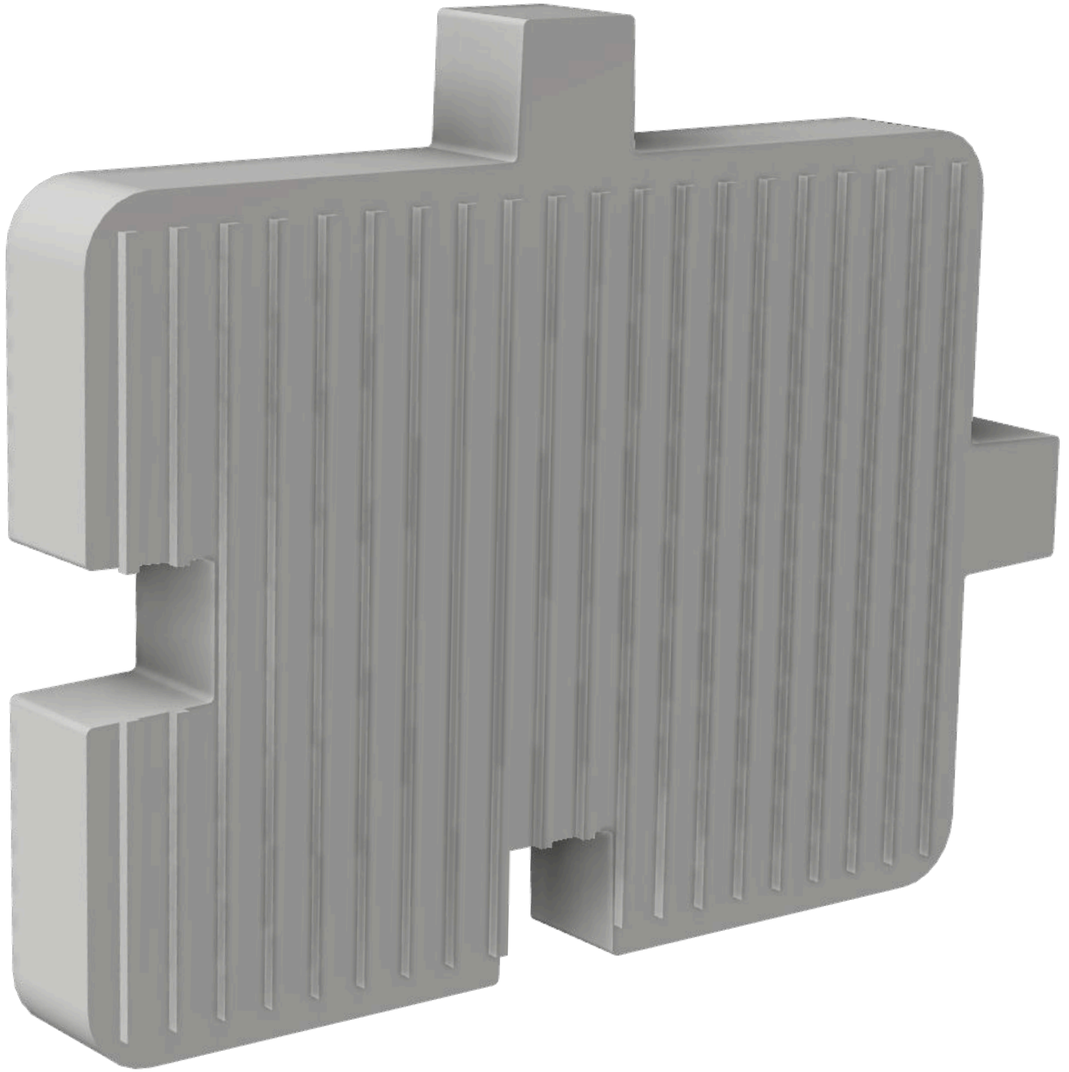
PFD501
Specialist Skills

Maya Lam



Design Intent

Product intent

The intent of my product is to address organisational and mental challenges users endure while encouraging creativity and playfulness, embracing the idea of “finding the fun in the mundane”.

My product will be a simple 2 part moulded object designed to support everyday organisation while introducing an element of play through form and interaction. By incorporating playfulness into my product, it aims to improve users’ mental wellbeing through use. Through 2 part moulding, it will be a product optimised for repeatability and mass manufacture, allowing it to reach a wide range of users.

Target Market

Target market: young adults

The target market of my design is **young adults**, specifically **those who are transitioning into independent living**, such as **university students or first-time movers** who may find organisation and mental wellbeing challenging during this period.

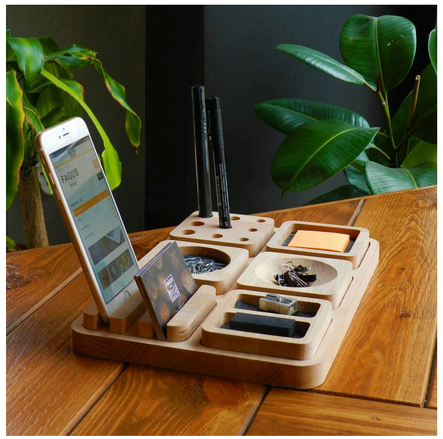
Data research

Through data research, I have encountered numerous surveys of young adults in the UK expressing a decline in mental health after transitioning into independent living.

- **GOV.UK:** many adults in early adulthood who have **left home** and started **living independently** was **associated with a risk of loneliness or poor mental health.**
- **TASO: 1 in 6 undergraduates** now report **difficulties in mental heath.**
- **Psychreg: 18%** of adults admitting to **having a cluttered home**, **35%** stating that their **mental health is affected by clutter**.

Existing Products

Beech Wood Modular Desk Organizer



This beech wood desk organiser is designed to be used on any workspace for optimal organisation. It includes a phone holder, a pen holder, keyboard rack, card holder and paper holder.

