Body-Weight-Activated Lighting System for Children with Autism: Enhancing Engagement Through Interactive Light Installations.

Abstract

This project uses a design-led, qualitative research approach to explore how lighting design could support neurodiverse users by developing an interactive lighting model. I observed that using body weight as a way for the child to control their environment can be a powerful and empowering approach to sensory interaction. Utilising a qualitative research approach, the study involved observing children's interactions with pressure-sensitive pads connected to an interactive light installation. The objective is to develop an intuitive and accessible lighting control system within sensory spaces that enables children with autism to easily activate and manipulate lights. The study underscores the potential of customisable sensory models to support children with autism. It highlights the need for further research to refine these interventions and assess their long-term developmental benefits.[1]

[1] To address both hypersensitivity and hyposensitivity related to visual stimuli in children with autism, creating a flexible, controlled environment is key. For children with hypersensitivity, reducing overwhelming visual inputs such as dimming bright lights, avoiding flashing lights, and using soft, neutral colours can prevent agitation. On the other hand, for children with hyposensitivity, introducing more noticeable but not overstimulating visual cues like clear contrasts, gentle movement, or highlighted details can help them better engage with their surroundings. Balancing these adjustments ensures a sensory-friendly environment tailored to each child's specific needs, reducing agitation and promoting comfort.

Table of Contents

Introduction

How can a body-weight-activated lighting system enhance engagement in children with autism through interactive light installations?

The rationale for my research is based on my personal experiences working with a child or young person aged 15 to 24. This project uses a design-led, qualitative research approach to explore how lighting design could support neurodiverse users by developing an interactive lighting model. Autism presents significant challenges in Ireland, with approximately 1 in 65 school-aged children diagnosed, representing a prevalence rate of 1.5%. Recent reports indicate that about 1 in 20 school children are diagnosed with autism, highlighting a threefold increase over the past decade(National Council for Special Education (NCSE, 2016)). This rise necessitates increased resources and specialised support, as many autistic individuals face difficulties such as anxiety. Despite efforts to enhance awareness and promote inclusive education, widespread misunderstanding persists, leading to stigma and inadequate support.[2]

By reviewing existing research and practices related to sensory spaces for children with autism, such as studies highlighting sensory challenges like agitation and hyperactivity, I identified a gap in the design of sensory spaces (Galvez-Pol, Calvo-Merino and Forster, 2020). This gap specifically concerns the difficulty children with autism face in activating lights within sensory spaces. I will explore ways to improve their sensory spaces through an interactive light installation designed to reduce agitation using a body-weight-activated system. The objective is to develop an intuitive and accessible lighting control system within sensory spaces that enables children with autism to easily activate and manipulate lights. This system aims to reduce agitation and enhance their comfort and engagement in these environments, thereby improving their overall sensory experience. An interactive light installation in a sensory

[2] Advocacy groups like (AsIAm) are essential in addressing these issues, emphasizing the need for a collaborative approach among policymakers, educators, and communities to effectively support autistic individuals and their families.

space for children with autism is designed to create a calming and engaging environment (Habbak and Khodeir, 2023*)*. It uses dynamic lighting effects, colours, and patterns that respond to touch, sound, or movement, encouraging sensory exploration and interaction. According to Efthymiou (2024), these installations help children regulate emotions, improve focus, and enhance sensory processing in a safe, non-overwhelming setting tailored to their unique needs.

I suggest that it is possible to replace traditional switches with pressure-sensitive floor panels, such as flex carpet or mat (a hard material, such as wood, will not work well) that activate the lights when someone steps on them. This innovative approach creates an engaging, body-weight-activated lighting system that is particularly well-suited for sensory rooms designed for children with autism. In developing a solution for the gap, my research will focus on examining the contributions of individuals who will aid me in exploring interactive light installations.

The exceptional contributions of Dr. Michael A. Fox, who is an interactive light installation theorist, and Simon Baron-Cohen and Temple Grandin who are autism spectrum disorder specialists, have profoundly influenced their fields and will enrich my research. Pallasmaa's insights into the sensory experience of architecture will guide my exploration of how spaces affect human interaction. Dr. Michael A. Fox (Architect, academic and design theorist specialising in responsive architecture and interactive systems) further explores the role of technology in interactive design. Baron-Cohen's research on autism will provide critical insights into the needs of neurodiverse individuals. Grandin's unique perspective as both a scientist and an autistic advocate will help me design environments that support and accommodate individuals with autism. By synthesising their ideas, I aim to develop a comprehensive approach that leads to meaningful and impactful results in my study.

Literature Review

Interactive light installations have emerged as a transformative tool in sensory spaces, offering unique opportunities for engagement and therapeutic benefits, particularly for children with autism. These installations combine art, technology, and sensory design to create environments that stimulate emotional, cognitive, and physical responses (Earnshaw, 2017). This literature review explores the works of pioneering figures such as Juhani Pallasmaa, Dr. Michael A. Fox, Simon Baron-Cohen, and Temple Grandin, whose contributions have shaped the understanding of light, space, and sensory interaction. By examining these works, the review aims to provide insights into how interactive light installations can bridge the gap in creating inclusive, adaptive, and meaningful sensory spaces for children with autism.

In the field of interactive design, Juhani Pallasmaa, a renowned architect and theorist known for his work on sensory architecture, posits that the experience of space should engage all senses rather than relying solely on visual perception. His influential ideas, particularly articulated in the book *"The Embodied Image: Imagination and Imagery in Architecture" (2011)*, emphasise the importance of light in creating atmospheric environments that resonate emotionally with occupants. By drawing on Pallasmaa's insights, this literature review explores how multisensory design can enhance user experience in contemporary architectural practices (Pallasmaa, 2014). Pallasmaa advocates for multisensory experience more than design premarily a theorist and archtectural educator rather than a designer (Pallasmaa, 2021). Pallasmaa's writing on light avoids advanced technologies like LEDs or AI, instead focusing on its natural, emotional, and poetic qualities (Pallasmaa, 2007). By exploring how light interacts with materials and space, he supports thoughtful integration of light in architecture to support sensory depth and atmosphere. Pallasmaa's writing, grounded in phenomenology, prioritises sensory perception and emotional connection. He advocates for designs that engage all senses touch, sound, smell, and memory creating spaces that foster human interaction and balance, as presented in Pallasmaa (2024). Pallasmaa's work elevates user experience promoting the incorporation of multisensory elements like light, texture, and materials (Pallasmaa, 2021). This approach fosters spatial awareness and emotional resonance, advocating spaces that evoke comfort, introspection, and a strong sense of place.

