitive kids are under-sensitive, which makes them not responsive to stimuli (Child Mind Institute, 2020). However, under-sensitivity leads to another SPD pattern, sensory seeking, where kids actively look for sensory stimulation (Otismo Editorial, 2018). SDP affects more than 1 in 10 children, at least 1 in every classroom, and 4-12 million children who are younger than 18 years old in the US (CHLSS, 2018). Researchers have not confirmed SPD's causes but have found that genetics, low birth rate, and trauma could contribute to children with SPD responding excessively, too frequently, or too long to sensory stimuli (CHLSS, 2018). They can become assertive or impulsive when overwhelmed by sensory stimuli. Children with sensory issues can also exhibit extreme behaviours: a state that causes them to be aware of all stimuli at the same time rather than avoiding unimportant stimuli (Child Mind Institute, 2020).

Due to increased anxiety about perceived threats, a defence mechanism known as fight-or-flight can be overwhelming to them, resulting in children with SPD being prone to avoiding social and group activities. They have difficulty maintaining relationships, can be extremely cautious of the surroundings and nervous to try new things, or can be easily upset by transition and unexpected changes (CHLSS, 2018). Often children with SPD need things to be a particular way – their way, whatever that may be. That might mean eating oatmeal for breakfast every day or just wearing a long-sleeved shirt on the hottest days. When their lives are disrupted in the smallest way, children with SPD children can break down and develop stress and anxiety that they cannot control (Yoga and SPD, 2013). It is important to note that SPD makes it difficult to coordinate with everyday environments, whatever the specific patterns. It impacts how a person relates to others, studying and learning, participating in sports and group activities, and following your dreams.

The Relationship Between Autism and Sensory Processing Disorder

ASD (autism spectrum disorder) is a complex group of brain development disorders that affects individuals at different levels and can be classified according to social interactions, verbal and non-verbal communication and repetitive behaviours (What Is Autism? | Autism Speaks, 2013). Approximately 1 in 66 children and youth are diagnosed with ASD in Canada (Public Health Agency of Canada, 2018). However, this does not account for all cases of ASD. In 2009, the BBC released a statement saying, "for every three known cases of the autism spectrum, there may be a further two cases that are undiagnosed" (Roxby, 2019). Therefore, it is unclear how many undiagnosed cases of ASD actually exist.

Adults and kids with different ability levels, most of them stated sensory processing challenges as the number one difficulty for them, regardless of where they were on the spectrum (Sicile, 2010).

Over 90% of children with Autism Spectrum Disorders (ASD) demonstrate atypical sensory behaviours. However, there can be cases where children with sensory processing disorder may not be diagnosed with an ASD diagnosis but show atypical sensory behaviours to the same or greater degree as ASD children (Chang et al., 2014). Children with SPD tend to have more tactile problems than children with autism, while children with autism have more difficulty with sound processing. Perhaps that explains why language and communication problems are common in autism (DeWeerd, 2016).

Existing research shows that Sensory Processing Disorder is most presented along with ASD (Singer, 2015). SPD is more common in children than autism and perhaps even as common as attention deficit hyperactivity disorder. However, SPD may not be recognized as a defined disease, making this condition less well known (Bunim, 2013). It is essential to recognize that if most children have SPD, this does not mean they are autistic or on the spectrum, although many individuals with ASD struggle with sensory-related problems (Singer, 2015). Based on the University of California San Francisco (UCSF) research, children with SPD have different brain connectivity deficits than children with autism and the study suggests that sensory processing disorder is a disease of its own, separate from autism. (Bunim, 2014). Most parents and educators have acknowledged that sensory processing disorder is a separate

disorder of its own, one of many neurological diseases, including autism, which is why it must be part of the mental health conversations and not be overlooked.

Treatments for SPD

The Understood (2019), a founding partner of Child Mind Institute, states that there is no medication to manage sensory processing issues. However, there are therapies and functional changes parents, and educators can make at home and at school to help a child with SPD to have a balanced life. Many families with a child with SPD find that it is not easy to get assistance. One reason this may be the case is that sensory processing disorder is not currently recognized as a distinct medical diagnosis (Goodman, 2012).

Occupational Therapy

Treatment for sensory processing disorder usually includes occupational therapy, a sensory diet, and sensory integration challenges that challenge a child in a fun, playful way so they can learn to respond appropriately and function more normally (Rodden, 2017). Despite the lack of a widely accepted diagnosis for SPD, occupational therapists commonly see and treat children and adults with sensory processing problems. Occupational therapy has proven to be a convenient tool for children with SPD (Goodman, 2012). Occupational therapists engage kids in physical activities designed to regulate their sensory input, to make them feel more comfortable, secure, and focused.

Many parents have found that the therapies and exercises help kids feel better and function better (Understood, 2019). Treatment depends on each child's personal needs. In general, it consists of helping children do better at

activities they usually do not execute well and assisting them to get accustomed to things they cannot tolerate (Goodman, 2012).

Sensory Integration Therapy

SI (Sensory integration) therapy aims to help children with SPD respond to sensory stimulation in a structured, repetitive way. Sensory integration practices therapies such as deep pressure, brushing, weighted vests, and swinging. These therapies sometimes appear to calm an anxious child (Arky, 2022). Over time, the brain will adapt and allow kids to process and react to sensations more efficiently, making SPD easier to manage in day-to-day life. Children's nervous systems respond in a more "organized" way to sensations and movement through repetition. This type of therapy should only be provided by specially trained occupational therapists (Morin, 2019). In addition, it is believed to increase a child's threshold for tolerating sensory-rich environments, make transitions less disturbing, and promote positive behaviours (Healthy Children, 2019). Although there are scientific studies to show that occupational therapists use SI therapy for children with a sensory processing disorder alongside ASD, the effectiveness of sensory integration therapy as a therapy for SPDs is limited and inconclusive (Pfeiffer, Koenig, Kinnealey, Sheppard, & Henderson, 2011). While this does not mean that the therapy might not help some children, effectiveness is so far mainly based on personal experiences (Healthy Children, 2019).

Sensory Gyms

It is relevant to mention that regular open gym classes or fitness environments can upset a child with SPD. An echoing of voices, squeaky shoes

on the floor, whistles blowing, sweat smells, or bright surroundings and moving objects is enough to raise their stress levels. Accompanied by a demand to follow instructions, learn new skills, and keep up with the rest of advanced peers would create a disastrous environment for children with SPD (Phelan, 2017). Children with SPD spend extra time playing alone during recreational time instead of fully participating in group activities possible. They need more explicit instructions depending on the stimuli they generate during playtime (Singer, 2015).

A sensory gym is a room for active sensory play and more than just a playroom. It includes sensory pieces of equipment designed to accommodate proprioceptive and vestibular sensory inputs (Sensory Gym, 2021). A sensory gym could include swings, trampolines, therapy balls, brightly coloured pillows, ball pits, tunnels, climbing walls, and many more tools to help children become more confident with sudden changes in their environment (Carolina Therapy Connection, 2019). Eventually, these reactions become more natural for the child, helping children participate in more typical academic and social activities. These gyms could encourage independence, reduce meltdowns, and control social stress by making children feel calmer and more focused. Furthermore, by providing health and fitness benefits, sensory gyms also increase a child's social skills and self-esteem (Carolina Therapy Connection, 2019).

Sensory gyms do not serve as a substitute for other types of treatment for a child, but they will amplify its effects. Sensory gyms have been reported to improve motor skills, physical awareness, social abilities, and muscle strength and improve coordination and balance (Carolina Therapy Connection, 2019). A

recent study indicates that gyms help children with SPD to become independent, communicate better, and strengthen their self-care habits and attention spans (Dean, 2016). A sensory gym offers the child the opportunity and motivation to use different muscle groups in a safe and friendly way. Sensory gyms help with developmental improvements primarily because they are fun. These gyms are explicitly designed for kids with sensory processing disorders, meaning they can play without stress. Sensory gyms provide these children with space and resources they need to feel secure while playing and growing at their own pace where learning becomes enjoyable and not overloading (Dean, 2016). While parents and therapists aim for developmental advances, children only see the fun. Therefore, it is relevant that while there are different types of therapy available, these therapies should also create an enjoyable atmosphere where the individuals with SPD would want to play/participate willingly and not just because parents demand this of them. There is no doubt parenting a child with SPD has its challenges. Sometimes the process of making a child healthier and happier feels like one step forward, two steps back (Dean, 2016).

Sensory Yoga

Yoga is a mind-body-focused physical activity that has been shown to have many benefits related to physical, mental, and cognitive health. Therapeutic yoga is characterized as applying yoga postures and practice to health requirements. It includes instruction in yogic practices and teachings to prevent, decrease or alleviate structural, physiological, emotional, and spiritual pain, suffering or limitations (Woodyard, 2011).

Yoga therapy, a mind-body intervention, is an interdisciplinary approach to relieve psychological anxiety and bring stability and harmony to the mind and the body, through physical posture, breathing, and relaxation techniques, consequently improving overall wellbeing (Woodyard, 2011). Various yoga studies have shown promise in growing symptoms of ASD by improvement in sensory processing, gross motor skills, balance and coordination, cognition, imitation skills, and the ability to connect in relationships. (Kankan Gulati, Praerna Hemant Bhargav, Abraham, & Hemant Bhargav, 2020). The brain operates collectively with input from the proprioception and vestibular systems to recognize the body's position and acceleration from moment to moment. Yoga is an excellent way to strengthen these senses as the mind and body work together to achieve the poses (Sensory Processing Disorder Parent Support, 2021).

For individuals with a sensory processing disorder, sensory integration (SI) therapists formulate sensory diet programmes. Through personalized yoga poses and programmes, which involve various vestibular (movement/balance), proprioception (movement and resistance) and tactile (deep pressure and touch) activities, individuals can obtain the sensory input they need to help them become focused and coordinated during the day (Sensory Integration Education, 2019). These techniques, tasks, and postures (mostly when performed continuously) can improve children's abilities to relax when they find themselves in a stressful situation (Yoga and SPD, 2013). Yoga therapy embraces a multifaceted technique to reduce psychological distress to convey balance and harmony to the body, thus enhancing overall wellbeing. Existing studies have shown that yoga has improved SPD symptoms by

enhancing sensory processing, motor skills, balance and coordination, cognition, and imitation (Kankan Gulati, Praerna Hemant Bhargav, Abraham, & Hemant Bhargav, 2020).