Pros:

- Versatile use
- Removable modules
- Sustainable material
- Neutral appearance

Cons:

- Limited to 6 compartments
- Non portable
- Limited element of creativity and playfulness

Opportunity: Adopt removable and individual element as well as neutral tonality.

LEGO brick box

The LEGO brick box consists of 790 individual bricks to be built in numerous ways, channelling users' creativity. It includes different elements such as windows, doors, and baseplates, also including 33 different colour bricks.

Pros:

- Encourages creativity and playfulness
- Suitable for all ages
- Ideas included for building guide

Cons:

- Limited building functions
- Can cause clutter
- High cost

Opportunity: Adopt buildable and open ended creativity element.

2-part mould research

2-part mould opportunities

Injection moulding

Pros: High precision and repeatability, suitable for complex forms and fine details

Cons: High tooling cost, tooling limitations such as draft angles, injection points and no undercuts

Cast moulding

Pros: Low tooling cost, quick and straightforward process, good for experimentation

Cons: Slow curing time, defects common, inconsistent results

Compression moulding

Pros: Produces strong products, low material waste

Cons: Limitations on fine details and complex forms, relatively slow process

Material research

Material opportunities

Polypropylene

Pros: Lightweight, highly durable, low cost, recyclable, can be injection moulded
Cons: Relatively low surface quality, can degrade from prolonged UV and heat exposure,

ABS

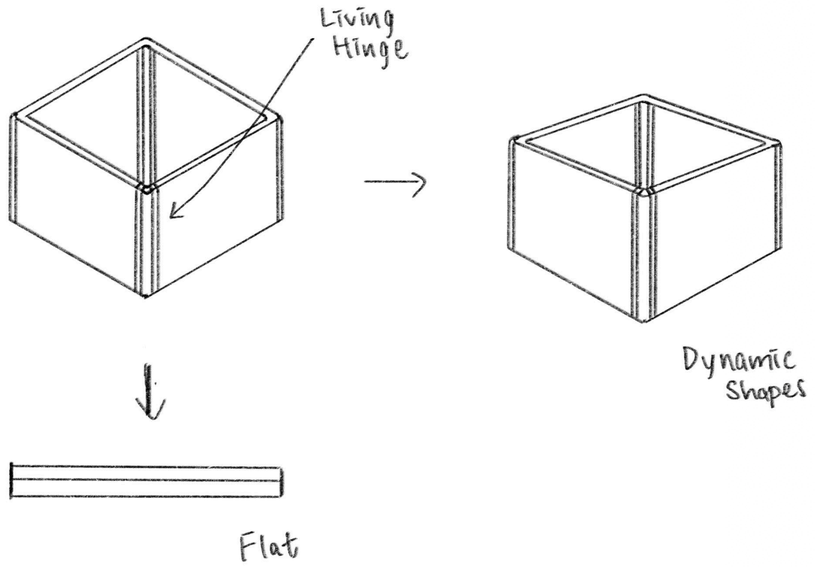
Pros: Excellent surface finish, premium feel, rigid, can be injection moulded
Cons: Higher cost, low flexibility, more brittle compared to polypropylene

Jesmonite

Pros: Good surface finish, alternative aesthetic and feel, can be cast moulded
Cons: Hard and brittle when cured, heavy, requires labour, intensive finishing

Initial exploration

Initial concept



My initial concept for my design was to create flexible, modular components that can be connected together in different ways to act as a desk organiser.

Each module would use living hinges, allowing the square shapes to twist into different forms and create layouts to organise different items. It would also be able to fold down and act as a drawer organiser to form separate comportments.

As the module would be constructed with living hinges, each piece would be fidgetable and would be able to work as a small fidget toy on its own to target stress and anxiety.

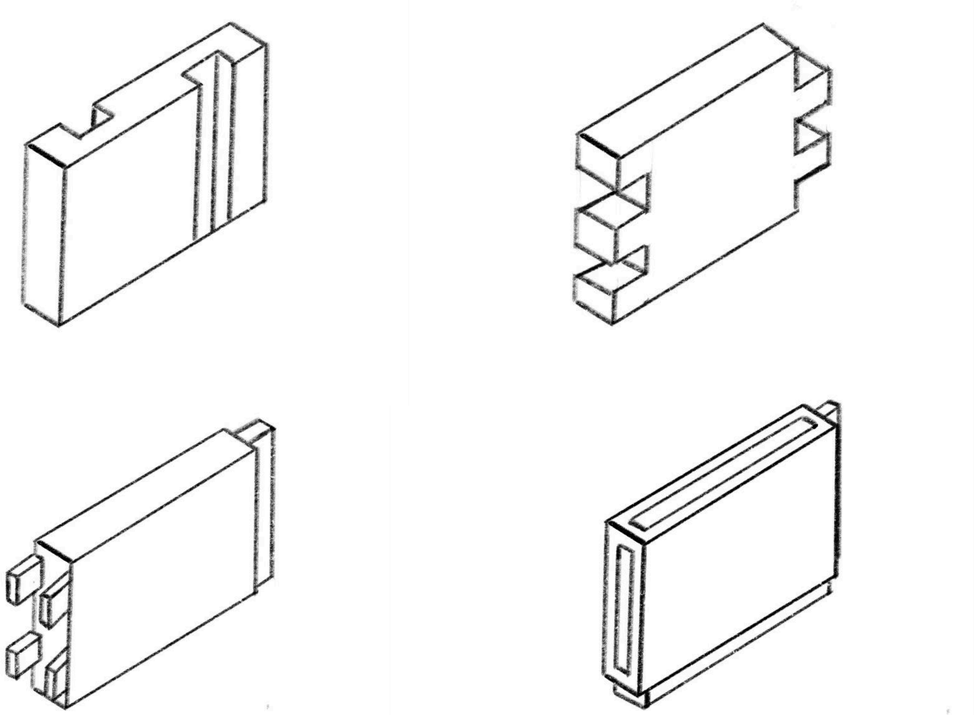
Concept refinement

Refined concept

Upon reflection of my initial concept, several limitations were found. The square shape restricted its compatibility to organise a wider range of products, and the living hinges made it difficult to connect modules together. This led me to refine my concept.