Pallasmaa's (2024) written work draws from psychology, philosophy, and art to deepen sensory experiences in architecture. His integration of phenomenology and neuroscience highlights how spaces impact perception and emotion, inspiring cross-disciplinary approaches to human-centred design. While celebrated for sensory engagement, Pallasmaa's work has been critiqued for overlooking accessibility, inclusivity, and sustainability. His philosophical focus could benefit from addressing scalability and modern environmental concerns in urban contexts. Pallasmaa's ideas have shaped contemporary trends in architecture and interior design, aligning with the demand for immersive, sensory-rich environments. His emphasis on atmosphere and emotional connection influences movements like biophilic and experiential design (Pallasmaa, 2011). Juhani Pallasmaa's sensory-focused philosophy can inspire interactive light installations in public spaces, healthcare, education, and entertainment by integrating light with touch, texture, and atmosphere to create immersive, calming, and engaging environments tailored to human experiences (Pallasmaa, 2007). By applying Pallasmaa's ideas, interactive light installations in sensory spaces can move beyond purely visual experiences to create richer, multisensory environments that evoke emotion, engagement, and a deeper connection to the space. Following Pallasmaa's emphasis on the emotional resonance of light in architectural spaces, Dr. Michael A. Fox further explores the role of technology in interactive design. As a leading figure in responsive architecture, Fox advocates for systems that adapt to user interactions, creating environments that are not only visually engaging but also dynamically responsive. His work, particularly in projects like *Lightplay*, demonstrates how interactive light installations can enhance sensory experiences by integrating real-time feedback based on user behaviour (Fox and Yeh, 2000). By considering Fox's insights, this literature review will delve into the potential of technology to amplify the sensory qualities of light in architectural design. His work focuses on creating dynamic spaces that adapt to human behaviour and sensory needs, particularly in therapeutic and educational settings. Fox and Kemp (2016) explore the integration of embedded computation and kinetic systems to develop responsive environments. His innovative use of adaptive systems allows environments to adjust lighting, acoustics, and other factors to cater to users' sensory needs, making his work particularly impactful in therapeutic and sensory spaces. Dr. Fox's work is grounded in the concept of responsive architecture, which posits that spaces should actively engage with and adapt to human interaction (Fox and Kemp, 2016). His designs align with theories of biophilia and experiential design, emphasising the importance of creating environments that support physical and emotional well-being through interaction.

Fox's interactive light installations enhance user experience by tailoring sensory environments to individual needs. His designs reduce sensory overload and create calming, engaging spaces, making them particularly beneficial for individuals with sensory processing challenges, such as those on the autism spectrum (Fox, 2010). Fox's work intersects architecture, engineering, psychology, and neuroscience, fostering collaboration across disciplines. His designs are informed by insights from these fields, such as the combination of technological advancements and empathetic design principles, allowing him to create environments that are both technologically advanced and empathetically designed for diverse user groups.

While Dr. Fox's work is widely praised, critiques regarding scalability issues and complexity in design and execution underscore the challenges of implementing responsive systems; addressing these concerns could significantly enhance the opportunities for children with ASD to benefit from the final exploration of the research (Peters, 2015). Additionally, there are challenges related to maintaining and updating technology to ensure long-term functionality. These practical limitations can hinder the widespread adoption of his concepts. Dr. Fox's research is highly relevant to contemporary design, particularly as architects and designers increasingly focus on human-centred and adaptive spaces (Fox, 2016). His work aligns with trends in sustainable and interactive design, offering solutions for creating environments that enhance well-being and inclusivity. By leveraging Dr. Fox's principles, you can design interactive light installations that are not only visually stimulating but also responsive, adaptive, and deeply engaging, enhancing the sensory qualities of the space. Sustainable materials are important in my research as they reduce environmental impact, ensure health and safety, enhance durability, provide educational value, and create a more engaging sensory experience for children with autism.

The future applications of Dr. Fox's work are vast, from healthcare facilities and sensory therapy rooms to educational environments. His innovative use of technology sets a precedent for creating spaces that are more inclusive, adaptive, and responsive to human needs. Dr. Fox's contributions to the field of interactive light installations in sensory spaces make him a pivotal figure in advancing both architectural theory and practical design solutions. His work continues to influence a multidisciplinary approach to creating environments that respond to and support the users they serve.

Juhani Pallasmaa emphasises a phenomenological approach to architecture, focusing on the multisensory experience of space. His work critiques the dominance of vision and advocates for designs that engage all senses, with light serving as a medium to create atmosphere and emotional resonance (Pallasmaa, 2024). In his influential book, *Pallasmaa (2024)* explores how light interacts with materials to evoke deeper sensory experiences, prioritising holistic integration over technological solutions.

In contrast, Dr. Fox adopts a technology-driven perspective, focusing on interactive architecture that incorporates responsive systems. His designs often utilise sensors and computational technologies to create dynamic environments that adapt to user behaviour, with interactive light installations that enhance engagement (Fox, 2010). Fox's work emphasises the functional and experiential potential of light as a tool for interaction, pushing the boundaries of architectural innovation while creating spaces that feel alive and responsive. Juhani Pallasmaa and Michael A. Fox have both contributed significantly to architecture, but neither has focused primarily on autism in their work.

To enhance the field of sensory design, it is essential to incorporate the insights of Temple Grandin, a distinguished scholar, author, and advocate for individuals with autism. Grandin, who is on the autism spectrum herself, provides valuable perspectives on the sensory experiences of those with ASD. Her firsthand experiences and scholarly contributions, particularly in her book *The Autistic Brain: Thinking Across the Spectrum*, underscore the significance of recognising sensory sensitivities and perceptual differences when creating environments for individuals with autism. She emphasises that elements such as lighting, sound, and texture can significantly impact those on the spectrum, offering a vital framework for developing sensory-friendly spaces (Grandin, 2013). By integrating Grandin's insights into sensory design research, we can create more inclusive and supportive environments that cater to the unique needs of individuals with autism.

Grandin is an animal behaviourist renowned for her work in designing humane livestock handling systems and advocating for individuals with autism. Grandin provides profound insights into ASD by drawing from her own experiences. She highlights key characteristics of autism, such as sensory sensitivities, difficulties with social interaction, and the need for routines. Grandin emphasises how sensory processing differences like heightened sensitivity to sound, touch, or light can significantly impact daily functioning and behaviour, often leading to anxiety or sensory overload (Grandin, 2006). Her work advocates for creating supportive environments that accommodate these sensory challenges, enabling individuals with autism to thrive. Grandin advocates for sensory integration therapies that address the unique sensory challenges faced by children with ASD. She highlights practices like deep-pressure stimulation (e.g., weighted blankets or her own "squeeze machine") to calm sensory overload and improve focus(Grandin, 1992).[3]

Grandin (2006) emphasises the critical importance of sensory-friendly environments to support children with ASD, helping to reduce sensory overload and promote calmness. She advocates for key design principles such as controlled lighting (avoiding flickering or harsh lights), soothing textures, and minimising sudden or loud sounds (Grandin, 1995). Grandin often references practical examples, including sensory rooms in schools or therapy centres that incorporate quiet zones, deep-pressure tools, and predictable layouts (Grandin, 2013). These spaces, she argues,

[3] Grandin also supports evidence-based methods such as occupational therapy and sensory diets, which systematically expose children to manageable sensory experiences. These approaches, she notes, can significantly enhance sensory processing, reduce anxiety, and improve overall functioning in daily life.

provide children with a safe environment to self-regulate and engage meaningfully with the world around them.