Through personalized yoga programs involving various vestibular, proprioceptive, and tactile activities, children with SPD can experience the sensory input they need to function throughout the day (Hamilton, 2020). The brain works collectively with input from proprioception and vestibular activities to identify the body's position and acceleration. Yoga is a great way to strengthen these senses as the mind and bodywork together to complete the poses ("Sensory Yoga Proprioception Vestibular," 2021). Poses such as a downward dog, airplane, tree pose, and planking are simple yoga movements for kids as they receive proprioception input from the pressures on their arms and input to the vestibular system by having their head inverted (Hamilton, 2020). Yoga provides these children with relief – a way for them to take control, take ownership of their feelings and develop their ability to cope without assistance. Teaching these children yoga breathing techniques allows them to learn to relax and calm themselves. Poses such as a child's pose allow them to feel the stillness and calm of their bodies. (Yoga and SPD, 2013)

In occupational therapy, the therapist enables individuals to participate in what they want and need, physically, mentally, and spiritually. Both yoga and occupational therapy-defined practice help one to increase body awareness and fine-tune coordination skills (Hamilton, 2020). For children with SPD, yoga can increase body awareness and muscle tone. It can aid in developing balance, joint coordination, motor-planning, and both fine and gross motor skills (Yoga and

SPD, 2013). All the poses that provoke play are present and remain important for growth, flexibility, and learning. One of the other critical components of a yoga practice is meditation and mindfulness. The significant aspect of mindfulness is the ability to concentrate on the present moment – the "here and now" (Eckerd, 2019). Many yoga and occupational therapists use meditation and breathing techniques to help autistic, or SPD individuals calm and regulate themselves. Self-calming techniques are instrumental in easing stress – and research shows that these techniques also are an efficient modality for SPD treatment (Centre for Children's Therapy, 2019). At the Centre for Children's Therapy, children between 3 and 8 years old who have Autism, ADHD, sensory processing disorder, mindfulness, meditation, and deep breathing are go-to treatment modalities because they are proactive measures. More than 200 children, ages 5 to 10, practiced yoga, meditation, and sensory procedures to assist them control stress, ease test anxiety, and focus on schoolwork (Centre for Children's Therapy, 2019).

In addition to breathing, yoga poses, and meditation for kids with SPD, there are many other wonderful features of yoga. The yoga class environment is typically calm and welcoming, with limited distraction and dim lighting, which creates calmness for the visual system. There is no need for specific clothing or extra equipment, which is great if kids have tactile sensitivity. The absence of footwear provides for feet to obtain tactile and proprioceptive feedback directly from the ground and mat. Yoga music is calming at a slower tempo and helps coordinate our auditory system, which accommodates to guide the breath and movement (Hamilton, 2020).

This chapter presents a brief literature review regarding the benefits of OT and yoga for children with SPD and autism. In the next chapter, the methodology and specific methods applied in this study will be uncovered.

Chapter 3: Methodology

Theoretical Framework

This qualitative study researched sensory processing disorder (SPD) as a rich and extensive topic by exploring the factors and challenges children with SPD face in their everyday experiences. This research focused mainly on children, age 6-12 with SPD, diagnosed with a hypersensitive sensory processing disorder. The study aims to improve the two senses: proprioception and vestibular sensory issues, by implementing sensory yoga as part of their daily routine.

The research was conducted using qualitative research methods and Participatory Action Research to uncover common themes in exploring the factors and challenges hypersensitive children with SPD face in their everyday experiences. In this qualitative research, semi-structured interviews were used to uncover common themes in hypersensitive children to investigate, gain insight, document, and understand their difficulties and strengths. It was expected that the use of thought-provoking interview questions and an understanding of body language would help gain insight into the research question to develop a better solution to the research purposes.

Participatory Action Research

Participatory Action Research (PAR) encourages equal involvement of the researchers and participants in the research process, making the participant and equal researcher partners, which allows the research focus and results to be more relevant to a specific community (Watters, Comeau, & Restall, 2010). PAR is based on reflection, data collection, and action to improve the world by

changing it (Baum, 2006). At its centre is a collective, self-reflective inquiry that researchers and participants undertake to understand and improve upon their practices and the situations they find themselves in. The deliberative process is linked to action, influenced by understanding history, culture, and local context and embedded in social relationships (Baum, 2006). In contrast, action research uses findings to reveal strategies that can discuss community issues. Community needs are evaluated, and action is taken to achieve social change by developing services and organizations (Watters, Comeau, & Restall, 2010).

PAR relies on the reflective practice of the researchers in action. Unlike action research, PAR does not wait to apply new understandings to the following situation but incorporates them into the ongoing process (Bell et al., 2004). The method of PAR is meant to be empowering and can result in people having increased control over their lives (Watters, Comeau, & Restall, 2010). This study drew upon PAR techniques as the participants were perceived as experts due to their lived experiences associated with the research topic, ensuring that relevant issues were being investigated to reach the final goal.

Inclusive Design

Inclusive Design is a design approach that caters to permanent and temporary impairment and strives to overcome language, culture, gender, age, and other forms of human difference (Inclusive Design Research Centre, 2018). It highlights the contribution of understanding user diversity to inform design decisions to include as many people as possible. Inclusive Design understands that user diversity contributes to shaping these decisions to include as many individuals as feasible. User diversity covers variation in capabilities, needs and

goals. Inclusive Design focuses on the diversity of people and the impact on design decisions (Dhoundiyal, 2019). It is important to mention how existing yoga kits are not sensory-friendly since they were not designed for users with special needs from the moment, they conceive the design process. Existing yoga kits are not executed as part of children with sensory issues' daily routine at a very young age, with all the yoga benefits being promoted for the rest of us. It comes to the very beginning. Every design decision can potentially include or exclude customers (Newell, Gregor, Morgan, Pullin, & Macaulay, 2010).

Through Inclusive Design, products, services, and environments are created and optimized to use as many people as possible while catering to a wide range of user abilities (Clarkson, Coleman, Keates, & Lebbon, 2011). It is not about improving the excellent design by throwing in additional features that make something inclusive. The best Design considers the most significant number of people from the beginning (Kieron Marchese, 2021). Through Inclusive Design fundamentals, emphasizing new approaches for improvement in existing yoga play kits and evidence for broader implementation in the future, this research aims to develop a sensory yoga play kit that encourages Sensory Yoga for children with SPD and autism related sensory issues.

Prospective Participants and Stakeholders

There were several different perspectives to consider when thinking about the participant lists for this research study. When selecting individuals to conduct the research study, the leading participants were hypersensitive children with SPD, ages 6-11 years old in elementary school attending elementary school. It is quite common for children with SPD not to be diagnosed until they are well into

elementary school. The earlier a child can be evaluated, receive support, and have all their parents/caregivers on the same page, the greater the chances for a successful outcome at an earlier age (Yoga for Children with Sensory Processing Disorder, 2013). This research was aimed to design a play kit designed for hypersensitive children approved and tested by hypersensitive children. Therefore, they were prioritized as the primary prospective participants for the research.

The secondary prospective participants and key stakeholders were parents/caretakers, occupational therapists. It was necessary to focus on occupational therapists who have worked with children with SPD. The literature review has illustrated how crucial occupational therapy is for children with SPD (Goodman, 2012). Thus, it was crucial to focus on these occupational therapists to see if the yoga play kit could also be transferrable to the OT setting so that professionals could use it as part of their occupational therapy for SPD children. Due to the sensitive nature of children living with SPD and the researcher's lack of experience working with children with SPD, occupational therapists were considered a key part of the study. The focus on including occupational therapists as participants is that the OTs would be brought into the research due to in-depth knowledge working with children with SPD.

Children with sensory processing disorder are often incorrectly diagnosed and misunderstood (Goodman, 2012). Therefore, it would be an asset to have experienced and professional input from occupational therapists. It was hypothesized that occupational therapists who have worked with hypersensitive children could advise in the recruitment process and co-design process.

Data Collection Method

For the data collection method for the proposed study, semi-structured interviews were to be conducted to gather information from hypersensitive children aged 6-12 years old, where the interviews ranged from 60-90 minutes. Amidst the ongoing Covid-19 pandemic, the co-design session was to take place at a private location, in a quiet, distraction-free space. However, as the restrictions were being lifted as time went by, the co-design sessions were expected to be facilitated outside in Thomson Memorial Park due to its accessible TTC, parking lot, washrooms, and walkways. The interviews were to be conducted through notetaking and audio recordings. It is important to mention that overall interview sessions and co-design sessions would engage in accessible practices and materials for the participants if they expressed a need. The purpose of the interviews was to enquire into methods used to engage the participants in the research design process and to communicate those design ideas, which would be accessible and sensory-friendly.

Any research involving children would balance the aims of the research with the participants' safety and well-being. Therefore, it is important to mention that the study adhered to ethical, meaningful, and inclusive child participation practice as discussed in *Inclusive Practice for Research with Children with Disability: A Guide* (Jenkin et al., 2015). With the end goal of designing a sensory yoga play kit for children with SPD by SPD children, the researcher shared agency and control with the participants throughout the process, from the initial stages to collecting and delivering results. Allowing flexibility and some independence for the children in co-design sessions would enable them to

design a sensory yoga play kit that works for them and let the researcher take a step back and observe the entire process.

Recruitment

The researcher sought to recruit the targeted participants online, such as Facebook and Instagram, yoga studios, through word-of-mouth, support from OCAD University and the principal advisor. The researcher contacted Toronto Children Therapy Centre to get some recruitment support as they are respectable professionals working with children with SPD and provide different occupational therapy services in Ontario. Furthermore, occupational therapists in the close area who have worked with children with SPD who could connect to the parents of SPD children were reached out. This study was to be limited to no more than five participants: two children with SPD age 6-12 years old, their parents or a caretaker and one occupational therapist. These participants were to be involved in iterative co-design activities to better address user needs and be carried out in smaller working groups separately.

