The Orpheus System

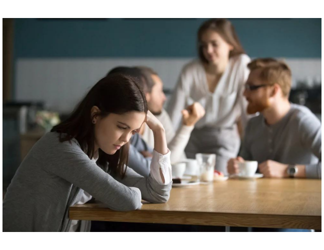
Product Design | UI/UX | Inclusivity | Communication

Communication, expression and therapy through musical improvisation for adults with Autism Spectrum Disorder

What Is High-Functioning Autism

Autism Spectrum Disorder, commonly known as autism, is a neurological condition characterized by differences in social communication, repetitive behaviors, and specific patterns of thought.

It is aptly termed a "spectrum" because it encapsulates a wide range of presentations and severity levels. From individuals with high-functioning autism who might excel academically but struggle with social interactions to those with more profound challenges in communication and daily living. This diversity within the spectrum challenges stereotypes and emphasizes the need for personalized understanding and support.



Social Challenges

Autistic individuals struggle with normal social connections, facing difficulty in understanding and expressing emotions, and often lacking sensitivity to others.

Sensory Sensitivities

People with autism may be more sensitive to stimuli like noise, light, and touch, leading to unusual reactions.

Communication Hurdles

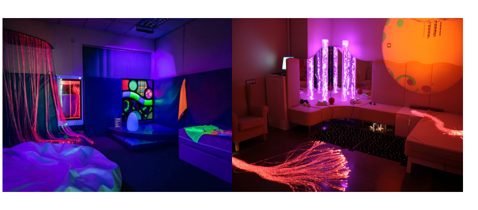
Autism can bring about challenges in verbal communication, ranging from being non-verbal to repetitive or stereotyped speech patterns.

Distinct Behaviours

Autistic individuals may have intense interests in certain areas, showing less interest in others.

Problem

1. How can we effectively empower adults with ASD to socialise and form connections in a fun and friendly way?
2. How can we make the benefits of sensory spaces more accessible for adults with ASD?

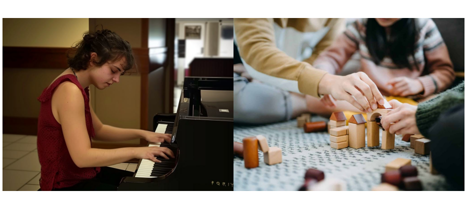


SENSORY ROOMS

Sensory rooms are therapeutic environments designed to stimulate the senses. Research indicates that these rooms can significantly reduce aggression, self-injurious behaviour, and anxiety in individuals with severe ASD, while also enhancing focus and socialisation. Despite their growing presence in public spaces, sensory rooms remain prohibitively expensive to install in private homes.

Communication and Socialisation

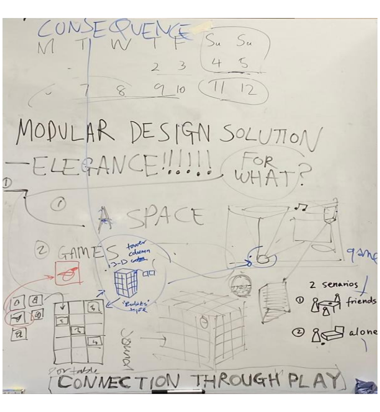
Effective communication and socialisation for individuals with severe ASD can be fostered through non-verbal creative engagements. Play therapy research highlights that rule-based and turn-taking games can improve socialisation, self-expression, and emotional well-being. Additionally, autism music therapy has been shown to positively influence brain activity related to emotional expression and verbal communication.



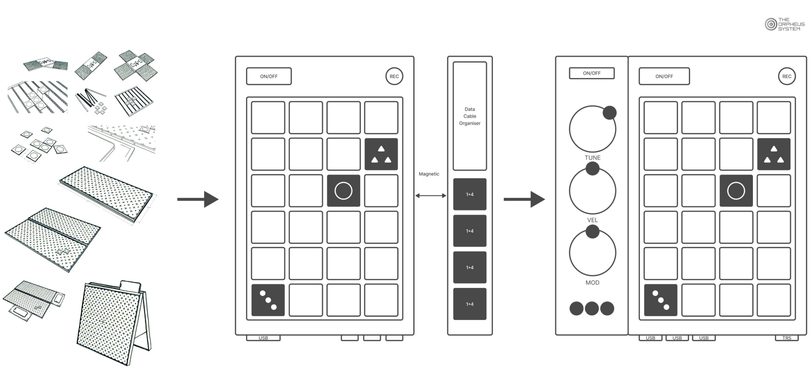
Our Solution

The primary product is a physical-to-digital communication game, where moving parts of a puzzle box initiate changing sounds and images. The physical box can be connected to a phone to play the sound and images, but can also be connected to additional, modular components, such as speakers and projectors which can be installed in a shared or private space.

