

Polymat

A discrete grip assistance aid to help stabilise sliding items in the kitchen.





The Polymat is a multi-use silicone mat to be used in sinks and elsewhere to provide grip and stability for people with partial physical impairment whilst washing up and completing other tasks made difficult by items sliding around.

It provides desecrate friction in an appealing form to help users, in some small way, adjust to a new lifestyle with onset or sudden loss of previous physical capability.



The irregular, textured surface is aesthetically pleasing and effective at stabilising items placed on it.



Accessories can be added to raise the washing surface higher for access.



Heat and pressure resistant silicone rubber makes it versatile outside the sink too.



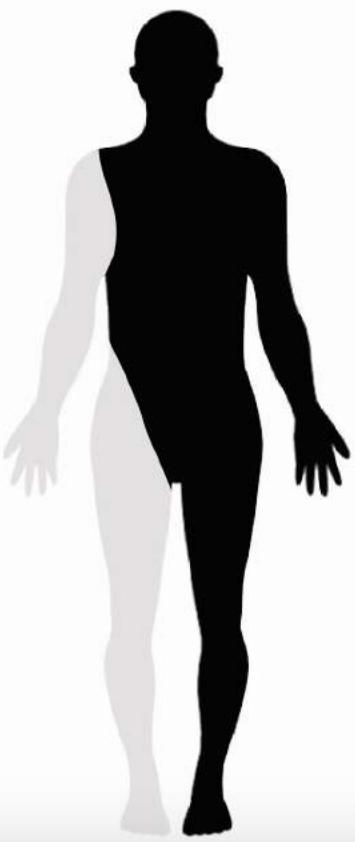
The long adjustment

From other research I discovered that only 17% of people who have a classified disability are born with it and that many people find transitioning to new lifestyles difficult.

Many assistive technologies and gadgets are already available but people are often put off by cost and the stigma they see attached. Why buy an expensive modified product when the one you already have requires only small modification?

In addition there is a massive correlation between age and disability / impairment / long term illness.

My chosen design direction focused in on this area of onset impairment, specifically the issue of food preparation and items sliding about while in use.



Alex

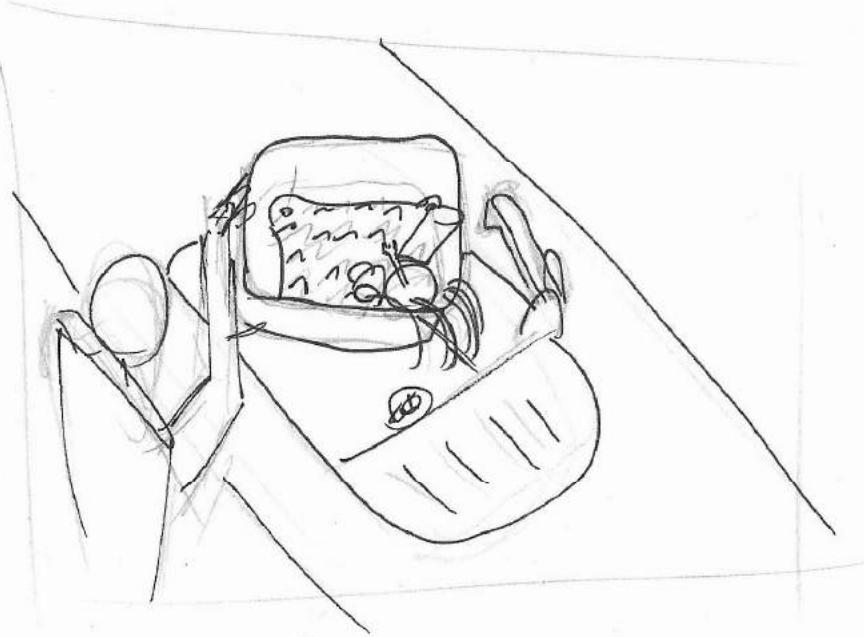
This is Alex, a work associate of a friend who collaborated on this project. Alex was born with Cerebral Palsy and can only use the left side of his body.

His condition is similar to Hemiplegia (also known as unilateral paresis, a weakness of one entire side of the body) and is exemplary of a range of common physical impairments that come with age or as the result of an injury.