Grandin recognises the potential of interactive and immersive technologies, such as light, sound, and projection systems, to enhance sensory engagement for individuals with autism. She advocates for using these tools to create controlled environments that reduce sensory overload while encouraging exploration. Although not directly involved in VR or AR development, Grandin supports research into these technologies for autism therapy, noting their ability to simulate real-world scenarios, improve social skills, and provide safe, customisable learning experiences for children with ASD.

Grandin emphasises the connection between sensory stimuli and brain responses in children with ASD, highlighting how their brains often process sensory input differently, leading to heightened sensitivities or overload (Grandin, 2004). She advocates for creating tailored environments that minimise overwhelming stimuli, such as loud noises or bright lights, to reduce anxiety and improve focus (Grandin, Barron and Zysk, 2005). By understanding these neurological responses, Grandin promotes designing spaces that cater to individual sensory needs, fostering a sense of calm and enabling better learning and interaction.

Grandin emphasises the importance of incorporating feedback from both children with autism and their caregivers when designing sensory spaces to ensure they meet individual needs effectively. She advocates for a human-centred approach that prioritises inclusivity, making these environments accessible to a wide range of users. Additionally, Grandin stresses the need for affordability in sensory space design, encouraging creative, cost-effective solutions so that families, schools, and therapy centres can provide supportive spaces for all children, regardless of resources. Grandin envisions a future where emerging technologies, such as virtual reality (VR), augmented reality (AR) and AI-driven tools, are integrated into sensory spaces to create even more personalised and adaptive environments for individuals with autism (Grandin, 2000). She highlights the potential of interdisciplinary collaborations between fields like neuroscience, architecture, and psychology to develop innovative designs that cater to sensory needs while fostering learning and emotional regulation. Grandin emphasises that these advancements should remain practical, accessible, and grounded in real-world applications to benefit as many individuals as possible. By applying Grandin's insights, lighting in sensory spaces can be tailored to reduce overstimulation, accommodate sensory sensitivities, and create a calming, adaptable environment that supports the unique needs of individuals with autism.

To conclude the exploration of key figures in autism spectrum disorder (ASD) research, Simon Baron-Cohen, a professor of developmental psychopathology at the University of Cambridge, offers groundbreaking contributions that bridge cognitive science and neurodiversity. Baron-Cohen is widely recognised for his work on the theory of mind, which examines the challenges individuals with autism may face in understanding others' thoughts and emotions (Baron-Cohen, 1995). Additionally, his advocacy for the neurodiversity framework challenges traditional views of autism as a disorder, instead promoting it as a natural variation in human cognition that includes unique strengths and abilities. By incorporating Baron-Cohen's perspectives, this literature review will explore how cognitive and neurodiversity frameworks can inform the design of sensory spaces that are inclusive and supportive of individuals with autism.

Baron-Cohen highlights that ASD is characterised by differences in social communication, repetitive behaviours, and unique sensory processing challenges, which vary widely among individuals. He emphasises the significant role sensory processing differences play in daily functioning and behaviour, such as hypersensitivity to sounds or textures, which can lead to anxiety (Baron-Cohen. By understanding these sensory challenges, Baron-Cohen advocates for tailored approaches to support individuals with autism in navigating their environments more comfortably and effectively.

Baron-Cohen also recognises the value of sensory integration therapies for children with ASD, which focus on helping them regulate sensory input and improve daily functioning. These therapies often include activities such as deep-pressure stimulation, balance exercises, or tactile experiences to address sensory challenges (Baron-Cohen et al., 2001). While he emphasises the importance of evidence-based practices, Baron-Cohen notes that research is ongoing to assess the effectiveness of such interventions, highlighting the need for individualised approaches tailored to each child's unique sensory profile.

Additionally, he emphasises the importance of creating sensory-friendly environments to support children with ASD, as these spaces can significantly reduce sensory overload and improve comfort and focus. Key design principles include controlled lighting to avoid harsh glare, the use of calming textures, and carefully curated soundscapes to minimise disruptive noise (Baron-Cohen, Knickmeyer and Belmonte, 2005). Sensory spaces, such as therapy rooms or sensory gardens, are tailored to address both hypersensitivity and hyposensitivity, incorporating elements like soft lighting, tactile surfaces, and vestibular activities to enhance sensory regulation. Case studies in schools and therapy centres demonstrate how these designs can foster learning, emotional regulation, and overall well-being for children with autism.

Baron-Cohen explores the potential of interactive and immersive technologies, such as light, sound, and projection systems, to support sensory engagement for individuals with ASD. He has also emphasised the growing role of VR and AR in autism therapy, particularly for teaching social skills, reducing anxiety, and providing controlled environments for sensory exploration (Baron-Cohen, 2008). Through ongoing research, these technologies are being tailored to meet the unique needs of individuals with ASD, offering innovative, evidence-based tools to enhance therapy and learning experiences.

Baron-Cohen's research delves into the connection between sensory stimuli and brain responses in children with ASD, highlighting how atypical neural processing can lead to heightened sensitivity or sensory overload. He emphasises that tailored environments, designed to minimise overwhelming stimuli, can significantly reduce anxiety and improve emotional regulation in children with ASD (Baron-Cohen, 1995). By integrating neuroscientific insights into sensory processing, Baron-Cohen advocates for creating supportive spaces that align with the unique sensory needs of individuals on the spectrum.

He emphasises the importance of human-centred design in creating sensory spaces for children with ASD, advocating for the incorporation of feedback from both children and their caregivers to ensure the spaces meet their unique needs (Baron-Cohen, Golan and Ashwin, 2009). He also stresses the need for inclusivity and affordability, ensuring that sensory environments are accessible to families and institutions regardless of budget constraints. By prioritising empathy-driven innovation and user collaboration, Baron-Cohen's approach aligns with broader principles of human-centred design to create functional, supportive, and inclusive sensory spaces.

Baron-Cohen envisions future advancements in sensory spaces through emerging technologies, such as AI-driven adaptive environments and advanced VR/AR tools, which can dynamically respond to the sensory needs of children with ASD. He advocates for interdisciplinary collaborations between fields like neuroscience, architecture, and psychology to design innovative, evidence-based sensory solutions that are both functional and therapeutic (Baron-Cohen et al., 2011). These efforts aim to further personalise experiences, reduce sensory challenges, and improve overall well-being for individuals with ASD. By applying Baron-Cohen's insights, lighting in sensory spaces can be designed to respect and accommodate the diverse sensory experiences of individuals with autism, fostering environments that are both inclusive and supportive.

Baron-Cohen and Temple Grandin, both prominent figures in the field of ASD, approach the topic from distinct yet complementary perspectives. Baron-Cohen, as a neuroscientist and psychologist, focuses on the scientific underpinnings of autism, emphasising research on brain differences, sensory processing, and the "empathy-systemising theory." His work is rooted in understanding autism as a neurological variation, advocating for tailored environments and therapies based on individual sensory and cognitive profiles. His approach is academic and research-driven, aimed at influencing broader clinical practices and policy.

In contrast, Grandin, an autistic advocate and scientist, offers an insider's perspective, emphasising practical strategies and firsthand experiences. Grandin's work focuses on visual thinking, sensory sensitivities, and concrete solutions to challenges faced by individuals with autism. Her practical designs, like livestock handling systems inspired by her sensory insights, and her advocacy for early interventions, vocational training, and inclusion, resonate deeply with families and educators.