Semi-structured interviews

Semi-structured interviews enabled the researcher to use pre-existing questions as a starting point for further questioning, depending on the interview's direction. Semi-structured interviews utilizes a combination of closed- and open-ended questions, often accompanied by follow-up why or how questions (Adams, 2015). The purpose of these interviews was to understand better the lived experiences, challenges of children, their parents/caretakers, occupational therapists, and preferences related to the children's sensory inputs. The semi-

structured interview format allowed participants to elaborate on the questions and create discussions.

Direct Observation

The interview section included a mini direct observation section where the researcher brought in different yoga materials or existing sensory play kits to observe how the children would react and understand the materials/textures that could better accommodate them in creating an ideal sensory yoga play kit. Direct observation facilitates the researcher to observe, interact and gain a rich picture of participants in their natural environment, where this data collection method allows the researchers to understand better the processes, culture, or people under study (Kawulich, 2012).

Co-design

After executing the data analysis from semi-structured interviews and direct observations, the proposed research study was to be consisted of three co-design sessions with the participants, where each co-design session informed the structure of the following session. Co-design is a design approach with participants that enables them to construct creative contributions based on their personal knowledge and lived experiences (Trischler, 2019). After conducting the qualitative data analysis, co-design sessions with children and occupational therapists were to be conducted. With the insights of the co-design session, a prototype would be developed. Two prototype iterations were planned, and both times with the expectation of working directly with children. In this way, including the users in the iterative process at each step, the research end goal was to design a sensory yoga play kit designed for hypersensitive SPD

children, approved, and tested by hypersensitive SPD children would be achievable.

Data Analysis

There are various methods available to analyse qualitative data. For this research, the primary evaluating data analysis process was conducted using thematic analysis.

Thematic analysis

As qualitative research becomes increasingly recognized and valued, it must be performed rigorously and methodically to deliver meaningful and valuable results (Nowell, Norris, White, & Moules, 2017). Thematic analysis allows the researcher to closely examine patterns of themes in the interview data and create sensitive, insightful, rich, and trustworthy research findings (Nowell, Norris, White, & Moules, 2017). Using thematic analysis and an inductive approach allow for flexibility in interpreting the data and approach large data sets more easily by determining them into common themes. Thematic analysis is an assertive yet flexible method for interpreting qualitative data that can be utilized within various paradigmatic or epistemological exposures (Kiger & Varpio, 2020). It is an appropriate method of analysis when aiming to understand backgrounds, beliefs, or behaviours across a data set. To be acknowledged as reliable, qualitative researchers must indicate that data analysis has been accomplished in a detailed, uniform, and comprehensive manner through recording, systematizing, and revealing the analysis methods with sufficient detail to facilitate the reader to differentiate whether the methodology is plausible. (Nowell, Norris, White, & Moules, 2017).

Integration of Methods

In this section, the aim is to integrate the components of the three co-designs of the data collection of these methods. For the data collection method for the proposed study, semi-structured interviews were to be conducted separately to gather data from hypersensitive children aged 6-12 years old with their parents/caretakers, where the interviews varied from 60-90 minutes. The interviews were to be followed by a direct observation session of approximately 60 minutes. These sessions were audio-recorded and photographed.

The proposed research study would consist of three co-design sessions where each co-design session advised the structure of the subsequent session to design a yoga kit that enables sensory yoga as part of SPD therapy for children with SPD. All the co-design sessions were audio-recorded and photographed for record. The study was planned to end with a final co-design with a closing interview with a final yoga playkit approved and tested by the children.

The chapter three presents the methodology and specific methods that would be integrated into the study. The next chapter will be focused on research results.

Chapter 4: Results

Amendment and Pivoting Research

In the previous chapter, the researcher had intended to follow a particular research path. In this chapter, the researcher will describe the pivots implemented to adjust the research plan given the constraints of covid. Although COVID-19 vaccines deliver reassurance from some of the risks and concerns of the past 18 months, parents with young children found themselves in a substantial grey zone (Pearce, 2021). As vaccine trials were ongoing, it could be months before U.S. vaccines are granted FDA authorization for those under 12 years old. Emergency authorization for Covid-19 vaccines in children under 12 could come in early to midwinter, relieving many parents who have been unable to vaccinate their children (Edwards, 2021). By July 2021, covid-19 vaccines have only authorized for individuals ages 12 and up in the U.S., and none has received full approval yet (FDA, 2021). Therefore, the researcher fully empathizes with Canadian parents who worried about their unvaccinated kids' potential exposure to the coronavirus for their children's safety in potentially participating in the proposed research. Parents and children were not responsive to participating in the research.

Furthermore, a couple of weeks into recruitment, the researcher began to pay particular attention to the challenges faced when seeking participants. After speaking to experts working with children and considering their advice during the recruitment phase, the researcher realized that the research participant requirement was restricting. The inclusion of participants exclusively with sensory processing disorders in this proposed research was because SPD has

always been overlooked in past research, and the condition receives far less attention because it has never been recognized as a distinct disease (Sensory | Mysite, 2015). Finding a range of children participants with just sensory processing disorder took effort, as SPD often occurs in children with autism or ADHD (Bunim, 2013). Speaking to multiple occupational therapists during the recruitment process resulted in amendments to the research plan to include children participants diagnosed with an autism-related sensory processing disorder. It was also advised that some parts of the research procedure, such as PAR co-design sessions, might be overwhelming for some children as they might feel some tension with the need for participation on the spot without a professional designer's direct influence (Vaajakallio & Mattelmaki, 2010). Co-design was envisioned as a collaborative knowledge-sharing and creation process in which the skills and experiences of various children with an autism-related SPD are brought together to create the sensory yoga playkit approved and tested by children with SPD. However, due to the circumstances mentioned above and to create the most stress-free participation for children, the researcher decided to create a prototype prior to recruiting the participants. Any modifications would be made after the prototype would be tested by the children participants or the secondary participants', the parent/caretakers, occupational therapists. It is important to cite that before formally researching with children participants diagnosed with an autism-related SPD, an application to the Research Ethics Board was re-submitted and approved.

Participant Recruitment

To profoundly understand the multi-faceted layers of a sensory processing disorder in the community the first step was to establish the research study by contacting occupational therapists and therapy clinics locally. Keeping the research locally in the Greater Toronto Area (GTA) allowed the researcher to maintain close physical proximity to potential clinics and participants with an easy commute. During the participant recruitment process, a total of twenty-seven therapy clinics, pediatric centres, schools, and hospitals were contacted for the recruitment process. The inclusion criteria for studies were hypersensitive children with SPD ages 6 to 12 years old, any gender attending an elementary school currently residing in Toronto and living with their parents/caretakers who have expressed concerns for their child's SPD. As for occupational therapists, the inclusion criterion was having prior experience working with hypersensitive children with sensory issues in Toronto. Exclusion criteria would be children diagnosed with hypotensive SPD. The exclusion age criteria were to recruit children younger than six and older than eleven. To verify that participants met the measures for inclusion in the study, a series of questionnaires was to be provided to potential participants during the recruitment phase.

The authorized permission from the centres, clinics and hospitals was obtained through email with an invitation for a brief introduction presentation about the research study as well as an agreement of providing the full research report with the final yoga playkit after the end of the study. Table 2 shows the

record of the clinics, centres and hospitals contacted for participant recruitment.

When reaching out to potential centres, clinics, and hospitals, the response was underwhelming. The first challenge, the researcher encountered was that due to the ongoing pandemic, it was difficult for occupational therapists to pitch the research idea to their clients' parents with children with SPD as most families are covid-conscious, and the children were not vaccinated. However, four centres responded with interest in my research. The initial stages of recruitment were brief, and the occupational therapists from the centres agreed to help find the children participants through their clinics and centres. The recruitment posters (see Appendix C) were posted on the centres' bulletin boards, and the researcher's contact information was shared among potential families and children.

Regardless of the information exchanged, the participants did not reach out over the three-week recruitment period. Due to the ongoing pandemic, families were not keen to participate in in-person interviews or co-design workshops. It is important to note that the researcher was not allowed to visit the therapy clinics/pediatric centres/schools and hospitals in person or pay a visit to potential participants' homes to further discuss the research due to the organizations being covid-conscious and to ensure the safety of unvaccinated young children. Over the three-week recruitment period, two rounds of reaching out to therapy clinics/ pediatric centres/ schools and hospitals through email were conducted. Many did not respond. The four centres that had previously responded were not able to recruit targeted participants.

Name of the clinic/organization	Contact information	Email Sent	Responses	Follow Up	Follow Up Responses
KinderCare Paediatrics	admin@kindercarepediatrics.ca	Yes	No	Yes	No
Giant Steps Toronto	info@giantstepstoronto.ca	Yes	No	Yes	No
Developing Hands Paediatric Therapy	inquiries@developinghands.com	Yes	No	Yes	No
Kids First Paediatric Therapy	info@kidsfirstot.ca	Yes	No	Yes	No
Pure Mind Counselling	info@puremindcounselling.ca	Yes	No	Yes	No
Sun Spring Counselling	reneritter@sunspring.ca	Yes	No	Yes	No
Red Path Centre	katy.albert@redpathcentre.ca	Yes	Yes but, the centre is a mental health centre that services mostly adults.	No	No
Youth Link Centre	info@youthlink.ca	Yes	No	Yes	No
ADHD Toronto	info@adhdtoronto.com	Yes	No	Yes	No
Beyond The Door	info@beyondthedor.ca	Yes	No	Yes	No
Toronto Children's Therapy Centre*	lizette@torontoctc.ca	Yes	Yes, still recruiting for participants but no responses.	Yes	Yes, still recruiting for participants but no responses.
Play Therapy for Children	susan@playtherapyforchildren.com	Yes	Yes, but not available due to a busy schedule.	No	No
	maria@kidspeech.ca	Yes	Yes, however participants do not meet with research	No	No