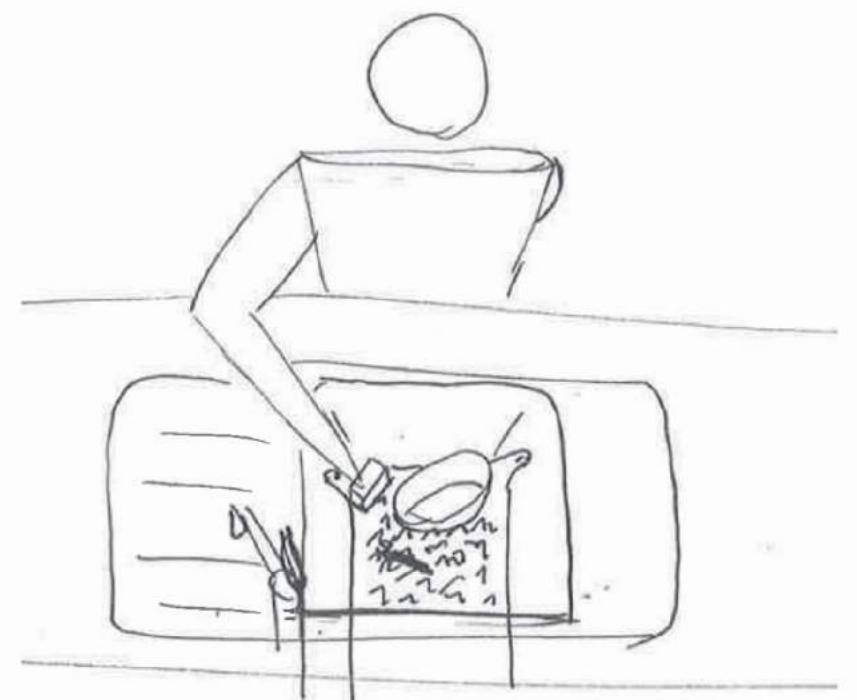
Some key insights we came up with were:

- Partial use of body creates great difficulty lifting and reaching things at various heights.
- Such problems are compounded by lack of one-handed items, handle-less items and hot items.
- Embedded ceiling lights pose real maintenance issue.
- Manual washing and using a dish washer is very difficult and sometimes not possible. Alex requires help washing dishes.