Grandin views autism as a unique way of thinking that, if nurtured, can lead to exceptional strengths. While Baron-Cohen relies on research and theoretical foundations, Grandin's strength lies in personal experience and applied problemsolving. Both, however, share a vision of fostering understanding and acceptance of autism. Baron-Cohen pushes for systemic changes through scientific research, while Grandin emphasises empowering individuals to harness their unique abilities. Together, they provide a holistic view of autism—one grounded in science and the other in lived experience making their contributions invaluable to the autism community.

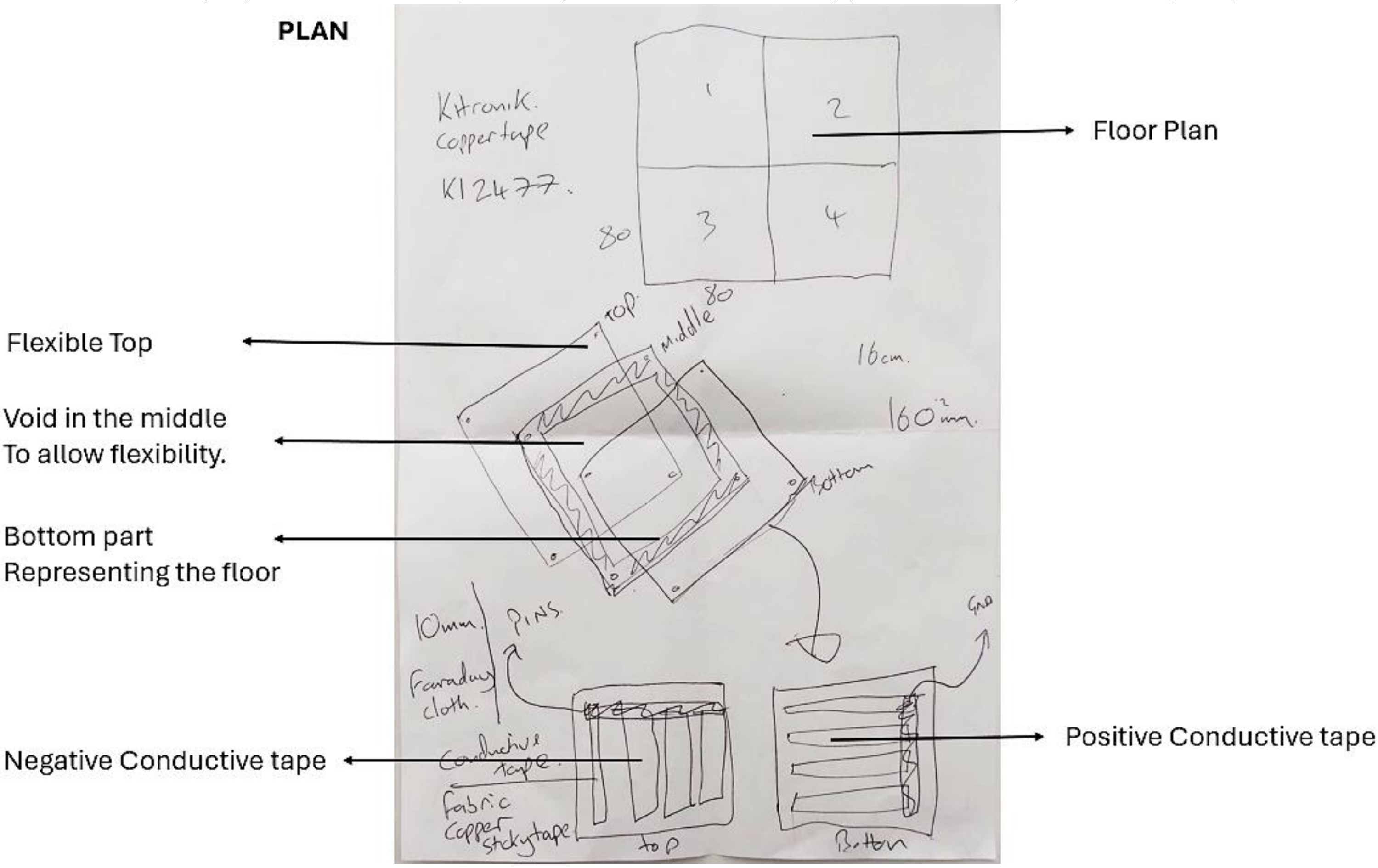
By integrating the insights of Baron-Cohen and Grandin, we can create effective sensory spaces for children with ASD. Baron-Cohen's research on sensory processing provides a scientific basis for understanding autistic needs, while Grandin's practical strategies emphasise designing environments that resonate with their unique perceptions. Their combined work highlights the importance of evidence-based, personalised sensory spaces that reduce overload and are shaped by real-world experiences. Collaborating with caregivers and autistic individuals is crucial to ensure these spaces are inclusive and empowering, ultimately fostering environments where autistic children feel safe, supported, and able to thrive.

In conclusion, the exploration of the works of Juhani Pallasmaa, Dr. Michael A. Fox, Temple Grandin, and Simon Baron-Cohen has provided a comprehensive understanding of how sensory spaces, particularly lighting, can be designed to accommodate diverse needs. Pallasmaa's emphasis on the emotional and multisensory qualities of light highlights the importance of creating atmospheres that engage all senses. On the other hand, Fox's focus on responsive and interactive systems demonstrates how technology can enhance user engagement and adaptability in sensory environments. Grandin's insights into sensory sensitivities in individuals with autism underscore the need for lighting that minimises overstimulation and allows for personalisation, and Baron-Cohen's advocacy for neurodiversity emphasises the importance of inclusive designs that celebrate cognitive differences.

Together, these perspectives underscore the need for a holistic approach to designing sensory spaces, where lighting is not only functional but also adaptive, inclusive, and emotionally resonant. By integrating these ideas, future research and design practices can create environments that are both supportive and enriching for individuals with diverse sensory and cognitive needs. This synthesis of ideas also highlights opportunities for further exploration, particularly in combining technological innovation with a deeper understanding of sensory and neurodiverse experiences.

METHODOLOGY:

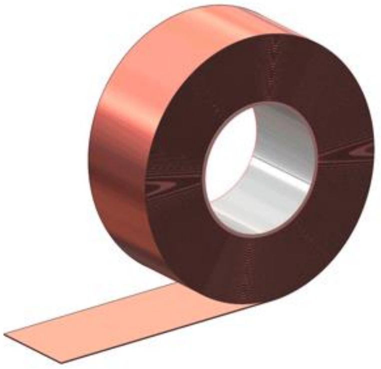
This project uses a design-led, qualitative research approach to explore how lighting



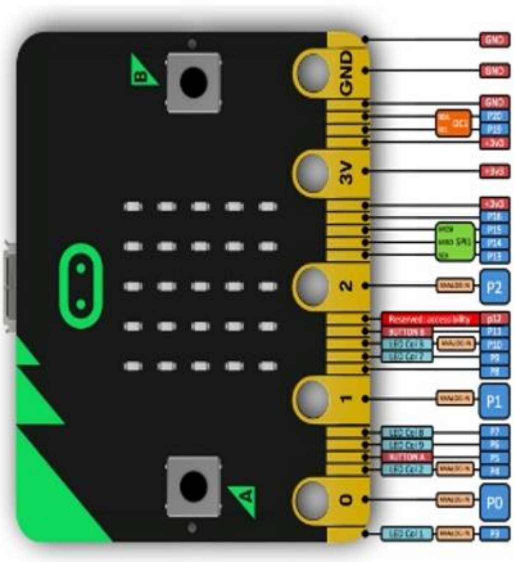
design could support neurodiverse users by developing an interactive lighting model. I am particularly examining the work done by Pallasmaa, Dr. Michael A. Fox (Interactive light installation Theorist), Temple Grandin, and Simon Baron-Cohen (ASD Specialist) to draw inspiration for my research.