Kids Speech Pathology & Family Rehabilitation*			inclusive criteria.		
Acorn and Anchor Therapy Centre*	michelle@acornandanchor.com	Yes	Yes, still recruiting for participants but no responses.	Yes	Yes, still recruiting for participants but no responses.
The Communication Clinic	info@thecommunicationclinic.ca	Yes	No	Yes	No
The Red Oak Centre	info@theredoak.ca	Yes	No	Yes	No
Aquilla Occupational Therapy Services	info@aquillaotservices.com	Yes	No	Yes	Yes, but waiting for their supervisor to approve the research at the clinic.
Butterfly Paediatrics Therapy Clinic	info@butterflytherapy.com	Yes	No	Yes	No
Developing Hands Paediatric Therapy Practice	inquiries@developinghands.com	Yes	No	Yes	No
Sick Kids Hospital	occupational.therapy@sickkids.ca	Yes	Yes however, the children that the OT do see with ASD, and sensory processing issues tend to be for acute illness or medical issues. Often, they are at the hospital for short periods of time or would be too unwell to participate in this kind of program.	No	No
Holland Bloorview Kids Rehabilitation Hospital	foundation@hollandbloorview.ca	Yes	No	Yes	No
Ellen Yack and Associates Paediatric Therapy Services*	ellenyack@gmail.com	Yes	Yes, still recruiting for participants but no responses.	Yes	Yes, still recruiting for participants but no responses.
Surrey Place Centre	communications@surreyplace.ca	Yes	No	Yes	No

ErinoakKids Centre	web@erinoakkids.ca	Yes	No	Yes	No
Dundas Junior Public School	dundas@tdsb.on.ca	Yes	No	Yes	No
Downtown Alternative School	downtownalternativeschool@tdsb.on.ca	Yes	No	Yes	No

Table 1: List of the name of the clinics/organizations contacted for research participation with *: The centres responded to recruitment email

Designing the Sensory Yoga Playkit

When working to create a prototype for designing a sensory yoga play kit for children with SPD, the literature review greatly influenced my process of engaging different sensory products available in the market as well as the existing yoga kits throughout the prototype-making process. Throughout this prototype-making, the different methods used included a heavily researched literature review, interviews, journals, and online blogs of parents with children with sensory issues and occupational therapists.

Existing Yoga Playkits Analysis






There are numerous yoga play kits in the existing market based on the targeted participants' age group. However, there are restrictions. The table below compares the existing yoga playkits in the market, and the sensory friendliness of yoga kits is evaluated on the basics of materials and colours. Kids with sensory processing issues are often oversensitive (The Understood Team, 2019). They can be oversensitive to touch or textures and colours around them, making everything from doing physical activities a challenge known as tactile sensitivity (Entremont, 2013). Parents should also know that tactile

oversensitivity also intrudes on the growth of motor skills and could lead to the limitation of other developmental milestones (Garbi, 2021). A young child explores and discovers the world by touching and imagining; however, children with sensory challenges overlook compiling information from people and things because they bypass touch and do not want to interact with others or their environment.

When it comes to colours, they also impact individuals with SPD. Concerning children with neurodevelopmental disorders with unusual sensory processing, some anecdotal evidence from parents, caretakers, teachers of persons with sensory disorders alongside individuals with sensory disorders indicate that children with this disorder may perceive colour differently (Grandgeorge & Masataka, 2016). Excessively bright colours can be overstimulating for children and adults with SPD. Radiant colours and visual clutter can be overwhelming for children with SPD. It can make it hard for them to concentrate or become calm enough to sleep (Morin, 2019).

Children with sensory issues can experience calm by using the right colours are used in their environment. These children usually find warm greens and blues pleasing colors, though they may also be attracted to neutral tones and pastel colours (Benitez, 2014). Having a neutral colour palette or calming colours such as pale pink, pale blue, soft green, or muted purple helps comfort individuals with sensory issues (Felton, 2017). Using these colors in their surroundings aids children with sensory issues in focus, attention and learning capacity.

Based on the research cited above and the comparison table of the existing yoga kits below, it is the position of the researcher that these yoga play kits were not made or tested with inclusion for users with sensory issues or children with SPD. This review of the products shows a gap in availability in designing sensory yoga play kits for children with SPD. Therefore, this study aims to design a sensory yoga playkit designed and tested for children with SPD.

					
Name	Miniyogaclub Spring yoga play kit	Alex Toys Active Yoga Activity Blocks	Peaceful Kids Yoga Kit	Merrithew Play & Exercise Kit for Kids	Mideer Yogi Cards-Family Yoga Game Cognitive
Product Description	Beautifully illustrated bundle is perfect for Pre-K-3rd grades.	ALEX Active Yoga Activity Blocks allows kids to work on strength balance and focus while playing this fun yoga game.	Young yogis stretch, pose, meditate and more – with our kid-friendly yoga kit.	An exercise kit completes for kids with 3 different play & exercise activities.	Yogi is a yoga-inspired kit, through which children, along with their parents and friends, can participate in activities and games with a variety of fun.
Basic Features	<ul style="list-style-type: none"> 6 positive affirmations. 4 themed mindful activities. 2 themed colouring pages. 1 gratitude activity. 1 emotional awareness activity. 1 yoga play board game. 	<ul style="list-style-type: none"> 2 fabric covered foam blocks. 24 double sided yoga pose cards. 3 plastic sand timers and instructions. 	<ul style="list-style-type: none"> 50 activity cards featuring fun poses that calm the mind, improve balance and boost confidence. A yoga mat. 	<ul style="list-style-type: none"> Double-sided Eco-Friendly Yoga Mat. 10 soft play pucks. 	<ul style="list-style-type: none"> 40 cards that can be used for countless activities: 20 cards have lovely illustrations of various yoga poses. 20 describes the poses in simple, fun rhyme. A colourful leaflet with ideas of four different games. A special birthday activity. 2 DIY dice featuring images of yoga poses.

Dimensions	Not Applicable.	25.4 x 25.4 x 10.92 cm.	Mat measures 23 1/2" x 55".	Not Applicable.	8" x 5.5" x 1.5".
Age	Pre-K-3rd grades, age 18 months and up	3 years of age and older	3 yrs. - 8 yrs. Preschool - 3rd gr.	Suitable for kids (age not mentioned)	3 years of age and older.
What it does	An amazing way to bring yoga, mindfulness, and connection to nature into your home or classroom.	Kids can benefit from the strength-building exercises while work on balance and focus by playing this yoga game.	Children will love learning loads of yoga basics as they twist, bend, and breathe from the comfort of the extra-thick, nonslip foam mat designed just for them.	Kids can challenge three different skill sets with this play & exercise kit when they use the designs on the Eco Yoga mat and the soft pucks to play hopscotch, tic tac toe and target toss.	Yogi is a great tool for developing mental and physical health. It reduces kids screen time and perfect for some indoor or outdoor quality time with friends and family.
Price	\$9.99	\$33.45	\$39.99	\$58.99	\$19.99
Sensory-friendly Materials	The playkit is research-based and play-based. The play kit does not mention it being sensory-friendly.	Inclusion 2 fabric covered foam blocks, however, does not mention if the fabric is sensory friendly.	The kit does not mention if the non-slip yoga mat is sensory friendly.	No mentioned of the materials soft play pucks and double-sided yoga mats.	The play kit does not mention their contents being sensory-friendly.
Sensory-friendly Colours	The playkit is research-based and play-based and uses muted colours; however, it has not been tested with children with SPD to confirm that the colours used in the kit are sensory-friendly.	The playkit use bright intense colours with cluttered illustrations which might be triggering.	The yoga kit uses teal yoga mat which is a comforting colour for children with sensory challenges. However, the fluorescent green yoga cards might be too intense for children with SPD.	The yoga kit uses purple yoga mat which is known for a safety colour for children with SPD. However, the bright orange soft play plucks might be overpowering and distracting for children.	The yoga game includes the usage of pastel colours and minimal illustrations therefore, it could be useful for children SPD however, it is not confirmed.
Strengths	Inclusion of thoughtful positive affirmations and mindful activities that could benefit children overall emotional awareness.	Being able to customise your pose blocks and difficulty levels.	The most activity cards included in a kit and inclusion of an children friendly illustrated yoga mat.	Inclusion of Corn Hole game, Tic Tac Toe, Hopscotch printed on a yoga mat that encourages children to use the yoga mat more frequently.	Multiple detailed yoga poses instructions that is easy to follow. A special birthday activity that other yoga kits didn't offer.

	Affordable.			Eco-friendly yoga mat.	
Weaknesses	Not very interactive compared to the rest of the play kits. Research based but not sensory friendly.	Unclear instructions. Some reviews stated hard to understand. Not sensory friendly.	Does not offer multiple supporting materials like the rest of the play kits. Higher price point. Not sensory friendly.	Higher price point compared to the rest of the play kits. Not sensory friendly.	Yoga mat was not included. Not sensory friendly.
Suitable to play with Parents and Caretakers	Yes	Yes	Yes	Yes	Yes

Table 2: Comparisons of existing yoga playkits

Below, I demonstrate the multiple approaches used to gather different sensory products for the prototype sensory yoga playkit compared to traditional yoga kit materials.

Traditional Yoga Product	Sensory Yoga Products
Yoga Mat	Yogi Junior Yoga PVC Free – Double Layered Yoga Mat
Yoga Block	SENSEEZ Calming Cushion
Yoga Bench	Bouncyband Wiggle Seat Sensory Cushion
Yoga Straps/Bands	OKSANO Colourful Sensory Stretchy Strings
Small Weights	Fun & Function Weighted Stressless Fidget Balls
Exercise Cards	Personalised Sensory Yoga Playing Cards

Table 3: Comparisons table of traditional yoga product and sensory yoga product for the playkit

Yoga Mat

When it comes to yoga, the first step is grabbing a yoga mat, however, the challenge is to identify the best yoga mat that fits one’s needs to elevate one’s yoga practice (SI, 2022). During the prototype-making process, there were a few principal factors to consider, such as how and when to use the mat, the mat size,

and the best materials as well as thinking about what makes the mat sensory-friendly. Children require good mats to do yoga without hurting themselves (Barnes, 2018). However, many yoga mats incorporate polyvinyl chloride (PVC), which numerous environmental specialists acknowledge as highly toxic plastic (Billard, 2019). There are now yoga mats that are made of non-toxic materials, such as rubber or foam, so that they offer firm grip and nonslip surfaces; regardless, there is no recognition of how thick a yoga mat should be or what materials in the yoga mat should be for it to be sensory-friendly. The downside to yoga mats made of rubber or foam is that they can absorb sweat and bacteria, getting smelly over time (Sam, 2022).