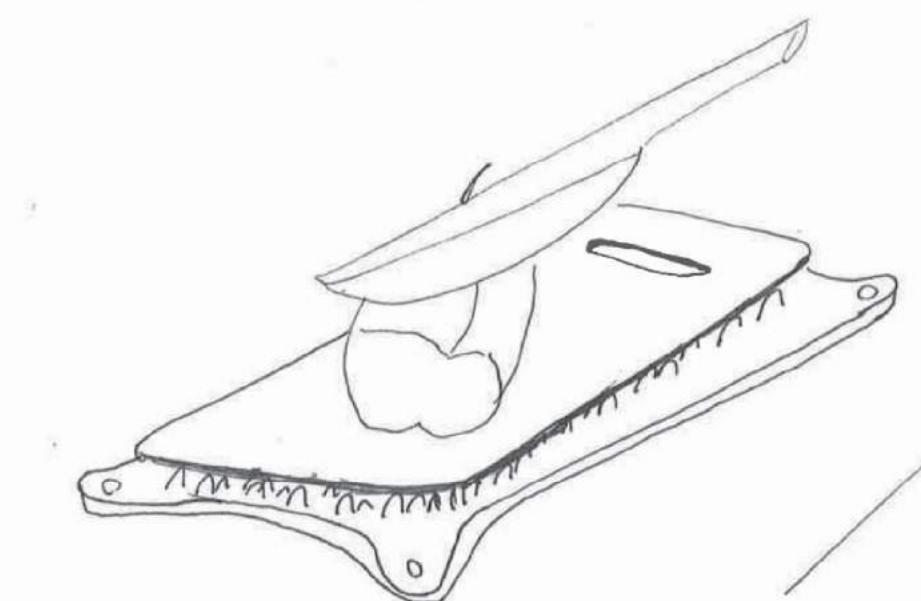




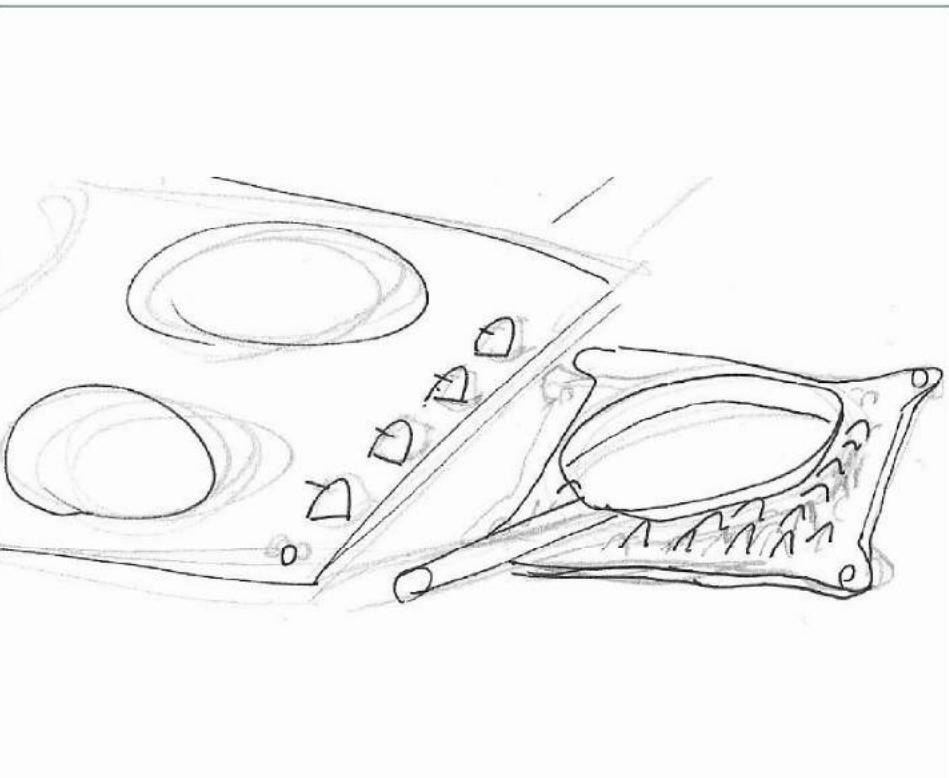
The user (Tylor) has recently broken their arm and can only use one hand. Tylor has bought a [NAME] to help with food preparation. [NAME] grips items in the basing while Tyler empties it.



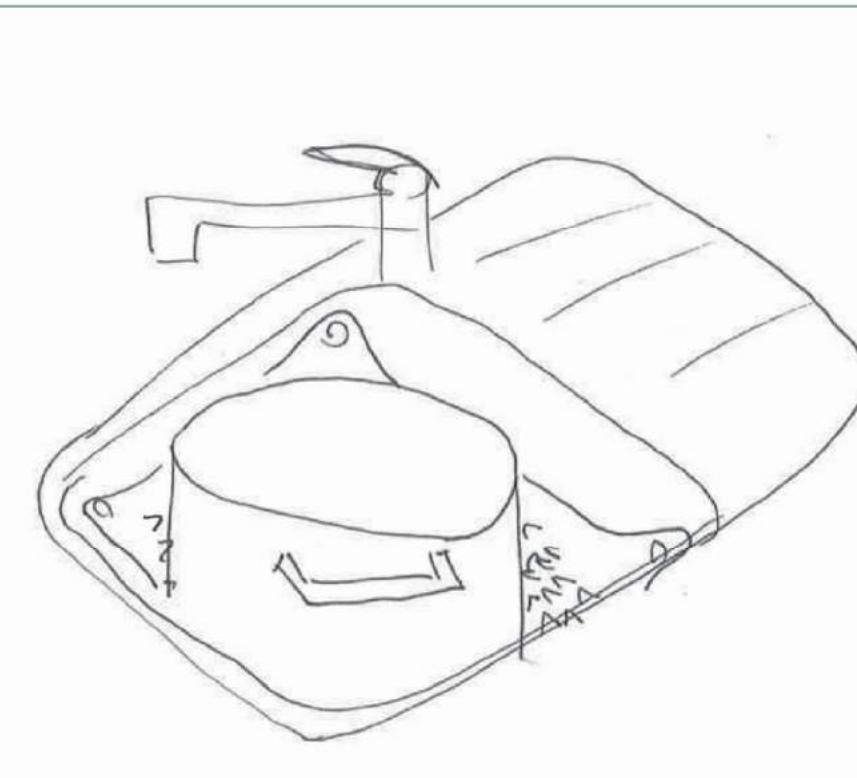
Tylor fills the basin with fresh water and is able to wash items one handed thanks to the grip provided by [NAME].