Instead of putting focus on a square form, I decided to break it apart and focus on each side individually, placing focus on the potential of each side and how they can act as a component by itself to be connected together, providing a wider range of shapes to be built, expanding usability and element of creativity .

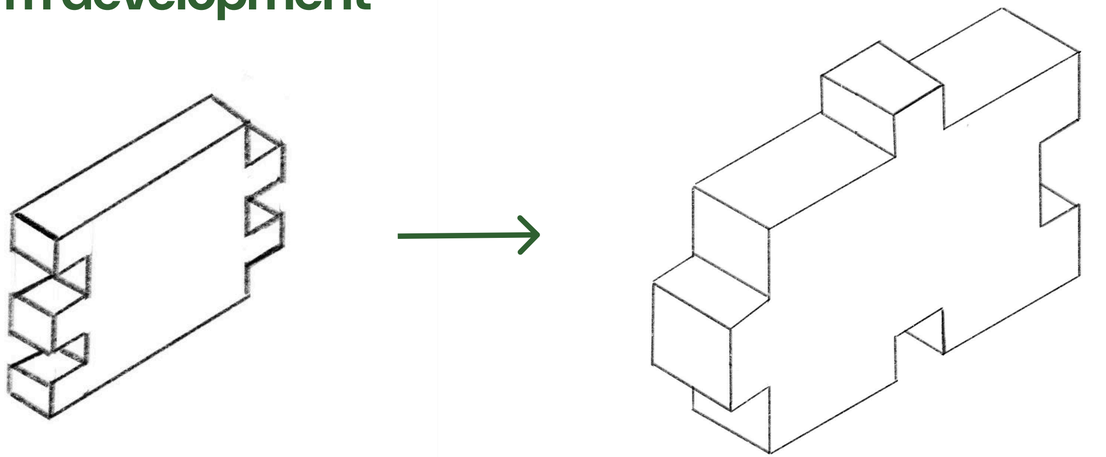
Joint / form development

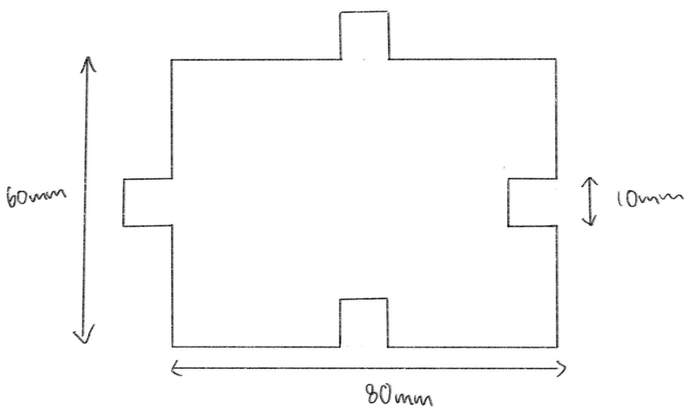


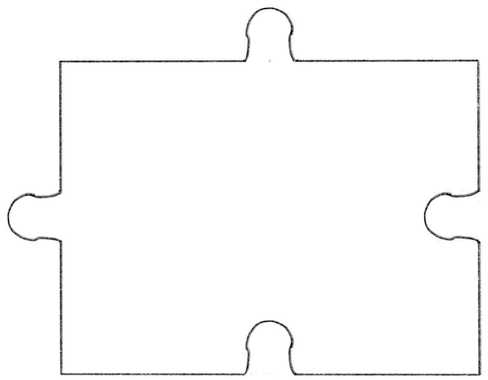
Following my refined concept, I experimented with the form of each side piece to find the most effective way for them to join and connect easily from all directions whilst still allowing flexibility.