The best sensory yoga mats for kids provide a cushioned surface to practice and traction to prevent them or the mat from slipping. A yoga mat gives a designated place to practice and makes it feel more like a defined activity (Barnes, 2018). Yogi Junior kids' yoga mats are made with TPE (Thermoplastic Elastomer), a durable foam that is safe for kids and great for the environment. TPE is hypoallergenic and free from harmful chemicals such as PVC, Phthalates, Latex and BPA. The mat is extra thick, coming off as 1/4 Inches, lightweight and accessible for children (*Yogi Junior Children's Yoga*, 2018). It comes with animal illustrations on the yoga mat, which is fun and encourages children to practise yoga. Not only is it sustainable, but the designs printed on the yoga mat are also printed with eco-friendly inks. The company uses closed-cell technology to support the surface to resist moisture and bacteria development (*Yogi Junior Children's Yoga*, 2018).

Based on an Amazon Online review of the Yogi Junior kids yoga mat by an occupational therapist that works with clients with paediatric gross motor and cognitive issues, Genevieve Anderson reviewed:

As a Paediatric Occupational Therapist, I have had the opportunity to use a variety of similar products with my clients, and so I can confidently say this yoga mat is by far superior. Beyond the quality material (that eliminates any risk of skin reaction through its closed-cell design), the animal prints facilitate each child's ability to achieve a multitude of complex gross motor poses through developmentally appropriate, simple directions of which extremity to place on which animal (further enhanced with the single representation of each animal on the mat). I tend to be overly critical of products targeted specifically to the paediatric population, and so I was presently surprised by my inability to find any fault with this yoga mat (Anderson, 2016, n.p.).

With many other parental reviews, the researcher believed that Yogi Junior Yoga mats were the most appropriate yoga mats for the sensory yoga play kit. These Yogi mats are made with extra thick, non-toxic, closed cell, TPE foam, which is cushioned and supportive for children with vestibular difficulties. It also comes with rounded corners, so it is great for toddlers, babies, and kids to get hurt by slipping and falling because there is nothing to grab hold of (Murthy, 2021). Additionally, both dual layers of this yoga mat from Yogi Junior have significant texturing, making it feel grippier and less prone to slip than other mats. It also helps that both sides have substantial texturing, which is comfortable yet sticky enough to stay put.

Yoga Block

Yoga equips numerous props to enhance a person's ability to express a yoga pose. One of the most popular yoga props in class is the yoga block. They are usually made from foam, bamboo, wood, or cork. The yoga block is often utilized to lengthen the arms and supports the back, head, and hips to help the body settle into a pose (Thielen, 2018). Yoga blocks are an excellent addition for beginners and those experiencing injury or other physical limitations. Therefore, it would be an accommodating addition to the play kit. However, I replaced it with the SENSEEZ Calming Cushion to make it sensory-friendly instead of the traditional yoga blocks. The squared shape mimics a traditional yoga block, and what makes it unique from the standard yoga blocks is that it has a portable vibrating mini device. It offers a gentle sensation when squeezed or sat on, relaxing, calming, and soothing the body.

Additionally, the inside is filled with a thick memory foam. Therefore, it can be used as traditional yoga blocks for yoga practices. While the cushion is great for kids with energy, the Senseez sensory cushions make ideal special needs cushions, especially for children with autism, ADHD, or sensory processing disorder. The vibrating cushions can calm children who need more sensory feedback or help train hypersensitive kids to tolerate more sensations (Senseez, 2022). The Calming Cushion is a valuable acquisition of the sensory yoga playkit. It could act as a yoga block and offer calmness and a sense of comfort to a yoga routine that helps it create mindfulness for children with sensory issues.

Yoga Bench

Most yoga beginners do not maintain sufficient body awareness to stand

correctly. This may lead to extreme stretching or compression of the cervical spine and intervertebral discs (Restrial Life, 2022). Yoga benches can be intimidating and expensive. Hence, instead of the traditional yoga benches, I replaced them with a Wiggle Seat Sensory Cushion by Bouncyband. It is made of high-quality PVC material, and an ergonomic disc drives the body to stabilize itself, improving posture (Scholastic, 2022). The cushion has different textures on each side, allowing the child to select his/her preference. These seats improve core strength and postural control and, as a result, improve attention, have a calming effect, that leads to improving proprioception and vestibular senses. Disc seats can vary in their benefits based on inflation. It comes with its own inflatable tool, allowing users to adjust their preferred inflation liking. The disc encourages balance and core engagement if the seat is fully inflated. Partially inflated, the disc provides more significant movement, enabling more proprioceptive input (Senso Minds, 2020). Wiggle Seat Sensory Cushions give just enough wobble and wiggle to keep kids moving without distracting others, giving them vestibular and proprioceptive input (Grogan, 2018). Both can be very calming and meet the sensory needs of children with hypersensitive sensory issues.

Wiggle seats have long been used with children with known sensory issues or difficulties, including kids with Autism, ADHD, and Sensory Processing Disorder (SPD). Those groups may have difficulty sitting still, attention challenges, low core strength, and difficulty balancing (Senso Minds, 2020). With all the benefits mentioned, I believe the wiggle seat meets all the advantages that

promote vestibular and proprioception senses, which is why it is one of the essential elements of the sensory yoga play kit.

Yoga Strap

A yoga strap is prominent for increasing muscle flexibility and length, especially in poses that involve reaching the toes or bending the arms. A yoga strap can help less flexible beginners enjoy the benefits of poses they may be discouraged by. In addition, the use of a strap can help support or stabilize many positions (Morin, 2016). In its most basic form, a yoga strap adds length. It helps elongate muscles and tendons by bridging the gap in flexibility.

A unique benefit of a yoga strap is that it decreases the risk of injury on the mat. It also has other benefits such as maintaining alignment, improving flexibility without risks, increasing the range of motions, and strengthening muscles (Hailey, 2022). However, since the sensory yoga play kit's targeted audience is children, the ideal sensory yoga play kit for children, does not need require an expensive, adult-size yoga strap which could be challenging to use for children. The main goal of including a yoga strap is to assist children with sensory issues to move into deep stretches between each yoga movement alignment and encourage them to start exploring more advanced poses in the future that could lead to increasing the vestibular senses. To keep the yoga straps light-hearted and enjoyable for children, the researcher replaced them with very elastic tactile sensory stretchy toy strings instead of existing adult-targeted yoga straps. They are fun, but they also help stimulate focus and concentration, decrease stress, and increase tactile awareness of fingers/hands through proprioceptive input (OKSANO, 2022).

Additionally, using the yoga strap is a great way to strengthen proprioception such as reinforcing hands, wrist, and forearm muscles and promotes less stress. While squeezing them, it maintains rehabilitation, exercising and physical therapy. In this way, children can have an enjoyable, fun yoga experience while using colourful elastic sensory stretchy toys to help them get good stretches before practicing yoga and in between each pose for extra support. By implementing these toy strings, I aim to have a play element in the yoga routine to attract interest and keep it a children-friendly sensory yoga play kit.

Small Weights

Adding weights to a yoga routine maximizes muscle building and toning during a workout. Implementing light weights to the routine better engages the arms, encourages the building of lean muscle through controlled movements, and provides a complete total body workout. This helps them with the body's muscles and joint movements which aids the children's proprioceptive body awareness sense. While yoga generally does not take the added weight to strengthen the legs and core, arms are not always targeted effectively (Ferretti, 2012). Adding weights to yoga postures challenges the strength of the muscles that stabilize our hip, knee, ankle and feet joints and the intrinsic connective tissue (tendons and ligaments) of these joints (Toner, 2019). If human bodies are more stable, they tend to stumble and fall less, which increases the body balance of vestibular senses. Therefore, the next component of the sensory yoga playkit is the weights; however, the researcher used the same approach as the yoga straps. Instead of including standard heavier weights that are not as accessible for

children, the researcher replaced them with weighted balls, acting as stressless fidget balls. They come in two colours, blue and green, with different weights and are made in flexible spandex material. The green ball is filled with foam pellets and weighs half an ounce. On the other hand, the blue fidget ball is filled with PVC pellets and weighs 4 ounces. As children use the balls, they may enjoy the feel of the smooth stretchy material and work on fine motor control and intrinsic hand strengthening (Fun and Function, 2022). Due to its circular-shaped, it is easy to grip and support kids with ADHD, low muscle tone and sensory processing disorder, which helps with coordination, fine motor skills and sensory integration.

Furthermore, the balls can be squeezed and used as self-regulating sensory toys if the children wish to use them outside of their yoga routine. When they squeeze the green, the children will hear a "crunchy" sound like waves crashing on a beach while the blue ball makes no noise, perfect as a silent fidget for kids (Fun and Function, 2022). These weighted balls could also help hypersensitive children with fidgety fingers as they can use them to keep their hands busy and get the input that their hands need in between switching yoga poses that do not require hand movements. They can also be tossed like a bean bag to another child, parents, or therapist. They are small enough and accessible throughout variety of environments.

Exercise Cards

With all the final objects added to the sensory yoga play kit prototype, the researcher felt that adding instruction play cards that are easy to follow each yoga pose would create an ideal experience for children's users experience.

There are numerous exercise cards for diverse exercises from various fitness brands. However, the researcher wanted to create personalized yoga cards for hypersensitive children with sensory differences with selected yoga poses that benefit their vestibular and proprioceptive senses.

The researcher designed 20 sensory yoga play cards with children-friendly illustrations and yoga poses. Yoga poses for children include downward dog, plank pose, tree poses, and many others that can provide individuals who need vestibular, tactile, and even proprioceptive feedback their body may be seeking. Partner poses, such as downward dog and lizard lying on a rock, provide deep pressure, which is often calming or soothing (Hamilton, 2020).



Figure 1: First prototype of sensory yoga play cards

Many children with sensory differences may have difficulty with sensory integration: body awareness, spatial cognition, and motor management (Costello, 2019). The poses practiced in yoga support the development of fine and gross motor skills while strengthening and stretching the whole body. The 20 yoga play

cards in the playkit are inspired by yoga poses taken from YOREMI (<https://www.yoremikids.com>), an expert team of teaching artists and certified children-oriented yoga instructors who teach program formula that combines yoga, music, and mindfulness to promote sensory integration and complex cognitive development. By using mock-up illustrations from Envato Elements (<https://elements.envato.com/>) and changing them into a sensory-friendly colour palette with the addition of the other play kit components, the sensory yoga play cards were ready.