This modular suite of products can assist with communication for adults with ASD (connection-through-play), as well as making the well-researched benefits of Snoezelen-style sensory rooms more accessible and affordable.

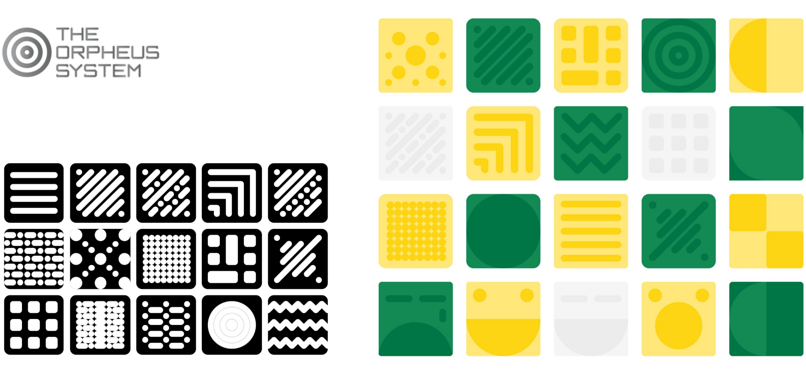


Sketch



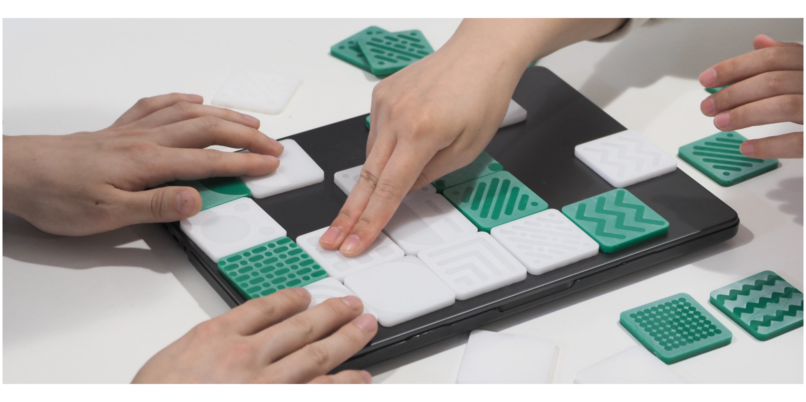
With the goal of devising an elegant, modular design for our product, Jiahuan and Anqi created a variety of product sketches, drawing inspiration from classic board game design and modern, digital modular synthesizers.

Visual Language



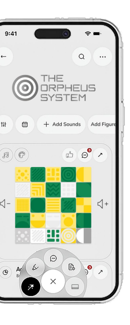
For the tile glyph designs, Melanie created a language based on a system of colours and patterns. The tile colour signifies the tone of the musical element that will be triggered when the tile is played, while the pattern (waves, dots or emojis) signifies the texture – staccato or legato, melodic or percussive. The patterns are inscribed on the tiles in relief, adding a tactile reference for users to identify with the sounds.

How will it work



The game board has an array of magnetic Hall Effect sensors below the playing surface, which, thanks to a unique magnet within each playing piece, can identify each piece and where it is played. Each piece has an associated ambient musical element, from legato synth pad sounds to staccato arpeggios and light percussive elements, saved in interactive patches written in MAX MSP. These elements are triggered by an internal processing unit within the game board and played either from a small sound bar on the gameboard or through any Bluetooth-connected audio device. All of the music is written so that no combined elements are discordant, and the interactivity of the elements is programmed so that the order and arrangement of the pieces affect the whole too.

As the players take their turns, elements can be removed and added until the players are happy with their composition. They can then press the "record" button on the top of the board, which sends an mp3 snippet of the composition and a diagram of the tile arrangement to any Bluetooth-connected mobile device. A mini projector can also be purchased and attached to the board to play audio-reactive visualisations.