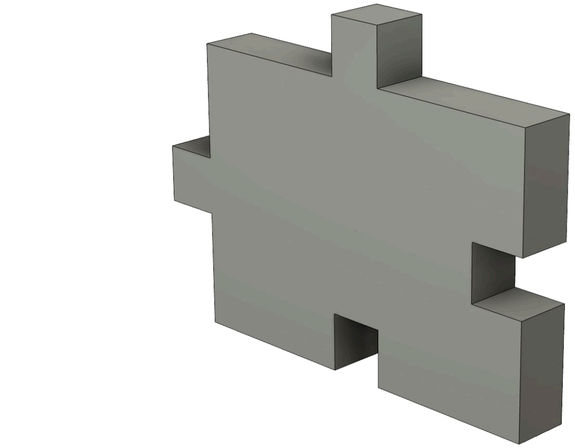
Design refinement

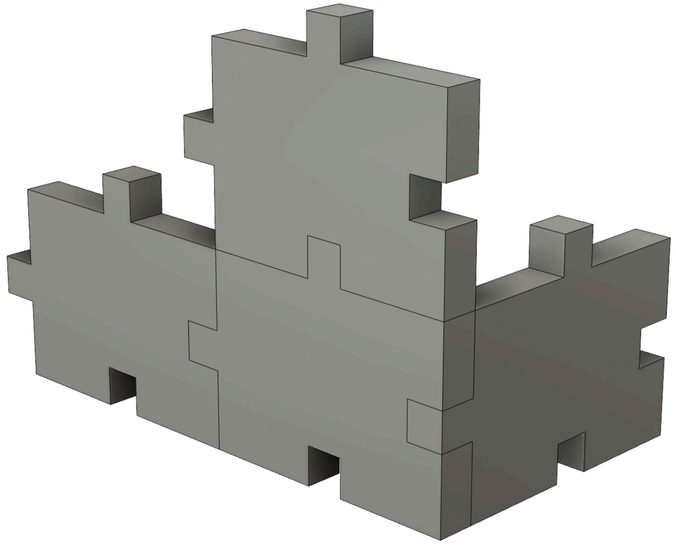
Form development









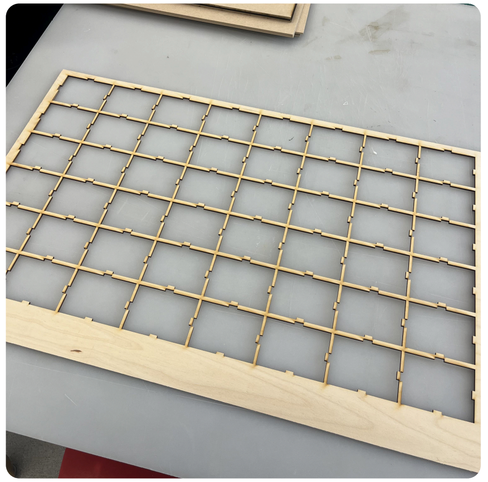


Through experimenting with the comb joint, I developed the form into a jigsaw-like piece that allows each module to connect from any direction.

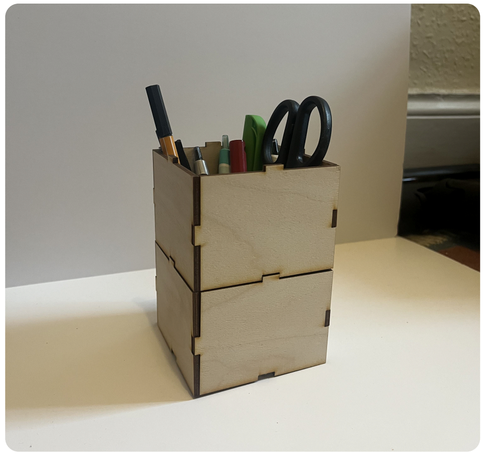
Prototyping

Laser cut prototypes

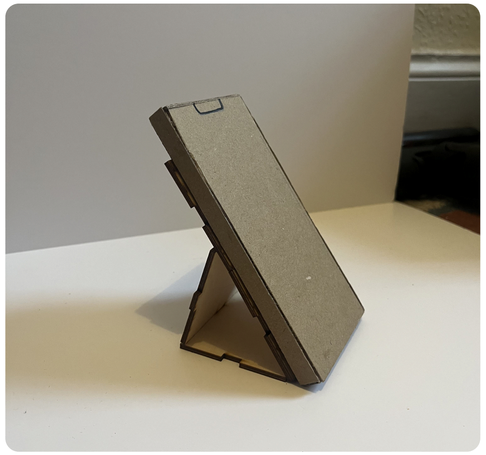
After testing and failing numerous tolerance adjustments for accurate joining, I was finally able to laser cut multiple pieces that resembled my product's jigsaw-like form using laser plywood. The tolerances I tested included -0.008, -0.050, -0.10, +0.10, +0.30, +0.50. Through this process, I found the correct tolerance for laser cutting was +0.5.



Prototype variations



Pen pot
8 in a pack



Phone stand
4 in a pack

Drawer / table divider
10 in a pack

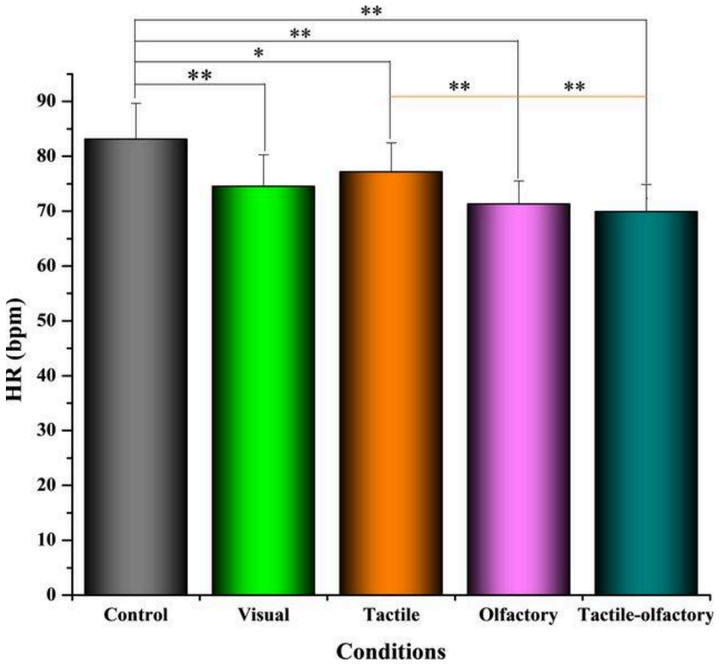
Using laser cut prototypes of my design, I experimented with different configurations on how the jigsaw pieces can be assembled to create organisational tools and how many pieces were needed in a pack, such as a pen pot, a phone stand and a drawer / table divider.

Tactile exploration

Tactile surface

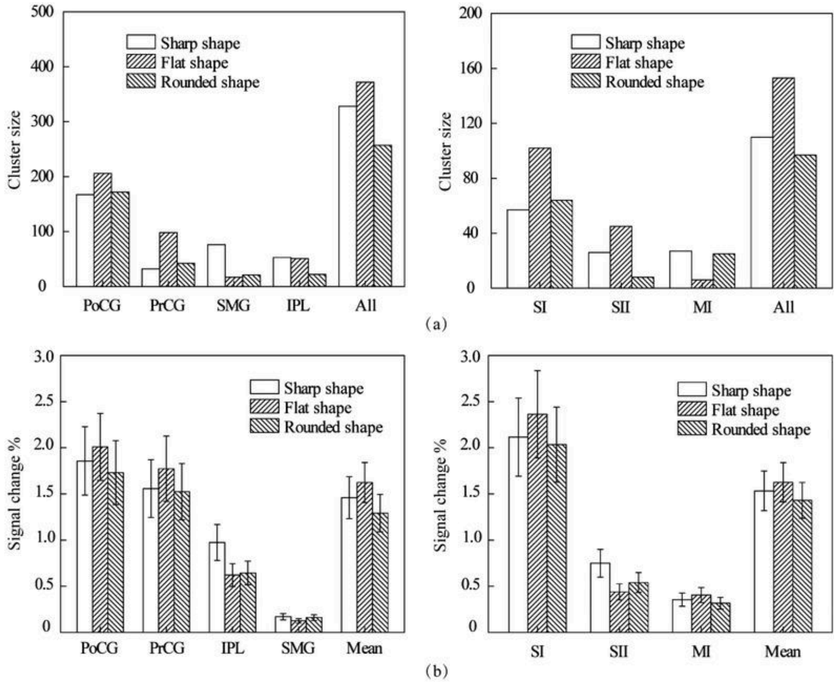
One element from my initial concept that was missing in my refinement was the ability for each component to function as its own fidget toy to help with mental wellbeing. To address this, I incorporated a tactile surface onto my design, allowing each piece to be used independently as a fidget toy with raised patterns users can trace with their fingers