Rather than searching for switches to turn on the lights, children who are autistic will have an alternative way to activate the light through their body weight on a flexible or spongy floor in the sensory room. This can be either additional light or the normal, regular room light. This design aims to reduce agitation and foster interaction with ceiling-mounted light installations that feature multiple colours, which are particularly appealing to children with ASD. These installations are intended to positively influence sensory engagement, emotional regulation, and behaviour in children with autism.

A Body-Weight-Activated Lighting System is a more immersive and tailored approach for children with autism, as it creates a direct, physical connection between their actions and the environment. Unlike motion sensor detection, which may feel passive and unpredictable, body-weight activation offers predictable, cause-and-effect interactions that are highly engaging for children with sensory needs. This system allows children to actively influence their surroundings, promoting sensory exploration, physical movement, and emotional regulation in a controlled manner. Additionally, body-weight activation can be more precise and focused, responding only when the child directly interacts with specific areas (e.g., stepping on a mat or platform). This reduces the risk of overstimulation caused by unintended triggers. By investing in this innovative system, you're introducing an alternative solution that fosters sensory engagement, focus, and empowerment, while addressing the unique needs of children with autism in a creative and meaningful way. I employed experimental techniques using a model to control the study design, testing hypotheses by manipulating variables and observing the outcomes. In collaboration with Stuart Lawn, an expert in audio, video, electrical, and programming engineer, I carefully selected materials such as Individually addressable LEDs, Micro: bit, Kitronik Copper Tape, Pads, Black Plastic, Male to Female jumper wires, Translucent White Material, and a Socket Breaker to ensure high-quality results. Before finalising these choices, I tested other options, including Polydimethylsiloxane (PDMS), which has a negative charge, and Polyvinylidene Fluoride (PVDF), a high-performance thermoplastic, Crush Sensor, and ZIP LEDs. However, these materials did not work well with Micro: bit. Additionally, I experimented with Kitchen foil paper, but it exhibited low performance, leading to less effective results. To provide a clear understanding of our research process, we employed a step-by-step methodology that systematically outlines each phase of our investigation, ensuring transparency and replicability in our approach as follows:

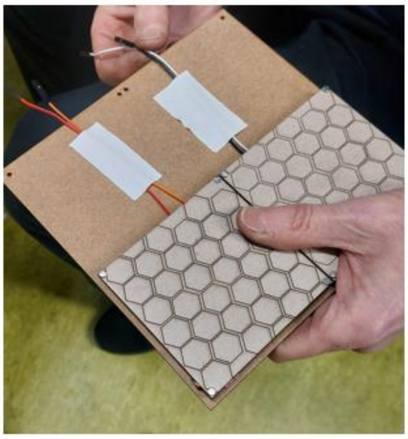


Kitronic Copper Tape provide a simple, accessible, and versatile conductive material that can be used to create interactive circuits and projects, particularly in the context of the Micro: bit educational platform.

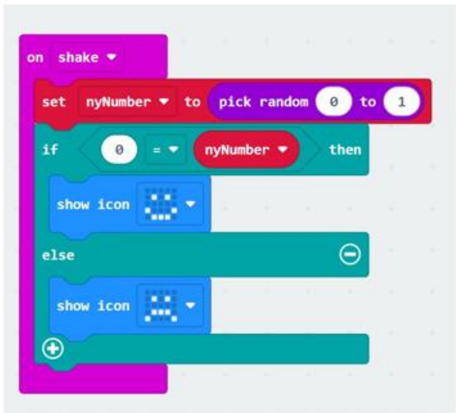


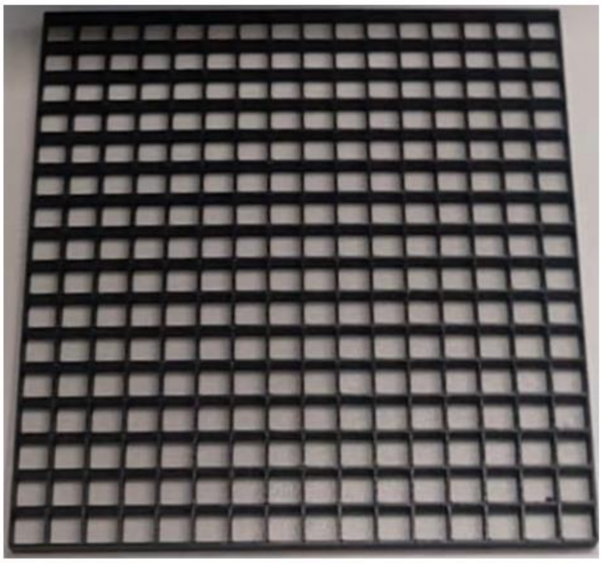
A micro: bit is a versatile and accessible platform that is designed to make coding and electronics more engaging and approachable for a wide range of users, from students to hobbyists and makers.

I call it a **'Pad'** made from Cardboard, in real sense it will represent a flexible Sensory Carpet or matt. They provide a safe, calming, and engaging environment that caters to their unique sensory needs, allowing them to explore different textures, colours, and patterns in a controlled and comfortable setting.



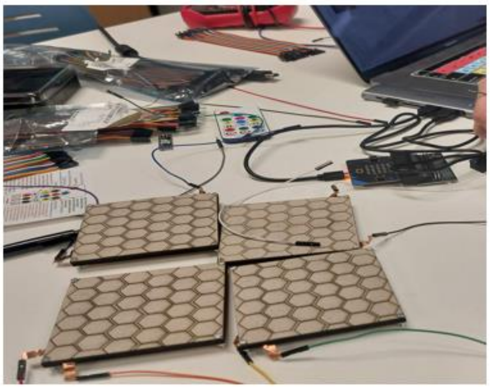
Coding a Micro: bit is to enable the creation of interactive and programmable electronic projects and devices.