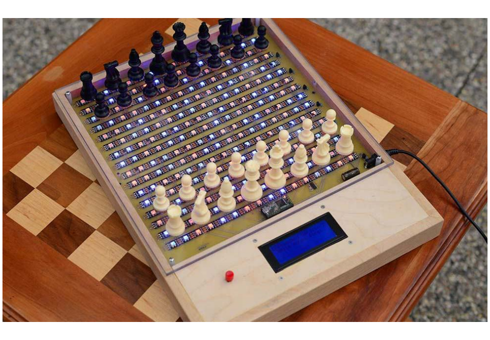
Technical Realisation

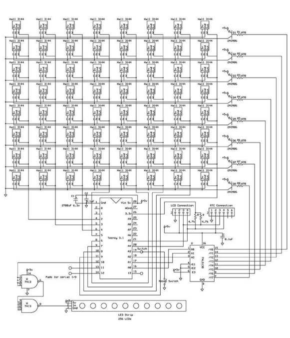
GRID SYSTEM

1. Game Board Design: The physical game board could be a flat surface made of wood, plastic, or any other suitable material. The board should have a grid or designated areas where magnetic counters can be placed.
2. Magnetic Counters: Design and manufacture magnetic counters that players will use on the game board. These counters should contain magnets that interact with sensors on the game board to detect their positions.
3. Sensor Array: Embed sensors into the game board at each grid intersection or designated area where counters can be placed. These sensors could be magnetic field sensors (e.g., Hall effect sensors) or other types of proximity sensors capable of detecting the presence of magnets.
4. Microcontroller Unit (MCU): Integrate a microcontroller unit (MCU) into the game board to process sensor data and determine the positions of the magnetic counters. Popular choices include Arduino, Raspberry Pi, or custom-designed microcontroller boards.
5. Wiring and Interfacing: Connect the sensors to the MCU using appropriate wiring. Each sensor's output should be interfaced with the MCU's input pins to read the sensor data.
6. Programming: Write the firmware or software for the MCU to interpret the sensor data and determine the positions of the magnetic counters on the game board. This involves programming logic to handle different scenarios, such as counter placement, removal, and movement.
7. User Interface (Optional): Optionally, you can include a user interface such as an LCD display or LED indicators to provide feedback to players about the game state or detected counter positions.
8. Power Supply: Provide a power source for the electronic components. This could be a battery pack or a wired power supply, depending on your design preferences and portability requirements.
9. Testing and Calibration: Test the system thoroughly to ensure accurate detection of counter positions. Calibrate the sensors and fine-tune the software as needed to improve accuracy and reliability.
10. Enclosure and Finishing: Enclose the electronic components in a protective housing to prevent damage and ensure durability. Add finishing touches to the game board to enhance its aesthetic appeal.

HALL EFFECT SENSOR ARRAY

In this example, an array of Hall Effect sensors detect which magnetic chess piece is at which position on the board.

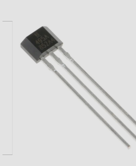




TECH REQUIRED

Raspberry Pi processor

Hall sensors x 16-32



Power supply

Bluetooth connectivity

THE ORPHEUS SYSTEM

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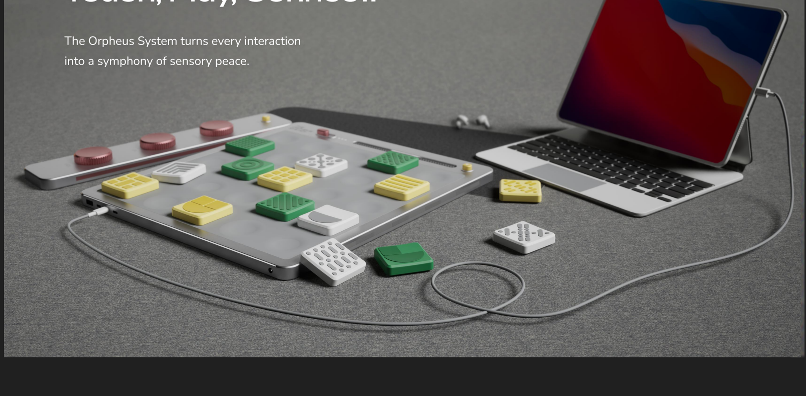
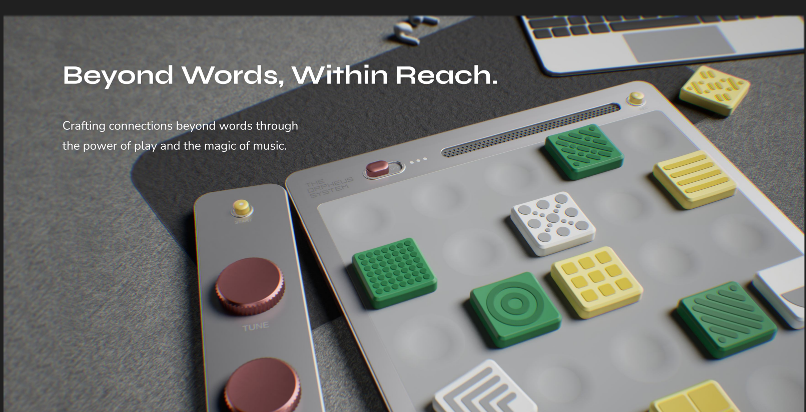
"Whether you're crafting solo soundscapes or enjoying a group game, find your focus and calm in a symphony of light and sound."





"We all see the world through a unigue lens."