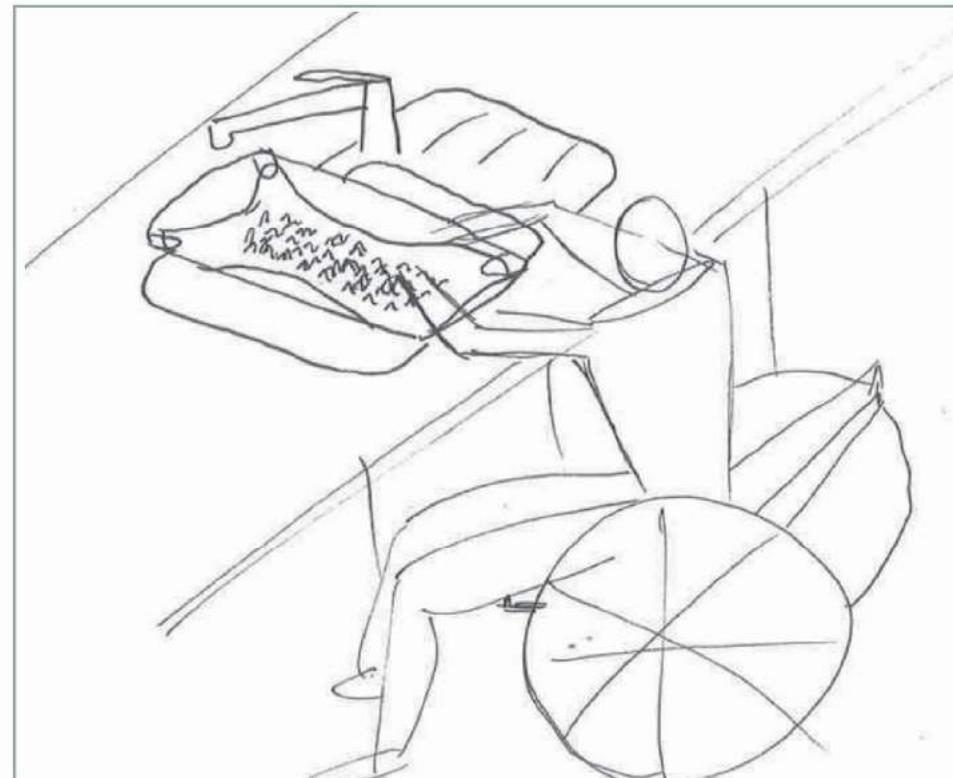
Tylor uses the smaller sized board to stabilise their chopping board, as its more versatile than buying a new, non-slip chopping board for only a month.



Later on, Tyler uses the same mat for holding a pan as it will be more stable is knocked than on a flat pot holder.



When washing items again, the curved nature of the larger mat means that any pot or pan that can fit in the sink basin can be held by [NAME].



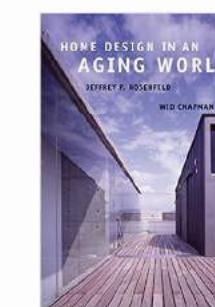
Tylor's friend, who has difficulty bending over and more impaired use of both arms, visits so Tyler installs the basin mount to bring items closer to reach and provide even more grip. This also allows easy rinsing due to water run-off.

Personal Observation

- Space management solutions are often inefficient for quick access.
- Worktops often have a lot of 'dead space'.
- The kitchen has evolved beyond being solely a place for food preparation.
- Even minor mental health issues can greatly affect ability to use a kitchen.

New Aging Book

- Social connection and independence are of utmost importance as we age.
- Being active is greatly important and can mean doing small, simple tasks.
- People approach new systems with the anticipation of error.
- This book is not very good.



Home Design in an Aging World

- There is a global shift towards less rigid social structures and independent living for the elderly.
- People often avoid assistive technology because of cost and stigma.
- Onset dementia can be mitigated by 'directional design'.
- Community engagement can be balanced with the need for independence through design systems.

HM Government Website

- There is a very large correlation between age and disability.
- Many disabled people feel a lack of independence and control.
- Few disabled people are born with their disability, most have to deal with an adjustment period.



Collective Kitchens Quebec

- There is great economic and social value in collective cooking.
- Collective cooking facilitates mindful eating and community engagement.

Key Research Insights

Blog Posts, Form Discussions

The Kitchin.com

Cooking Manager.com

Life Disabled.com

- Often using items off the counter is easier than on.
- People frequently modify technology rather than buy a modified device.
- Operating wheelchairs poses a cross-contamination hygiene risk.
- People often store items by keeping them out on countertops.

- Dishwashers are often too difficult to use, making them redundant.
- Often wheelchair users will work on their laps where handling multiple items can be an issue.
- Many items require two handed use but need not be designed this way.
- Mindfulness and pre-planning are imperative.



Insights

-Hygiene issues arise from using a wheelchair when cooking due to cross-contamination.

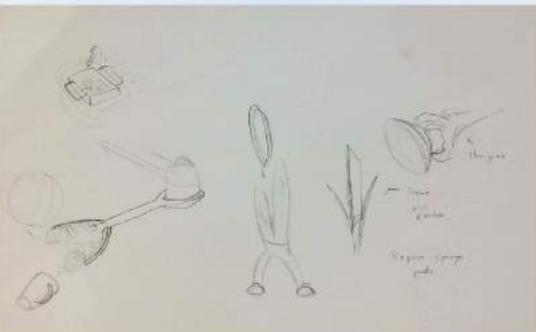
Ideas

A self-sterilising material to cover the handle grips.