Supporting data



Xie, J., Elsadek, M., Zhang Deshun, Zhou, Z. and Gao, J. (2025). Tactile and olfactory stimulation reduce anxiety and enhance autonomic balance: a multisensory approach for healthcare settings. BMC Psychology, [online] 13, p.806. doi:https://doi.org/10.1186/s40359-025-03140-x.

According to this research (Xie et al., 2025) on tactile and smell simulation on anxiety, results show that they produce the strongest calming effects, leading to a 42.3% reduction in anxiety.



Tang, W., Shu, Y., Bai, S., Peng, Y., Yang, L. and Liu, R. (2021). Brain activation related to the tactile perception of touching ridged texture using fingers. Skin Research and Technology, 28(2), pp.254–264. doi:https://doi.org/10.1111/srt.13122.

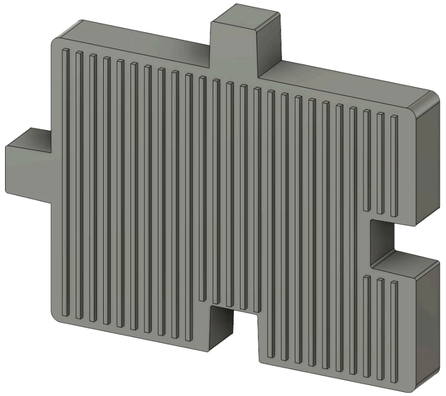
This research (Tang et al., 2021) shows how tactile stimulation of different shapes can influence different responses in the brain, including emotional and stress levels.

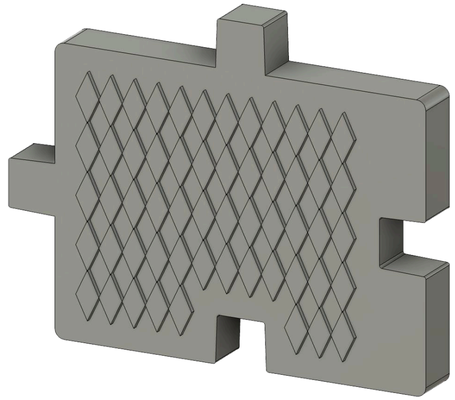
Design

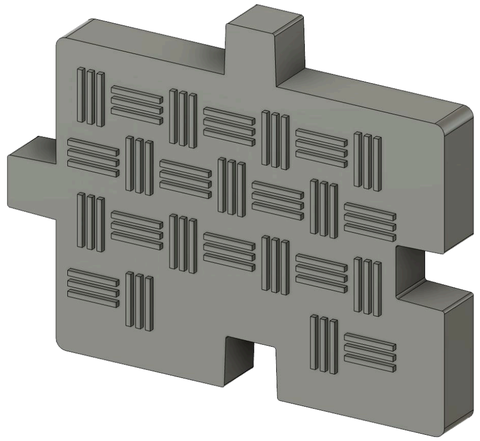
Tactile exploration

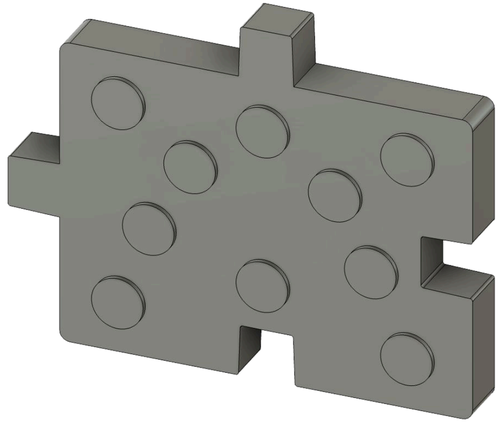
Through experimenting with CAD, I designed variations of tactile surface designs that can be adopted within my design, settling on a wave and line texture for each side.
I also experimented with neutral colours to decide which was better for a more calming approach.