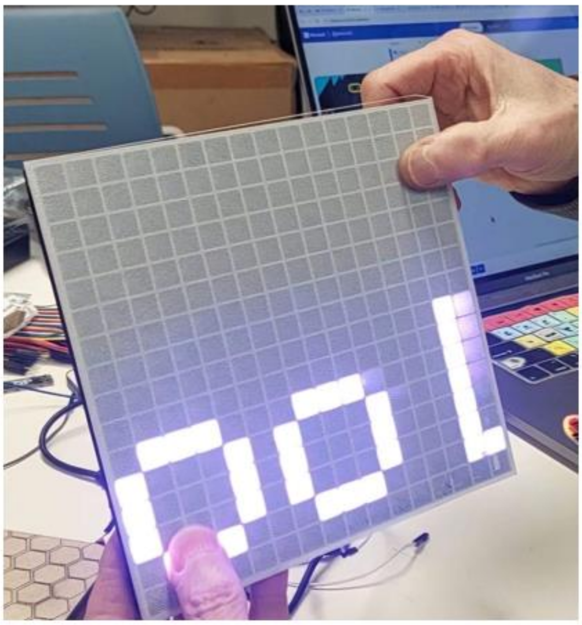




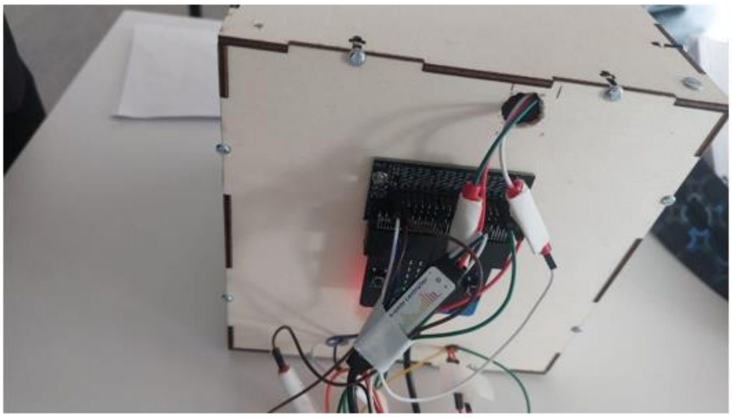
We used **black plastic** on the Ceiling with LED lights inside to create a black or dark appearance around the LED, which helps to enhance the brightness and visibility of the LED light itself.

The Micro: Bit Connecting both the LEDs on the ceiling and pads on the floor to allow Interactive light installation. Negative and positive charges are connected on the flex matt or spongy carpet to switch on the light using the body weight hence reduce the level of agitation on Childre with ASD.



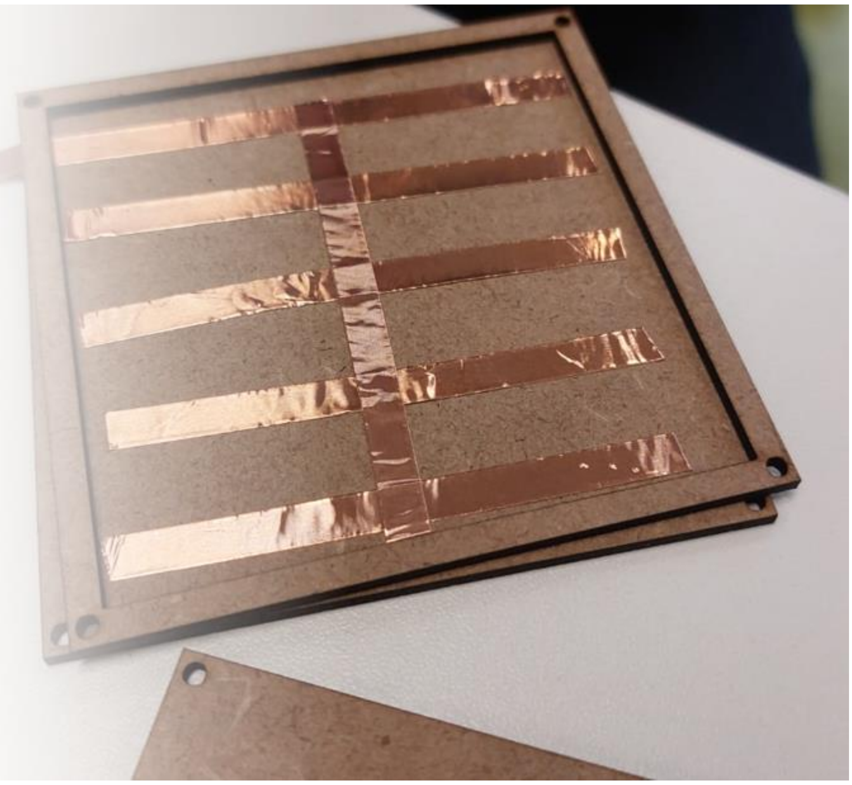


Translucent **white plastic materials** on LED lights to help diffuse and evenly distribute the LED's light output



The micro: bit and socket breaker connected with wires to enable conduction and connection from both the floor and ceiling.

• Creating both positive and negative charge from form board and Kitronic Copper Tape.



Ethical Considerations

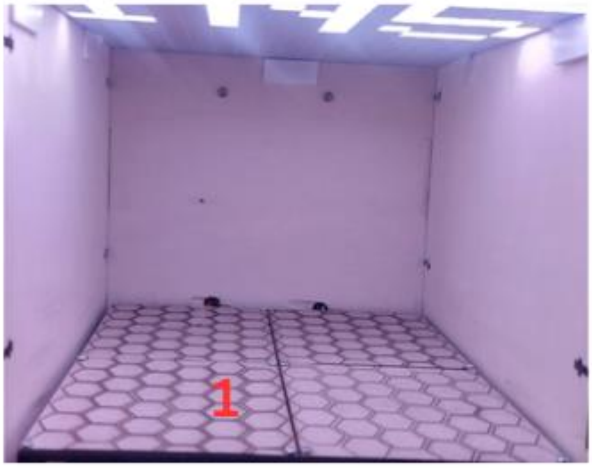
I aim to create a safe, inclusive, and meaningful research environment that aligns with the needs and values of the autism community.

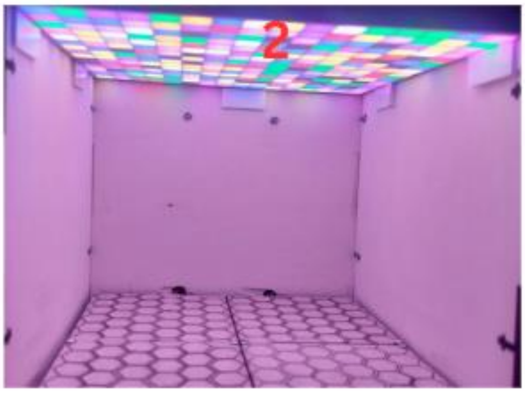
- I must ensure that the sensory model I design avoids overwhelming sensory inputs, as my experience with children with autism and findings from the literature review indicate that they often have unique sensitivities to sensory experiences. It is essential for me to create a comfortable and supportive environment for them.
- I need to clearly communicate the purpose of my research and explain how I plan to use the findings. It is important for me to be transparent about my intentions so that participants and stakeholders understand the significance of the study.

Findings/ Results:

Through qualitative analysis, I identified key patterns in interactions with the sensory model, illustrating preferences and responses to varying sensory inputs. These findings not only demonstrate the feasibility of the proposed model but also emphasise the importance of understanding individual sensory sensitivities, ultimately contributing to the development of more effective, engaging, and supportive environments for children with autism.