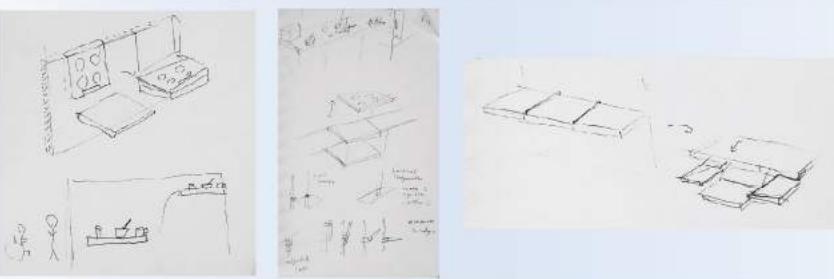
-Washing machines are often too difficult to use that people do not bother.
-Dishwashers can only be used if filled to sufficient capacity.
-When working in a confined space, being able to quickly wash a few items is imperative.
-Washing one handed is often difficult, a motion of rubbing an item with a sponge is often best.

A method for fast, immediate, one handed washing while in the food preparation stage.



-Height of counter tops is often an issue. Height adjustable workspaces exist but are expensive and seen as 'for disabled'.
-Countertops have a lot of 'dead space' with machines, hobs, working items etc.
-Many people use worktops as space storage.

Active countertops, fold away, slide about and replace cupboards.



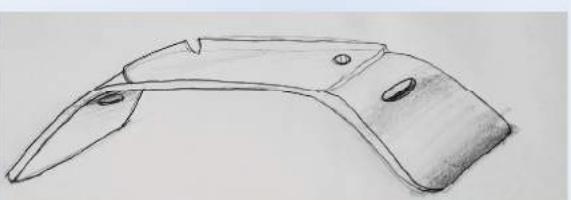
-Dementia often requires 'directional design' where physical direction is important to retain user on task.
-People use but are ashamed of safety systems.
-Learning new recipes and kitchen management often takes up mental energy.
-The kitchen is a social space.
-People approach a new system with the anticipation of error.

Universal 'Alexa' type assistant to monitor, advise and assist users at their will. Can double as a social 'window' and space management system.



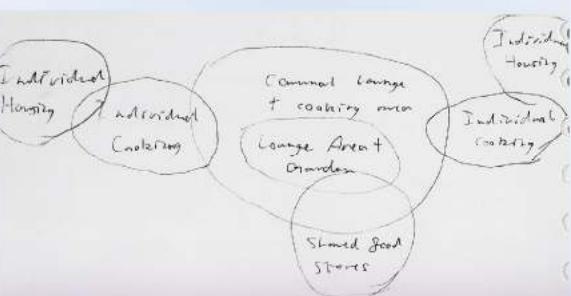
-People often have difficulty moving items about.
-People often use items on their lap which would normally be done on a worktop.
-Need for self-determination is high where physical disability is concerned.

Multi-use tray for processing and moving items.



-There is great economic and social value in social cooking.
-Motivation of social cooking encourages people to cook and eat more mindfully leading to better health.
-Collectivising resources can stave off the effect of austerity.
-With age, a primary risk is detachment from community and socialising.
-Community engagement while maintaining independence is best achieved with self-sufficient housing clustered around a community space.

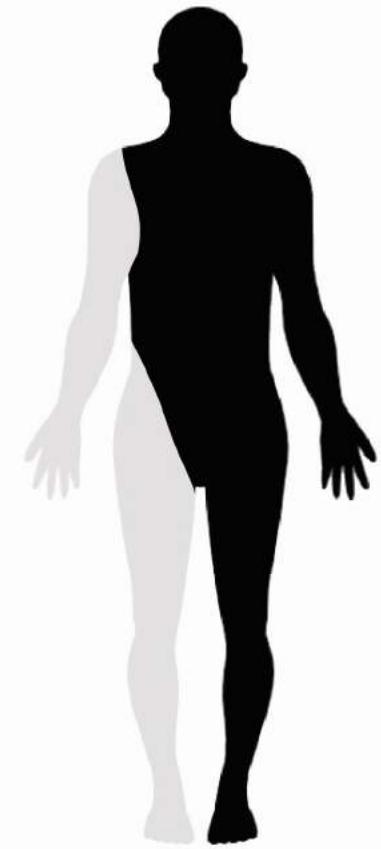
A community cooking space / kitchen garden attached to private kitchen facilities to facilitate community cooking where desired.