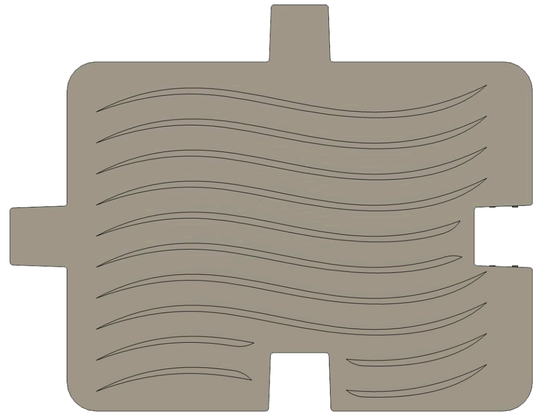
Tactile surface exploration





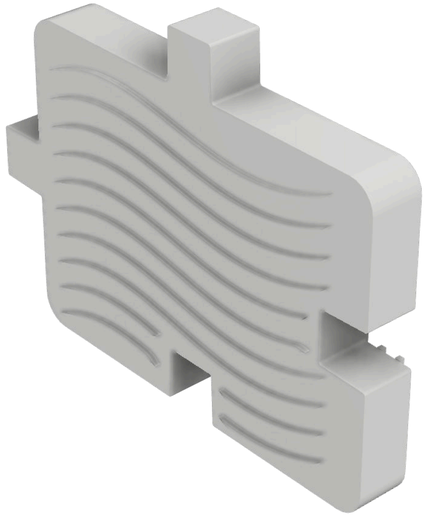


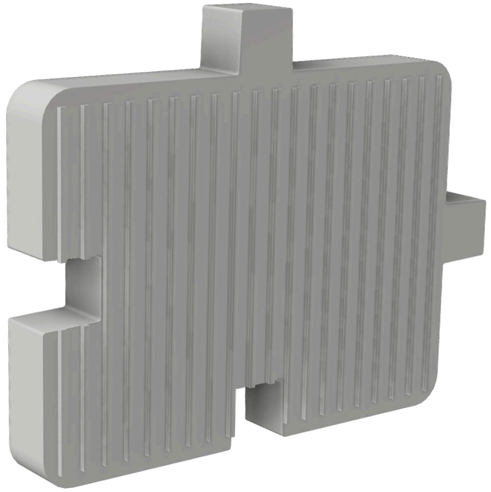




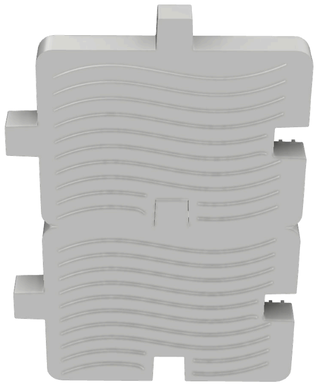
Design

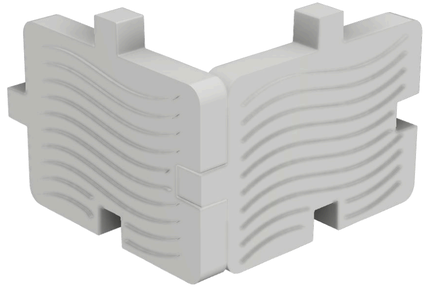
CAD development and render

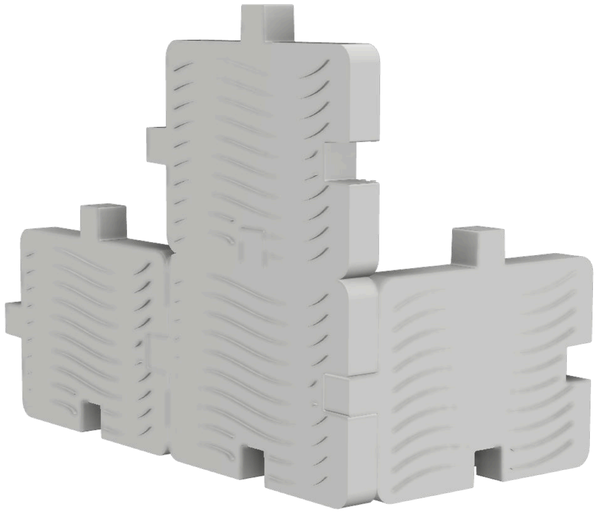




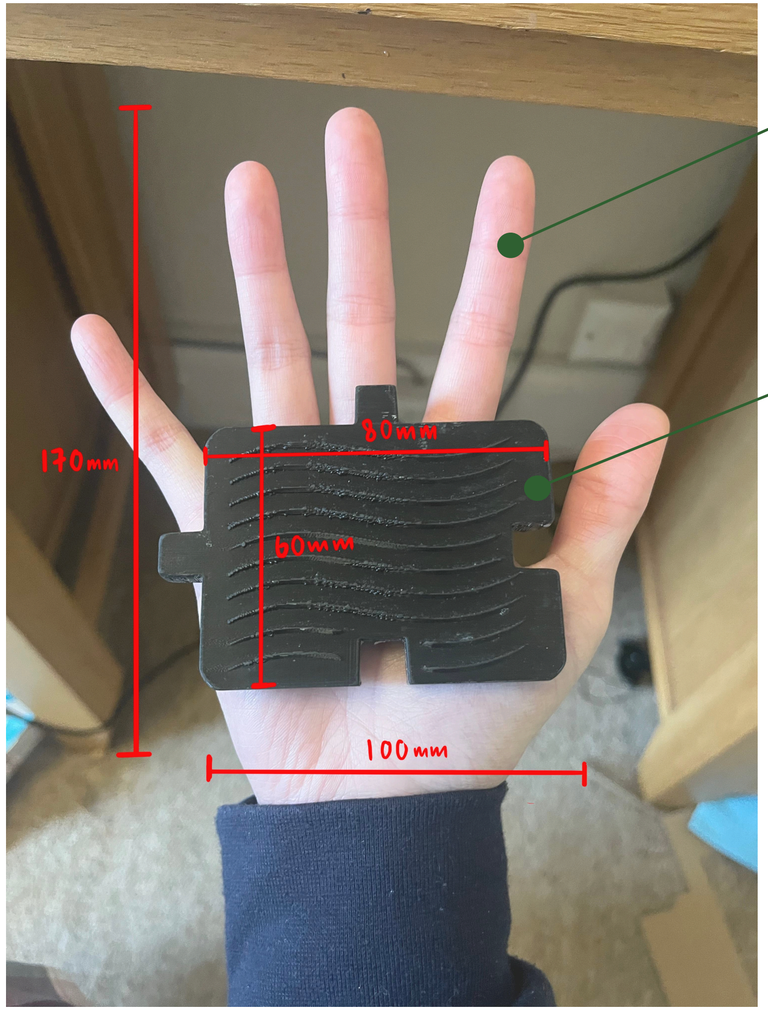
To allow for easier joining of pieces and optimisation for 2 part moulding, I added 2 degree draft angles on each connector.