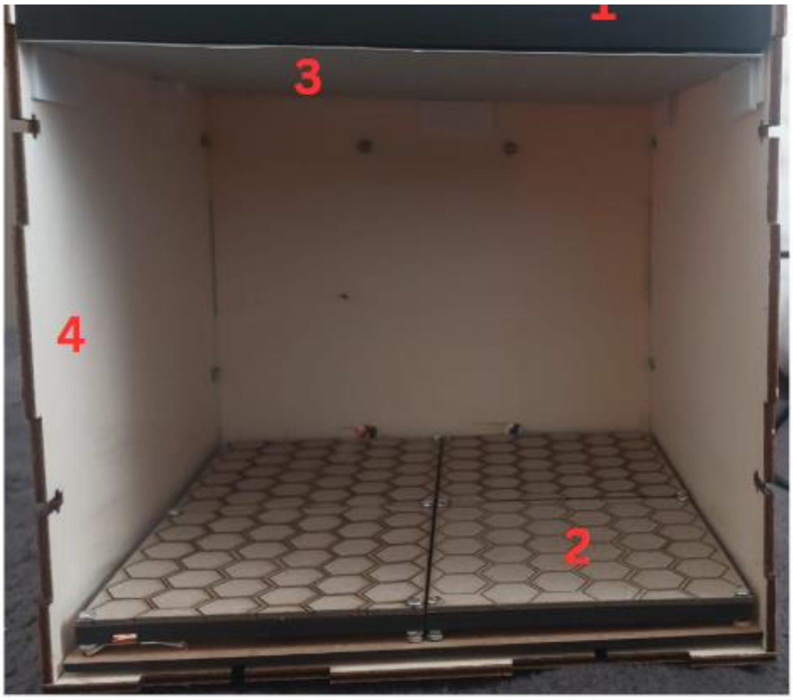
Positive results: Model





The following model outlines how different reactions of light can be triggered by body-weight pressure on pads in a sensory room specifically designed for children with autism.

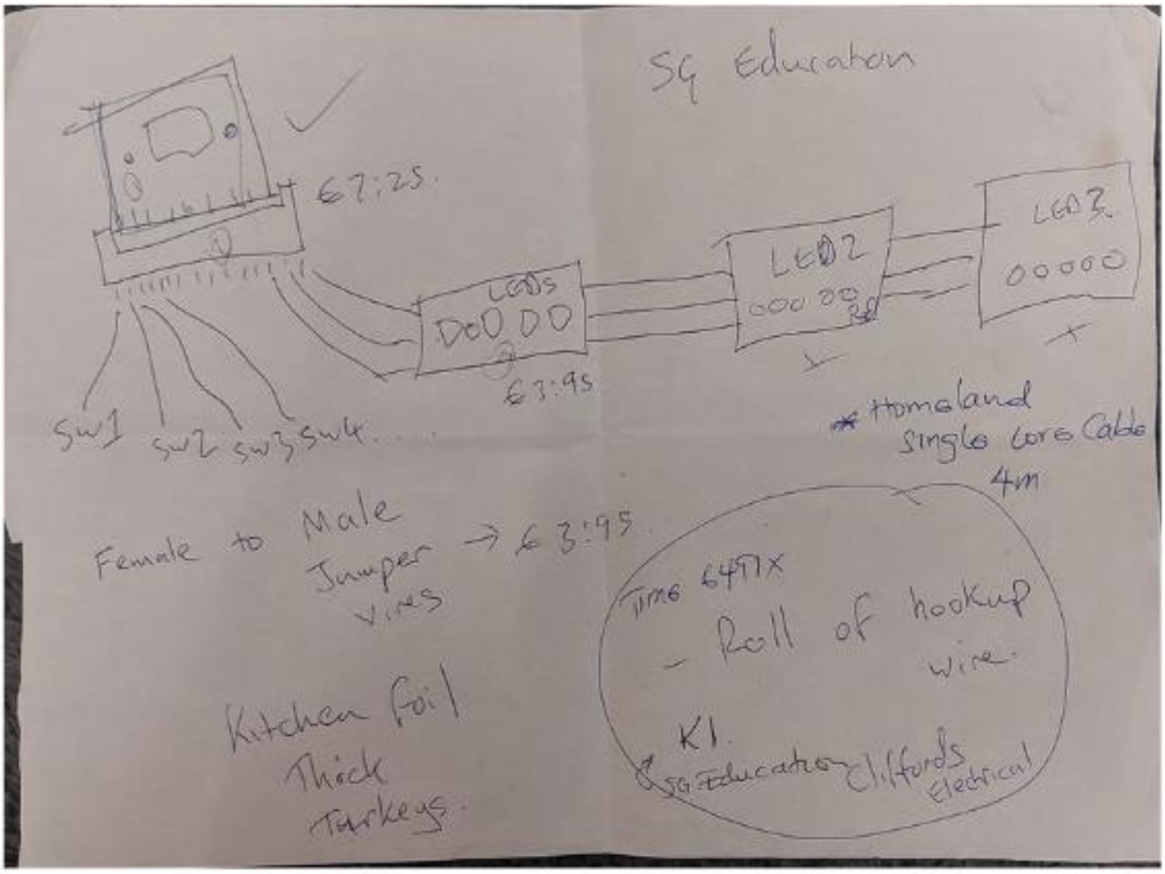
1. Flex pads on the floor   2. LEDs on the Ceiling



1. **Black Plastic material** that help to enhance brightness.
2. **Pads ,** responsible to trigger light.
3. **Translucent white material** to diffuse light
4. **Wall**

- To effectively present my research findings on the installation of 256 LED light points in sensory spaces for children with autism, I outlined the impact of dynamic, multi-colour lighting on mood and engagement, along with user feedback on sensory experiences. My systematic analysis of observations highlights the innovative design's effectiveness in addressing the specific needs of autistic children, providing insights relevant to existing literature, unlike J. Pallasmaa's focus on natural light.
- The model functioned effectively after connecting all necessary equipment, indicating successful integration and a solid foundation for further exploration and potential scaling. This initial success suggests broader applications in sensory spaces.
- The coding facilitated a reliable connection with the LED system, demonstrating effective communication between software and hardware.
- The use of Kitronic Copper Tape proved significantly more effective than the Kitchen foil paper and Polydimethylsiloxane (PDMS), which has a negative charge, and Polyvinylidene Fluoride (PVDF) due to its superior conductivity and adhesive properties, resulting in improved functionality and a more stable system. This finding emphasises the importance of material selection in designing interactive installations.