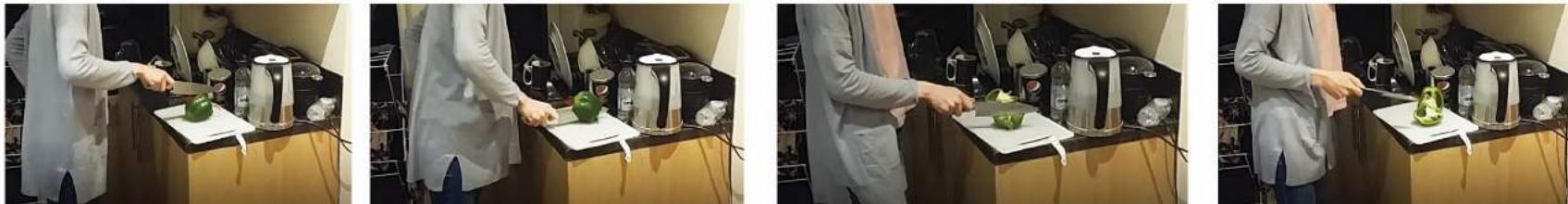
It is said that 'All of us are disabled at some point in our lives'. Adjusting to a new lifestyle, new (and impaired) capabilities and the social stigma associated with it can be a real struggle.

Through my work with Alex, we discussed at length how even minor impairment can greatly affect operating in a kitchen and how, in an ideal world, the solutions to these problems would be embedded in existing technology.

I wanted to create something to give people back some of the capabilities they had lost or may lose as a result of onset impairment, long term illness or age. We focused in on the issue of things sliding during food preparation, adding a layer of difficulty to tasks such as chopping vegetables and other tasks near impossible.



Due to distance, in person observation was not available but I did perform a 'day in the life of' where I prepared meals using only one hand, this gave me detailed insights (all be it from an outsider's perspective).



Chopping food was ok but the food would jump about while the chopping board slid under the force from the knife.

Improvised solutions to hand drying posed hygiene risks.

Plastic bags and packaging became an issue.



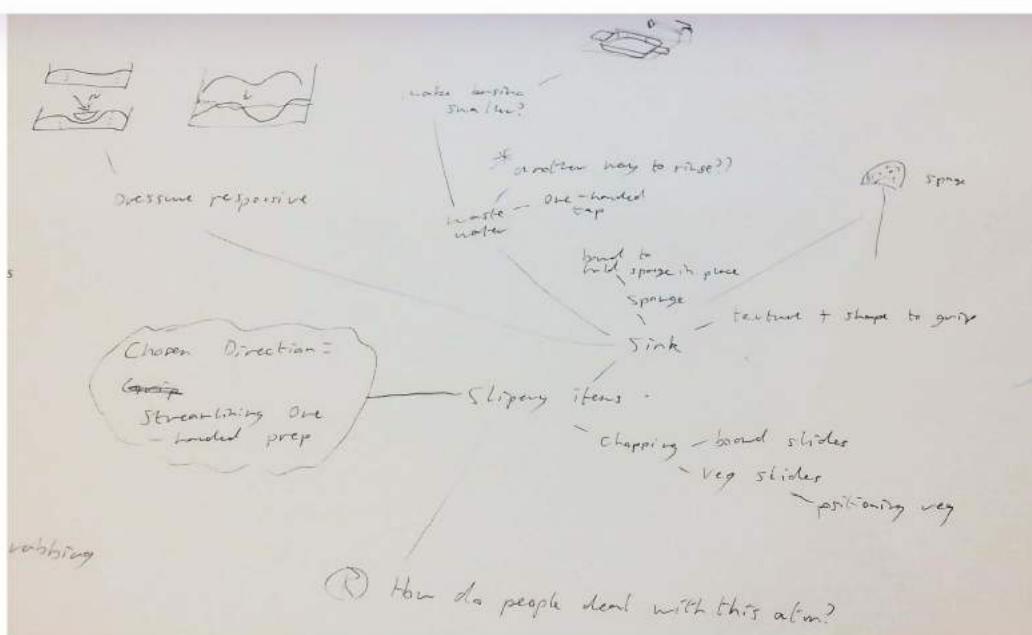
Alex has cerebral palsy but his condition is similar to Hemiparesis; partial or entire weakness of one side of the body. He can walk short distances without a walker and can do most tasks while others are impossible.

While operating with impaired movement or one arm only, washing most items is very difficult with some items such as bowls and cups being impossible.

Alex explained that washing machines do not provide much of an alternative due to not being able to bend much or position items; he gets help with washing dishes.



This sheet tackles the issue of items sliding about during food preparation.