Ergonomics



Hand size: 170mm x 100mm

Jigsaw piece size: 80mm x 60mm
Piece fits the hand perfectly for tactile stimulation whilst offering the perfect size for assembly.

Tactile texture: raised by 1mm,
Provides an optimal sensory experience whilst maintaining a discreet appearance.

Material

Polypropylene

Lightweight: Makes it suitable **for creating multiple modular pieces.**
Durability: Allows the jigsaw **joints to connect smoothly without wearing down over time.**
Flexibility: Ensures the **sensory textures feel comfortable** rather than harsh.
Recyclable: Supports a more **sustainable material choice.**

Injection moulding

Polypropylene is also chosen due to its suitability for **2-part injection moulding.**
Low melting temperature: Allows easy flow into complex moulds.
Cost-effective: Ability to produce numerous pieces at an affordable price.
Good balance of strength: Supports fine surface detail, allowing the sensory textures to be easily formed and durable.
Easy ejection: Provides clean release from mould, reducing defects

2-part injection mould

2-part injection mould opportunities

Repeatability: Allows each jigsaw piece to be identical, providing accurate joining and the ability to mass produce at an affordable price.

Precision in detail: Enables sensory textures to be intricate yet present.

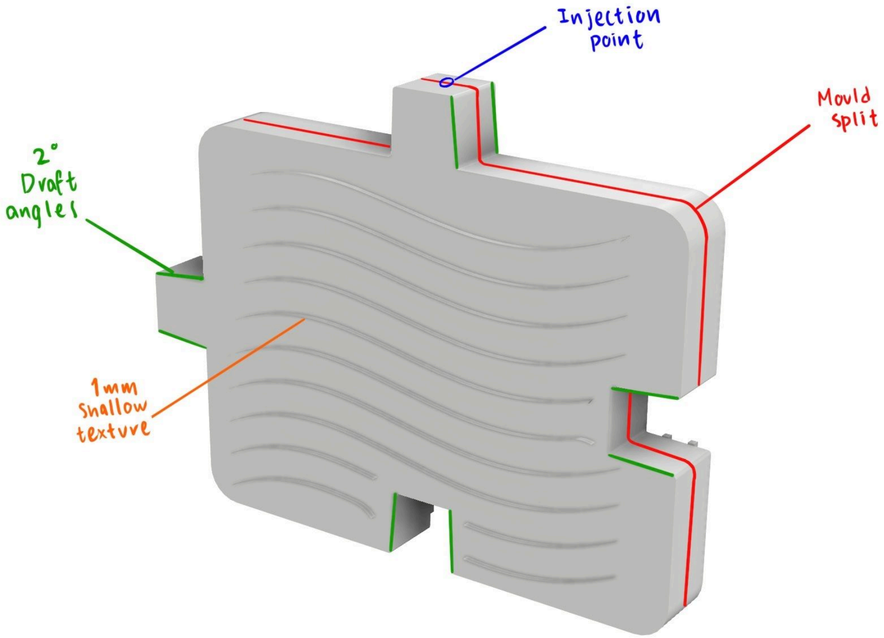
Strong, durable production: Allows pieces to be assembled and dissembled repeatedly without breaking.

2-part injection mould constraints

Draft angles: Each jigsaw piece has a slight draft angle in the joints to allow for easy release from mould, slightly restricting direction of connection.

Texture limitations: Sensory textures must remain shallow to suit injection moulding. Deeper or more complex textures would cause damage during ejection.

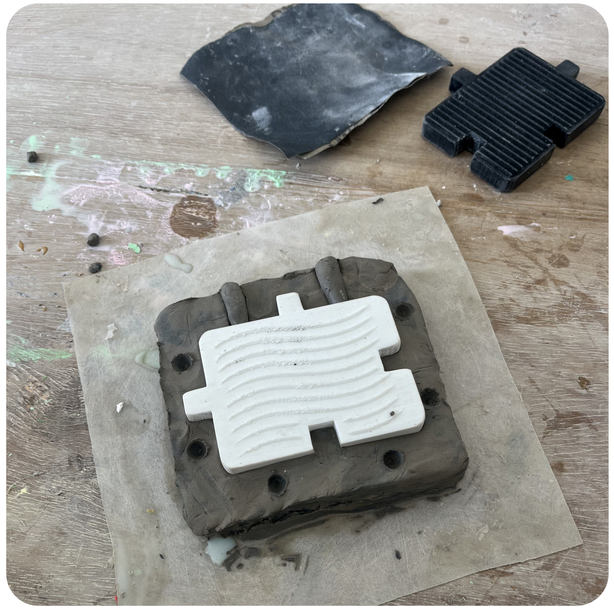
Undercuts: Form of the pieces are restricted to be 2 part injection moulded, initial idea of clip and bar system was disregarded.



Casting and moulding

Casting

After 3D printing my design, I sanded it down in preparation for the casting process



Using clay and my 3d print, I moulded the shape of my design, adding pour holes and key holes to ensure the plaster mould locks together.

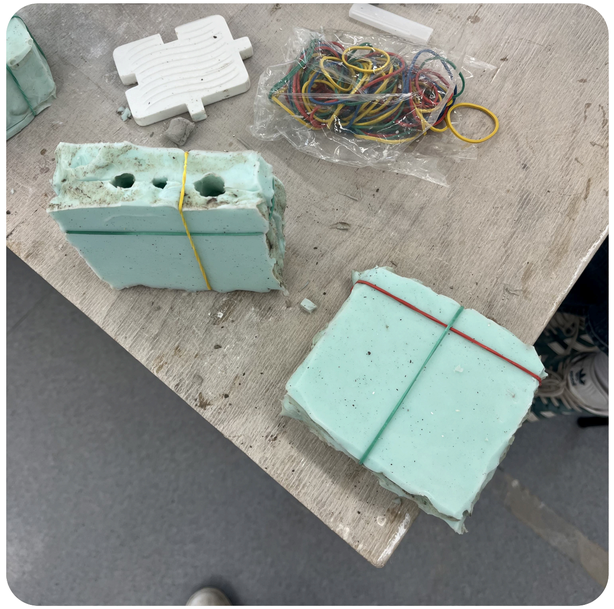
A wall was created around the clay model and plaster was poured in to set.