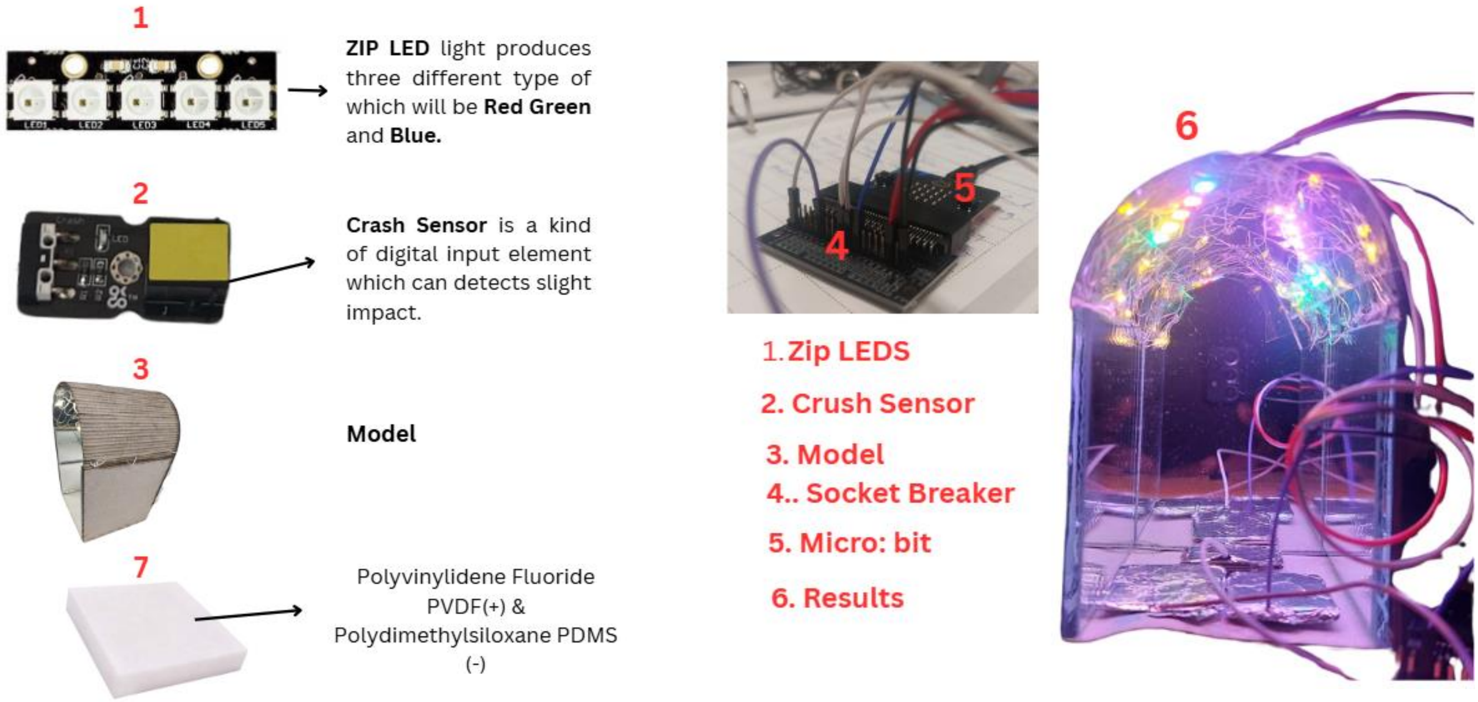
Previous Plan



Negative results

While the methodology provided valuable insights into how children who are autistic interact with sensory models, some aspects of the approach yielded unexpected or less effective results. For example;

- While working with Kitronic Copper Tape, we encountered some challenges, particularly in arranging it effectively. The adhesive properties, while beneficial for conductivity, made it somewhat tricky to manipulate and position accurately during setup.
- The process of figuring out the coding commands proved to be time-consuming, which hindered our progress. This complexity in both the physical and programming aspects highlighted areas for improvement in our methodology, suggesting that future iterations could benefit from more streamlined processes and clearer documentation to enhance efficiency and ease of use.
- Kitchen foil paper and Polydimethylsiloxane (PDMS), which has a negative charge, and Polyvinylidene Fluoride (PVDF), which has a positive charge, were slowing the process since they could not work well with the Micro: bit.
- 5 ZIP LEDs could not produce good results due to their inability to take command from the Micro: bit.
- Crush Sensor was not a better option because I wanted something that would light the space with a natural approach.



Discussion

It is essential to interpret the results in the context of the research questions posed at the outset of the study. The findings provide valuable insights into how children with autism can interact with the sensory model, revealing both effective responses and areas for improvement. From making the model, we can understand its implications for sensory interventions. This discussion will explore the significance of the findings, address any limitations encountered during the study, and suggest potential avenues for future research to enhance the effectiveness of sensory environments for children with autism. To effectively compare my research with existing literature, I will position my findings within the broader context of prior studies, highlighting both consistencies and divergences. This comparison allows me to demonstrate how my work contributes to the field and addresses gaps in interaction light installation:

In my future research, I will explore the role of somatic experiences in enhancing sensory engagement for children with autism, particularly using Body-Weight-Activated Lighting Systems. By focusing on how physical interactions with these systems can promote body awareness, emotional regulation, and a sense of control, I aim to demonstrate the significance of combining proprioceptive input with sensory feedback. This approach could provide valuable insights into creating effective, interactive environments that cater to the unique sensory needs of children on the autism spectrum.

I will investigate how a Body-Weight-Activated Lighting System can enhance the sense of agency in children with autism by fostering a direct, physical connection between their actions and environmental outcomes. The sense of agency, defined as the feeling of control over one's actions and their consequences, is crucial for developing autonomy and confidence. Allowing children to actively influence their surroundings through body-weight activation can provide a predictable cause-and-effect experience, reinforcing their awareness of being the agents of change. This approach could help children with autism better understand and control their environment, promoting engagement, emotional regulation, and a stronger sense of self-efficacy. There remains significant potential for further exploration. For instance, expanding the project to a larger scale could enhance its impact and effectiveness, allowing for a broader range of sensory experiences.

Challenges related to maintaining and updating technology to ensure long-term functionality can be view on:

- Implementing a body-weight-activated lighting system presents a promising alternative for children with autism, eliminating the need to search for traditional switches and promoting greater independence.
- Engaging directly with children who are autistic through interviews could provide critical feedback, helping us identify specific areas for improvement and tailoring the sensory environment to better meet their needs.
- Maintaining traditional switches in the sensory room offers flexibility for occupants, ensuring that various preferences and comfort levels are accommodated.

Conclusion

The primary objective is to assess the effectiveness of an interactive sensory model tailored to their unique needs. By employing a qualitative research approach, the methodology provided meaningful insights into the children's interactions with the pressure-sensitive pads and the corresponding light responses. The significance of this study lies in its contribution to the field of autism research and sensory interventions. It highlights the potential of interactive sensory environments to promote active participation and tailored sensory experiences, emphasising the importance of designing adaptable and inclusive models. Additionally, the study addresses a gap in existing literature by focusing on body-weight-activated sensory mechanisms, providing a novel perspective for future research and practical applications.

Looking ahead, further research is needed to refine the sensory model, particularly by incorporating customisable features to better accommodate individual sensory thresholds. Future studies could also explore the long-term benefits of such sensory interventions, examining their impact on children's development, emotional regulation, and overall well-being. By continuing to build on these findings, the field can move closer to creating more effective, inclusive, and engaging sensory environments for children with autism.

Appendices

Link to my dissertation and video demonstration:

https://docs.google.com/presentation/d/1sEkbaUJgMeDjHU1s84qTCTHRwnmIeW7Q/edit?usp=drive_link&ouid=116827120584655231590&rtpof=true&sd=true

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