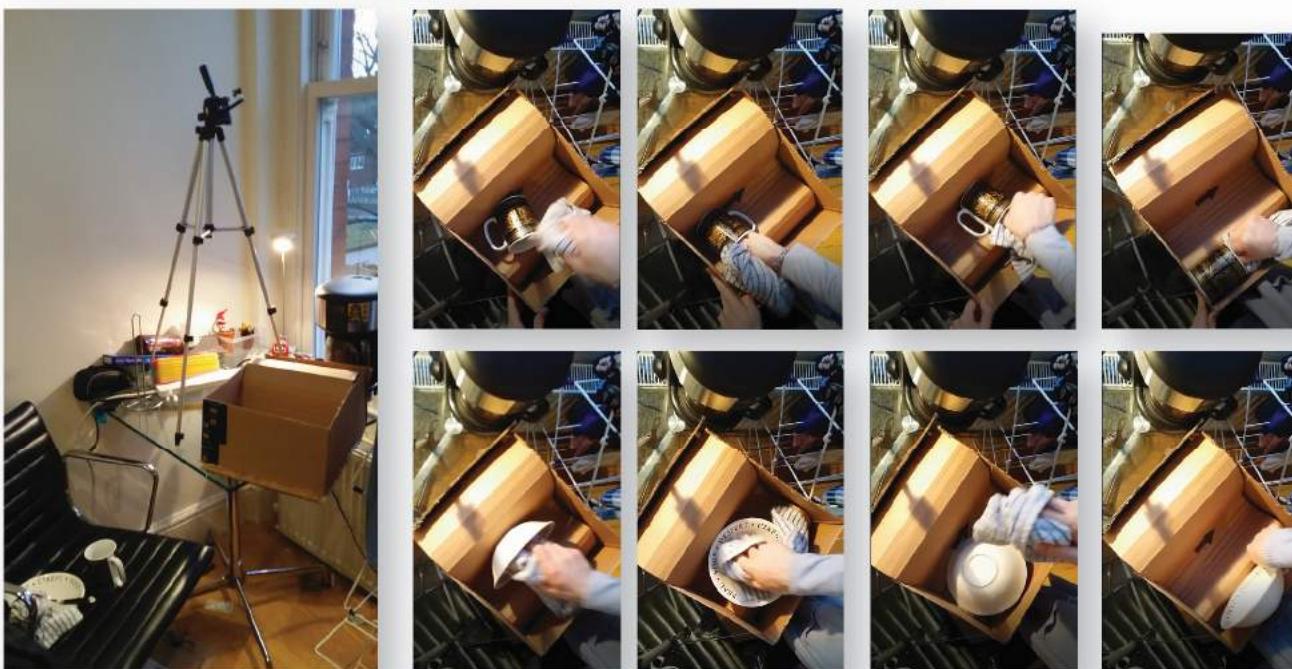


I began by considering the complexity of the issue, trying to pin down a solution to the issue of sliding objects.