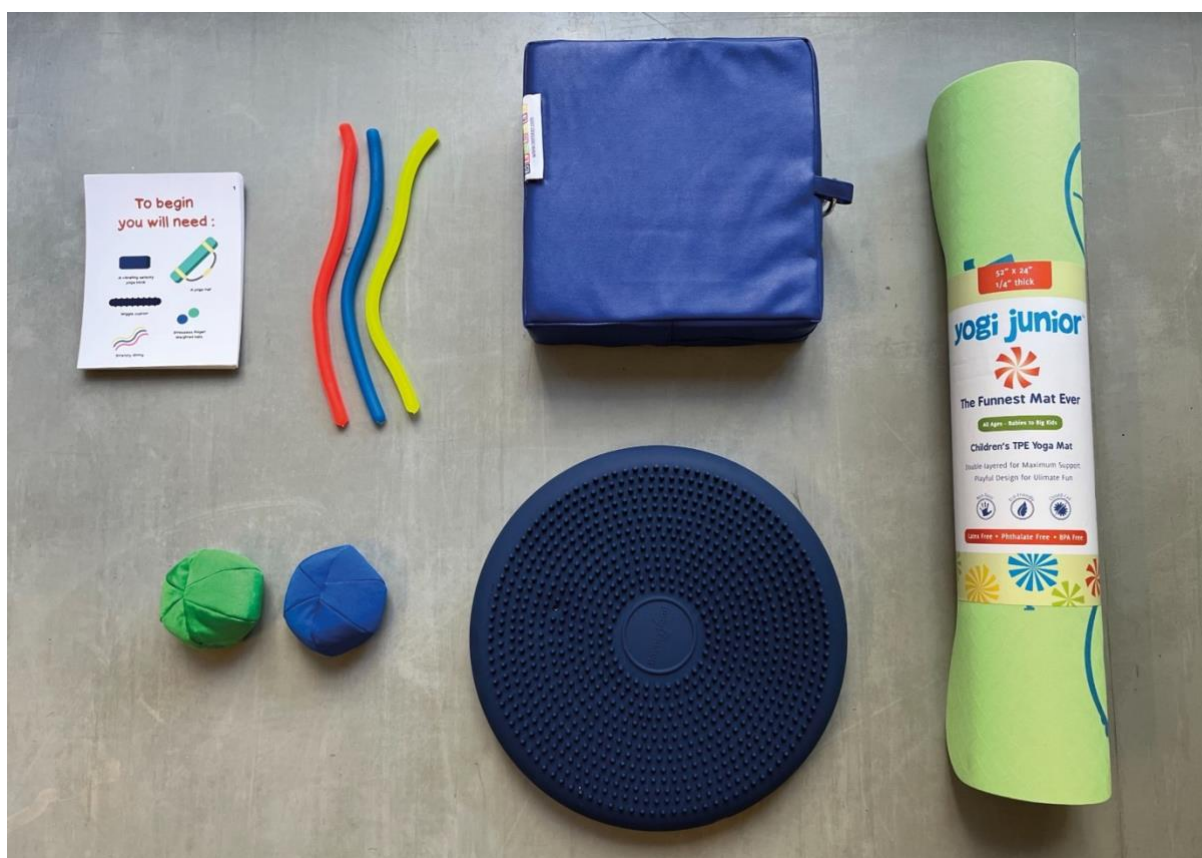


Figure 2: First prototype of sensory yoga playkit

Integrating co-design and interviews

Once the sensory yoga kit prototype was ready, the researcher set up co-design sessions. The proposed research study consisted of two co-design sessions with occupational therapists, where each co-design session informed

the structure of the subsequent session. Although the children were considered the primary participant of this initial research proposal, due to pandemic restrictions mentioned throughout the paper, the OTs were brought into the research due to in-depth knowledge and experience working closely with children with sensory differences. Their lived experiences were as meaningful and worthwhile insights as the children's. The major themes that arose from each co-design session is recorded in dialogue and conversations with the OTs and the researcher came up with the themes together collectively in Major Themes section of the research paper.

The first co-design session was designed based on the initial literature review findings. The purpose of the first session was to engage and encourage the participants to define their ideal sensory yoga playkit for children with SPD and autism-related sensory issues, appropriate for the targeted users.

Two interviews and observation sessions were conducted in the first co-design session, which involved two female occupational therapists from Toronto Children's Therapy Centre. Each co-design session was 45 minutes long, with 15 minutes observation sessions, followed by a 30-minute semi-structured interview. All these research steps took place at the Toronto Children's Therapy Centre. Participants were set up around a meeting room and were interviewed and observed separately. Both participants were encouraged to feel the components of the sensory yoga playkit at their own pace. They were prompted to imagine using the prototype with the children at their therapy centre. The session was then followed by an interview session. The interview encouraged participants to talk about insights based on their experience as OTs,

materials/environments and routines that presented challenges or supported a child's sensory difficulties and well-being. In the interviews, participants were asked to discuss insights, including their experience of the children's therapy centre, circumstances that presented challenges or supported a child's experience and well-being, and preferences related to sensory differences. Additionally, they were interviewed on ways they would improve upon the sensory yoga playkit prototype. The interview questions can be found in Appendix A. The data was gathered through notetaking and audio recordings.

The second co-design session was executed to address the limitations of the first session by developing sensory yoga play cards that would be less overwhelming for children to use, and the inclusion of weighted balls that would benefit a child's stimulation needs. The revised sensory yoga play cards developed from the first co-design session were then used as co-design materials in session two. The second iteration of the sensory yoga playcards can be found in the appendix.

The co-design session involved the previous two female occupational therapists from Toronto Children's Therapy Centre. The length of the session was 30 minutes, with 15 minutes observation session followed by a 15-minute semi-structured interview. These co-design sessions took place at the Toronto Children's Therapy Centre. The room was set up with a second prototype that included a junior yoga mat, a calming cushion with vibration, a wiggle seat cushion, colourful sensory stretchy strings, two 1lb weighted balls and yoga play cards. In this session, more yoga poses are added to the sensory yoga play cards, and they were divided into different skill levels: beginner, intermediate, and

advanced. Additionally, a designed cover introduction card was added to the deck, as well as an information card about the benefits of yoga based on the first co-design session. The results of each co-design sessions are discussed in much detail in the results of integrative methods further into the research paper.

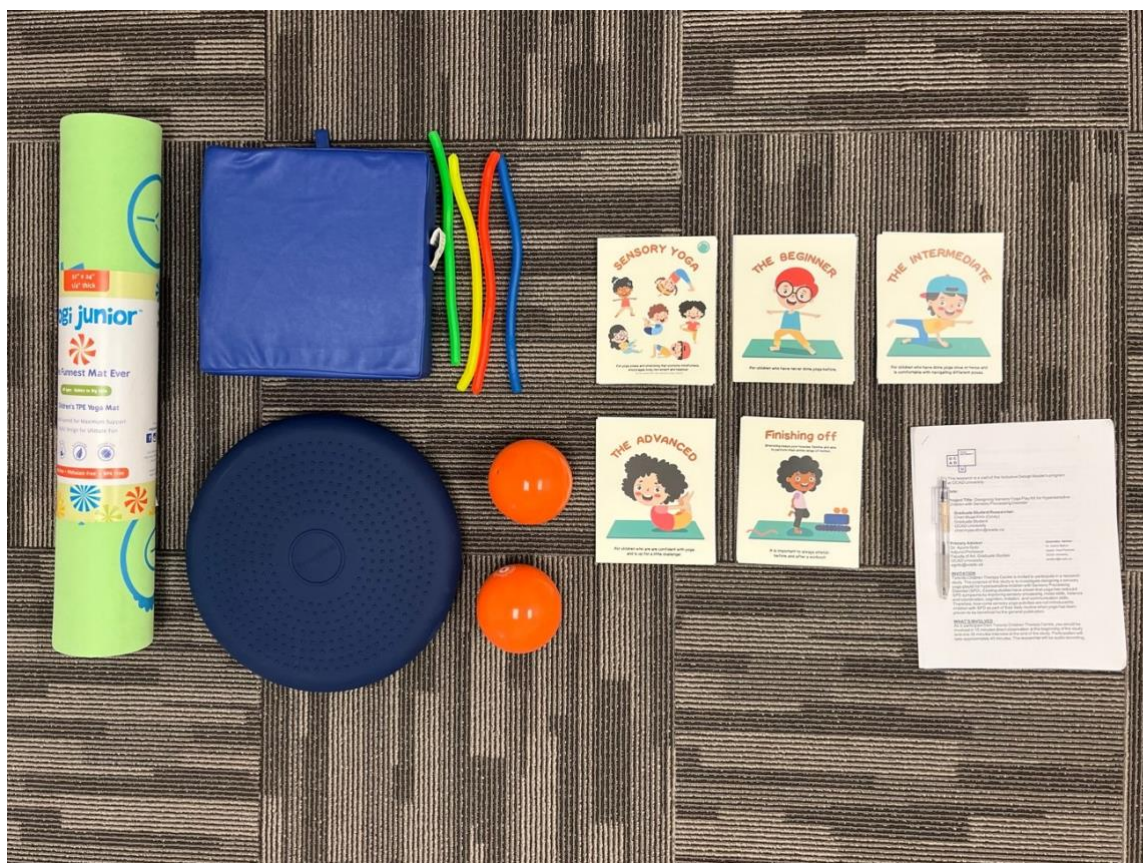


Figure 3: Second prototype of sensory yoga playkit

Participants were encouraged to go through the cards and feel the new weighted balls. The data session was audio-recorded and photographed. The session concluded with discussion feedback about the second prototype, which identified extra modifications that would create more mindful and informative sensory yoga playcards for children and parents.

The third and final session of the co-design was a closing interview that involved the insights from the previous two co-design sessions and showcasing a final prototype. The conclusive prototype was iterated after a deeper

understanding of the sensory considerations for the sensory yoga play cards and yoga play kit for children with sensory differences.