It was then put into a pressurised chamber to ensure there will be no trapped air bubbles

Casting and moulding

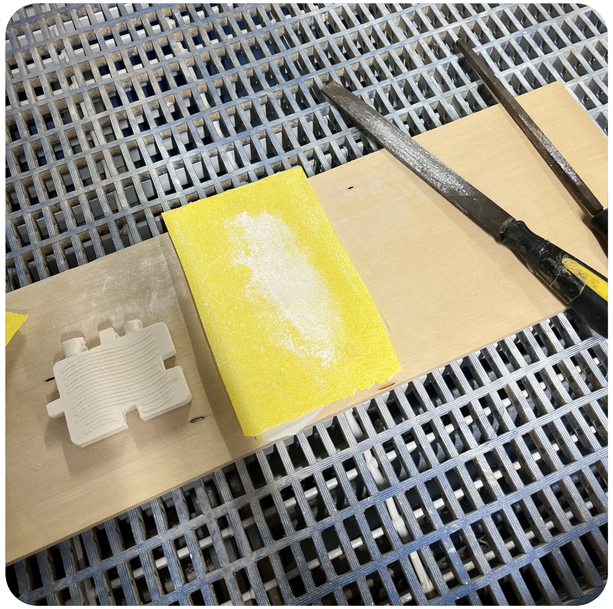
Moulding

After the plaster has set, I removed the 3D print and cleaned the plaster mould



I then assembled the plaster mould together, using rubber bands to ensure there would be no leakage

Using the pour holes on top, I slowly poured jesmonite in, filling the plaster mould up then placing it in the pressurised chamber once again



After the jesmonite has set, I removed the moulded piece and sanded it down with a metal file

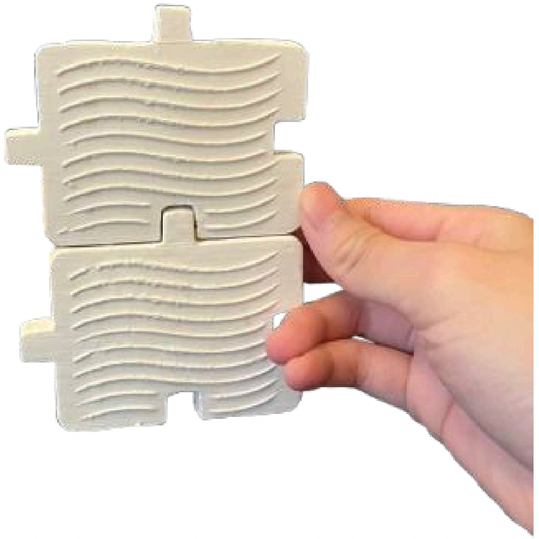
Issues in casting and moulding

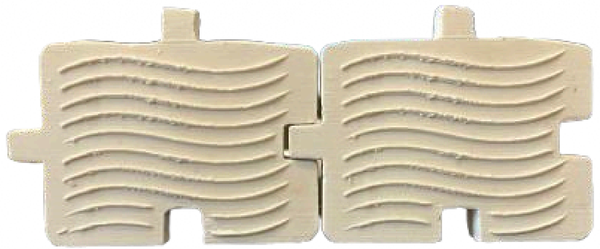
During the moulding process, I encountered numerous issues.

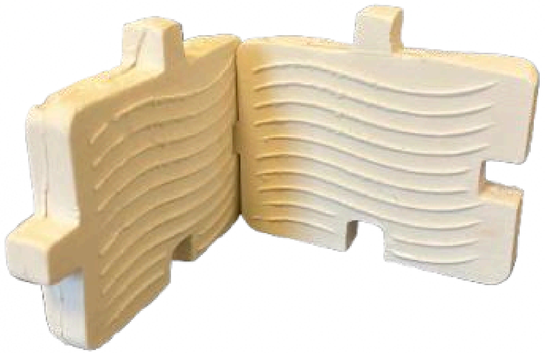
The first few attempts were unsuccessful, with the designs only being partially formed or developing holes and defects due to insufficient jesmonite being poured, as well as volume reduction due to vacuum degassing in a pressurised chamber. To address this, I overpoured the jesmonite, causing pour holes to form. This made sanding very difficult and time consuming as jesmonite becomes very hard once cured. A few attempts also caused the product to expand due to pressure from the pressurised chamber.

Final product

After numerous failures and a long process of sanding, final, successful products were created







Reflection

Project outcomes

Reflecting on my final product and my design intent set out initially, my design tackles all the main issues I set out to solve. My jigsaw organiser provides a playful experience through use, whilst also acting as a functional product to solve organisational issues by creating a number of possible variations. My design also aids in mental wellbeing by providing a tactile surface for users to relieve stress and anxiety through independent use, tacking my main aims for this project, specifically in embracing the idea of “finding the fun in the mundane”.

Key learnings

Through this project, I have developed a stronger understanding of 2-part moulding processes and the importance of draft angles, tooling points and other tooling constraints. I have also learned the importance of material selection and how different materials can greatly influence performance, cost, and production methods. Furthermore, I have also developed my skills in CAD modelling and prototyping with materials beyond cardboard and foam board, utilising laser cut and 3D printing and working out specific tolerances needed for an accurate design.

Development opportunities

Upon reflection, I have noticed areas I can improve upon my design. More variations of organisational tools can be tested within my product to show wider versatility. Further clarification, such as a building guide, could be added to show my product’s intent, and tactile surfaces can be refined to enhance sensory feedback.