The closing interview involved one female occupational therapist from Toronto Children's Therapy Centre. The session was 15 minutes long, and the co-design session took place at the Toronto Children's Therapy Centre. The final yoga play cards revised from the previous session were provided for a final observation and a brief interview. The data was collected through audio recording.



Figure 4: Final prototype of sensory yoga playkit

Results of Integrative Methods with Major Themes

Yoga Play Kit Components

One of the main findings that surfaced after the first direct observation session from the first co-design was that the weight of the Weighted Stressless Fidget Balls in the first sensory yoga play kit prototype was lighter than the usual weight appropriate for children with sensory difficulties. It is noteworthy to remember that every child has unique needs and preferences. Whereas one child may prefer a heavier weighted ball, another individual may do better with a lighter one. There is no rule for determining how heavy a weighted ball should be for children with sensory difficulties (Sensacalm, 2018). However, based on their professional experiences as OTs, the interviewed participants' OTs perceived that one-ounce and four-ounce balls were very light and may not benefit a child's stimulation needs, especially if the children are older than the targeted age. Based on the interviews the researcher conducted with the OTs, according to the children that come to the therapy centre, the best weight to start is 1lbs weighted balls. This resulted in replacing the Weighted Stressless Fidget Balls with two 1lb weighted balls for the second sensory yoga play kit prototype for co-design session two.

Differences in Terminology (SPD vs. SD)

More noteworthy themes of the first co-design session will be discussed further in the Discussion of Findings session of the research paper. However, one of the significant findings was that the usage of the term Sensory Processing Disorder is not recognized in Canadian Healthcare. The OT participants refer to Sensory Processing Disorder as Sensory Differences in their

practices and within the community. Therefore, from this moment on, the research paper will articulate Sensory Differences (SD) as a replacement for Sensory Processing Disorders to align with the OTs and their community. More data will be analysed further in the discussion of the findings. The first iteration of the yoga cards lacked diversity based on the yoga poses and the children's experiences in yoga; therefore, new recommended weighted balls and level-based yoga cards were introduced in the second co-design session.

Sensory Yoga Play Cards

Additionally, the sensory yoga play cards caught the OTs' attention the most from the overall prototype playkit. However, during the first co-design session, there was a discussion that some yoga poses may be challenging for children with sensory differences such as dancer and aeroplane poses. Additionally, the researcher designed the sensory yoga play cards prototype by categorizing each pose with numbers, assuming it would be easier to follow the sensory yoga. However, during the interview, the OTs pointed out that having the sensory yoga play cards categorized in the following numbers could pressure the children to follow through to finish the routine, creating an overwhelming experience. They stated that yoga play cards with different levels of categorized yoga routines would make it a much more enjoyable experience and independent for the children as they could choose their yoga poses based on their personal experience and skill with yoga. This resulted in categorizing the sensory yoga play cards into different levels so that there would be a choice for children to choose their yoga poses based on the children's experience and skill with yoga. Therefore, the sensory yoga play cards were separated into different skill levels:

beginner, intermediate, and advanced for the second sensory yoga play kit prototype. Furthermore, the researcher decided to colour-code at each yoga level as we move further into our co-design sessions to create a cohesive selection of cards for each difficulty level and smoother visual access.

In the second co-design session, the key theme was to improve the yoga play cards to be as inclusive as possible for the children by making effective changes. Changes were made based on the prior co-design session, such as familiarizing the yoga play cards diverged into different skill levels: beginner, intermediate, and advanced. As mentioned previously, each co-design session's goal was to create an ideal sensory yoga playkit approved by OTs that could potentially be used with children with sensory differences. It is important to mention that all the modifications had been made in each phase of the prototype iteration based on the OTs' professional experiences working with children with sensory differences. Additionally, an add-on designed cover introduction card and a brief information card about the benefits of yoga was presented with design for inclusion in mind for parents and children who might have prior experience with yoga and its benefits before.

The critical discovery that emerged from the second co-design supported earlier co-design findings and incorporated the need for clear visual instruction in the yoga play cards for a smooth user experience. The first revision was to add prominent signs on each card to distinguish the yoga poses that support each sense; "P" was added to indicate proprioception and "V" for vestibular senses. The identifications would prompt the parents and OTs so that they could assist children with sensory differences in an informed way. The accessibility of

different yoga levels that the users can choose from based on their experience was a crucial requirement that the OTs requested. The poses were colour-coded at each yoga level to create a cohesive selection of cards for each level and smoother visual access. These add ease to access the children's yoga level based on their respective yoga experiences with practicing yoga. Making these minor yet impactful add-ons to the yoga play cards was essential as the visual system works with the vestibular and auditory systems to help the children navigate and move around our environment safely (The Autism Helper, 2019). With the help of the participant OTs, each modification suggested was made into the sensory yoga playkit and the play cards to create an ideal sensory yoga playkit that could be incredibly beneficial to children with sensory differences and promote a fun, enjoyable routine.

Improving Proprioception and Vestibular Systems

During the co-design sessions, the researcher had open discussions with the OTs participants about whether or not the sensory yoga play kit would support the improvement of the proprioceptive and vestibular senses. Based on their experiences working with children with sensory differences, the components in the yoga play kit support the two senses as the components are heavily focused on coordination between body parts and senses. Furthermore, most of the yoga play kit components were already used by the participant OTs with the children that come to the therapy centre. However, the elastic tactile sensory stretchy toy strings were a unique addition and were something the OTs had not considered using in their practice to implement deep stretches during physical therapy to increase the vestibular senses. Additionally, the elastic tactile

sensory stretchy toy string strengthens proprioception by strengthening hands, wrist, and forearm muscles and stimulating less stress.

Moreover, with prominent signs on each sensory yoga play card to distinguish the yoga poses that support each sense, "P" for proprioceptive senses and "V" for vestibular senses, the OTs agreed that when the sensory yoga play cards are to be used with the components from the sensory yoga play kit, it aligns with the principle that the researcher was investigating. Based on the participant OTs' experiences working in the centre and with the children with sensory differences, the final sensory yoga play kit does support the proprioceptive and vestibular senses that the researcher was trying to improve for children with sensory differences during this study.

The closing co-design results confirmed the importance of developing sensory yoga play cards with simple sensory features approved by the OTs. Having straightforward sensory instructions on the sensory yoga play cards makes a massive difference for the targeted users. The final notes from the participant resulted in the sensory yoga play cards being designed to match the needs of the children with sensory differences. The usage of the sensory yoga play kit with matching sensory yoga play cards confirms its promotion of sensory yoga due to its enjoyable gamification of the sensory yoga play cards for children with sensory differences while creating convenience for parents and occupational therapists who are new to sensory yoga play kits.

The previous chapter discussed the major themes of the research results as well as the process of the co-design sessions. The researcher will discuss

further data findings and self-reflections of the observations, semi-structured interviews, and co-design sessions in the next chapter.

Chapter 5: Discussion of Findings

This chapter presents critical reflections collected from the observations, semi-structured interviews, and co-design sessions on creating an enjoyable, fun sensory yoga playkit that encourages sensory yoga as part of SPD therapy for children with SPD and autism-related sensory issues. The analysis below will report the perspectives, experiences, and needs of participants and their community in designing an inclusive sensory yoga playkit that encourages enjoyable sensory yoga, approved, and tested by Occupational Therapists.

Understanding Sensory Processing Disorder and Sensory Differences

Sensory Processing Disorder has a long history of anecdotal evidence, but actual, significant research has not been readily accepted. Due to this, it has not been considered a separate condition but is included with other behavioural, neurological, and mental disorders (DCCINC, 2021). A common theme arose from the participants' responses: Sensory Processing Disorder is not officially recognized as a standalone diagnosis in Canadian healthcare. Currently, there is poor awareness of sensory processing problems because the condition is not yet a recognized condition under the DSM (Diagnostic Statistical Manual of Mental Diseases). However, a movement is underway to have sensory processing problems officially recognized as a condition under the term 'Sensory Processing Disorders' (eMentalHealth, 2008).

Based on the OT participants' interviews and co-design sessions, they informed the researcher that Sensory Processing Disorder is exclusively a recognized term used in the United States. There could be potential confusion

for parents and researchers regarding the term Sensory Processing Disorder in Canada due to it not being officially recognized as a stand-alone diagnosis. SPD is not acknowledged in the International Classification of Diseases (ICD-10-CA) or the Diagnostic and Statistical Manual (DSM-5). Both the ICD and DSM mention sensory processing *ISSUES*. However, neither book recognizes it as a stand-alone medical condition (L, 2018). SPD is not yet recognized in the Diagnostic and Statistical Manual of Mental Disorders. However, it can be identified and categorized by a certified occupational therapist with advanced training in sensory processing integration (Chruchhill Centre & School,2017). The OTs use the term "sensory differences" for children and individuals with a sensory processing disorder. Individuals with sensory differences may be over or under-sensitive or both at different times (National Autistic Society, 2022).

Likewise, the OT participants explained that there is no such thing as autism-related sensory difficulties. A child with autism, a child with a learning disability and a child with ADHD with sensory differences are all in the same category of individuals with sensory differences. However, there could be a child with only sensory differences and none of these things. Sensory issues are expected in people with autism and are even incorporated into the diagnostic criteria for autism spectrum disorder (Autism Speaks, 2022). Each person is unique, and this includes their sensory sensitivities. Previously, the researcher used the term Sensory Processing Disorder to follow the proposed research. The findings from the co-design report on the perspectives, experiences, and needs of participants and their community led to using Sensory Differences (SD) as an appropriate term for the targeted individuals of this research paper.

Formulating an inclusive sensory yoga playkit

During the co-design sessions, there were many discussions about what it is like to design truly inclusive products for children with sensory differences. In this study, the researcher started by designing a prototype based on the assumption that currently available yoga kits have not taken into consideration children with SD. The initial prototype had the necessary components for children with sensory differences. However, a sensory yoga playkit that has been co-designed and tested by professional OTs, who have worked directly with children with SD, greatly improved the original prototype. During the first co-design session, the materials in the yoga playkit were components that the OTs had already used daily and in hand; therefore, it was not as impactful as a standalone. However, with the personalized yoga play cards, the OTs agreed that having the sensory yoga play cards with the sensory yoga play kit works better together. The researcher designed the yoga play cards with a personalized routine in mind. However, it still may not be accessible for children and parents who do not have prior yoga experience. Therefore, the sensory yoga play kit with the sensory yoga play cards would need to be designed as a start-up kit for children with sensory differences, parents and caretakers who are new to yoga.

Limitations and Recommendations for Future Research

This research study consists of the insights, perspectives, and modifications made by the Occupational Therapists from their professional experience working with children with sensory differences. Although the research was initially proposed to include children aged 6-11 as primary

participants, the co-design sessions were met with health and safety security impediments due to the ongoing pandemic. During the execution of the study, Covid-19 vaccines had only been authorized for individuals ages 12 and up in the US, and none has received full approval yet (FDA, 2021). The participant children age group, 6-12 years old, were the last to be vaccinated, and during the beginning of the proposed research, the children in this age bracket were waiting to get vaccinated. As of the writing of this report, pharmaceutical companies Pfizer and Moderna are still doing clinical trials to witness how coronavirus vaccines perform in children under 12 to see if they are safe and in the correct dosages (Bonifield, 2021). Furthermore, a year and a half into the pandemic, parents wondered why younger children had yet to be vaccinated, which led to many parents/caretakers not being interested in participating in the proposed study for their children's safety. Therefore, the final research was conducted with the secondary participants and key stakeholders, occupational therapists, as focusing on occupational therapists who have worked with children with sensory differences was necessary to design a sensory yoga play kit in an informed way.

The co-design sessions were conducted through the OTs' office at Toronto Children's Therapy Centre. However, due to the OTs' busy schedules, there was limited access and time to fully observe the centre, meet the children and gain insights into children with the sensory yoga playkit prototypes and the final prototype. Insights into how sensory yoga play cards were designed and used relied heavily upon in the OTs' semi-structured interviews and co-design sessions. Furthermore, due to limitations in time and recruitment, only two OTs from the same centre participated in the co-design sessions. Therefore, the

researcher could not make more significant generalizations from the limited data of this proposed research and decided to frame the research as a case study.

This research would have been more beneficial if more OTs were involved from a wide range of therapy centres and parents with children with sensory differences with variable experiences. The data provided and the final prototype was laboriously established on the accounts of the OTs' professional experiences and stories of working with children with sensory differences. The final prototype would have been more impactful if it had been tested with children with sensory differences and their caregivers. Their involvement would have led to a more comprehensive understanding of their needs, likes and dislikes of the final sensory yoga play kit based on their lived experiences. Additional limitations included challenges in testing the proposed final sensory yoga playkit on a large scale with different therapy centres, children's hospitals, and families with children with sensory differences. If there were more time, the proposed research would have been conducted with children's participants in a stress-free environment with safe health and participation from the children with sensory differences.

Furthermore, if there had been more funding for the research, there would be less restriction on the research location, and the participant location could have been expanded Canada-wide with prototypes being sent to different centres and families. Designing a sensory yoga playkit for children with sensory differences that supports proprioceptive and vestibular senses creates an opportunity to design a sensory yoga playkit that has not been available in the existing market. This lack of products based on improving these two senses

indicates that the missing design and exclusion of a group of individuals leads to limited access to creating best practices for making yoga enjoyable for children with sensory differences. An inclusive design approach promotes research to investigate these current gaps, that is, to consider what children with sensory differences have access to, what they might do in each sensory yoga playkit, and how they might feel while using it. Furthermore, by exploring the complex stimulation issues that children with sensory differences may face, the sensory yoga playkit was designed to respond to their changing sensory needs.

Participatory Action Research with the OTs

This proposed study outlined Participatory Action Research (PAR) techniques as the participants were perceived as specialists due to their lived experiences associated with the research topic, ensuring that relevant issues were being investigated to design a sensory yoga play kit for children with sensory differences. As mentioned in the literature review, PAR promotes equal involvement of the researchers and participants in the research and generates knowledge centred on the belief that those most impacted by the research that leads the research direction and outcomes to be more suitable to a specific community (Watters, Comeau, & Restall, 2010). Although the children were supposed to be the primary participant of this initial research proposal, due to challenges and constraints mentioned throughout the paper, the OTs were brought into the research due to in-depth knowledge and experience working closely with children with sensory differences. Their lived experiences were as crucial and valuable insights as the children's. The proposed research included the OTs' perception in design iterations and the modes of analysis of such

research projects. The researcher collaboratively identified the major themes in dialogue and conversations with the OTs and came up with the themes together collectively.

Chapter 6: Conclusion

An inclusive sensory yoga playkit is one that promotes accessibility, flexibility, diversity, and facilitation of their unique sensory needs so that all children with sensory differences could feel a sense of belonging and empowerment, having access to the same yoga benefits promoted for the rest of the general population. Moreover, having all the sensory yoga components in a playkit creates convenience, a one-stop shop for parents unfamiliar with sensory Yoga and OTs to save time buying the yoga playkit instead of buying the yoga components separately.

As there are eight senses in our sensory nervous system, potentially in the future, with more time and funding, the researcher aims to create a sensory yoga playkit that could potentially engage all the senses fully and meaningfully. This study proposed a sensory yoga playkit that focuses on improving the proprioceptive and vestibular senses as they are the least researched senses; however, eight senses help us interpret the world around us and organize how we respond to sensory signals. Additionally, the price point of the final sensory yoga playkit needs to be researched further. As an inclusive designer, the goal is to create a product that is usable and affordable by a wide range of people, regardless of age, size, or disability status. Sometimes there are limitations in price points on consumer goods due to individual financial or physical conditions and materials used in order to create an accessible product to support individuals to live life to their total capacity.

The following steps of the research would be looking further into the existing consumer market as well as researching how to create a cost-effective

proposed sensory yoga playkit while maintaining its complete benefit capability. The recommendations and next steps proposed here aim to create an inclusive sensory yoga playkit that is restorative to children with sensory differences while promoting a fun, enjoyable practice. The OTs confirmed that the final sensory yoga play kit that has been designed promotes sensory yoga due to its enjoyable gamification of the sensory yoga play card and other sensory yoga components. Therefore, this concludes the research of designing a sensory yoga playkit for children with sensory differences approved and tested by professional Occupational Therapists.

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Appendix A: Semi-structured Interview Guide: Codesign one

About the Occupational Therapists: ice breaker

1. Can you describe your role at Toronto Children Therapy Centre and what a typical day looks like for you?
2. What are the major challenges you face while taking care of your children with sensory issues? How do you manage those challenges?
3. What resources do you rely on the most on supporting children with Sensory Processing Disorder or children with autism related sensory issues?
4. What kind of support would you recommend on Hypersensitive children with Sensory Processing Disorder children with autism related sensory issues? What is the most common therapy for them?
5. Have you ever considered Yoga as a therapeutic tool for children with sensory issues?

About the play kit

1. Have you ever used/recommend a Yoga kit before as therapeutic tool for children with sensory issues?
2. How do you as an OT feel about the sensory yoga play kit? Would you be able to share your first impression of it?
3. Are there any changes you would make to the prototype?
4. If you are designing a sensory yoga play kit, what would you have done it differently?
5. Do you think this is a children and sensory friendly yoga play kit? How likely or unlikely would they be using? Do you feel it is easy to use/safe for the children while using the playkit?
6. Are there any features in the prototype that the researcher has ignored? Does the prototype do what it's supposed to? What, if anything, doesn't make sense?
7. If we could break down the components featured in the sensory yoga kit prototype, could you list which products work and which wouldn't?
8. Do you see any potential issues/triggers that could arise for the children while using this product?

9. As an occupational therapist, would you recommend this yoga play kit once it's finished?
10. Lastly, does the yoga kit measure up to your expectations?

Semi-Structured Interview Guide: codesign two

1. Based on our previous co-design session, what were your expectation of the second prototype? Do the improvements measure up to your expectations?
2. Could you tell me your initial thoughts of the second prototype?
3. What did you like most from the second prototype iteration?
4. What are your thoughts on the improvement of the weighted balls?
5. What about the yoga play cards? Do you think separating them based on the levels and gamification of it is more appropriate for children than the previous yoga play cards?
6. Does the information on the yoga cards make sense? What would you have done it differently?
7. Are there any features that are missing? Does anything seem out of place or unnecessary based on the second prototype?
8. If you have a magic wand, what would you change of this second prototype?
9. What, if anything would make the children want to use this prototype more frequently?
10. From what you are seeing, if we could break down the components featured in the second prototype, could you list which products work and which wouldn't?

Semi-Structured Interview Guide: codesign three & closing interview

1. Now that we have officially completed the sensory yoga play kit, would you recommend it to children with sensory differences and their parents?
2. Do you see the sensory yoga play kit to be useful in the clinic or as part of therapy for children with sensory differences?
3. What are your final thoughts as an Occupational Therapist on final sensory yoga play kit? Would you implement the play kit in your practices?

Appendix B: Sensory Yoga Play Cards



First prototype of sensory yoga play cards



Second prototype of sensory yoga play cards



Final prototype of sensory yoga play cards

Appendix C: Recruitment Posters

Designing Sensory Yoga Play Kit for Hypersensitive Children with Sensory Processing Disorder

YOU ARE INVITED

- Does your child like yoga?
- Are they 6 - 12 years of age?
- Are they diagnosed with Sensory Issues?
- Are you familiar with Sensory Processing Disorder?

Taking part in this study will involve in an interview and codesign sessions.

IF YOU WANT TO LEARN MORE, PLEASE CONTACT

Please contact chanmyae.khin@ocadu.ca



Recruitment Poster for Parents

Designing Sensory Yoga Play Kit for Hypersensitive Children with Sensory Processing Disorder

YOU ARE INVITED

- Do you like yoga or want to try?
- Are you 6 - 12 years of age?
- Do you find yourself very sensitive to your surroundings?

Taking part in this study will involve in an interview and codesign sessions.

IF YOU WANT TO LEARN MORE, PLEASE CONTACT

Please contact chanmyae.khin@ocadu.ca



Recruitment Poster for Children