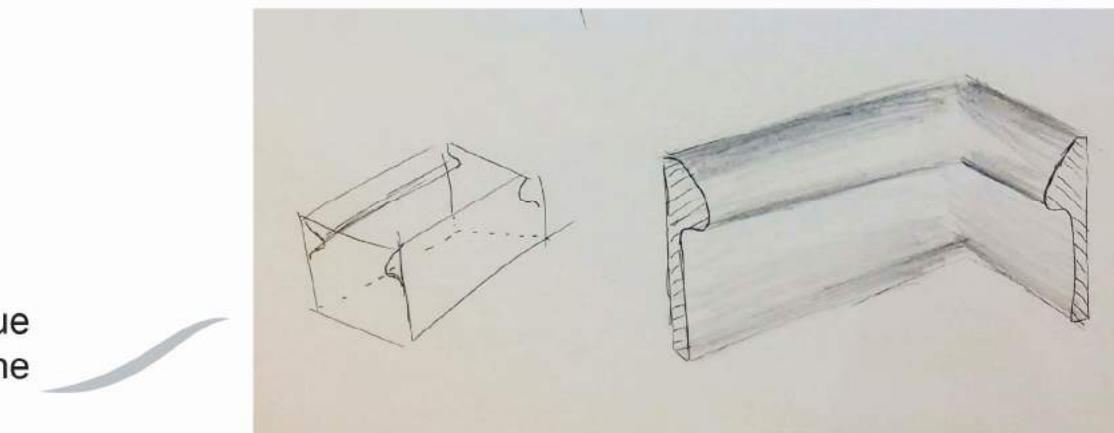
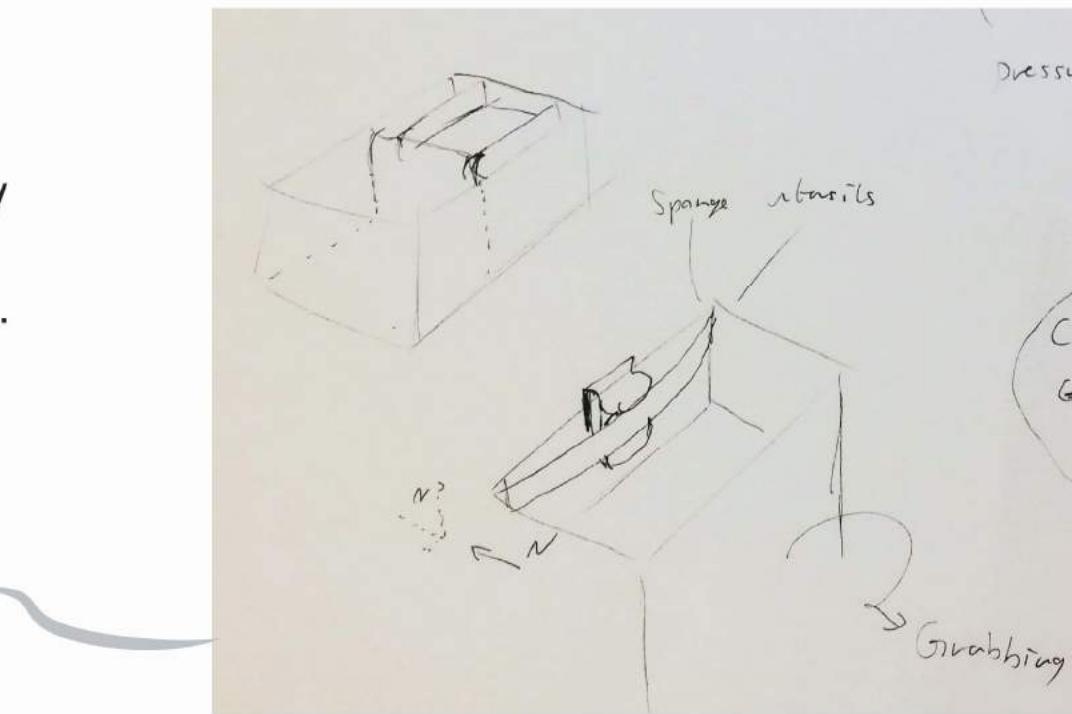
I considered designing a new way to prepare food and wash dishes but, after discussion with Alex, decided to take a more direct approach.



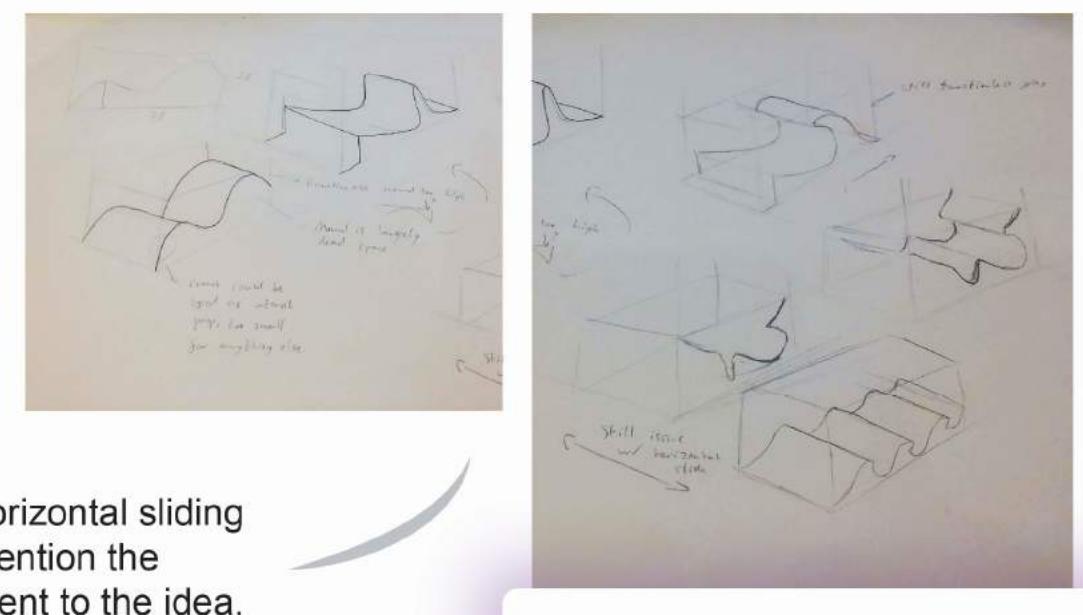
During my research it became evident that washing dishes was the area where this issue became most inhibiting, so I focused in on the sink, attempting to make a shaped basin to provide more ability to position objects.



In my first tests with a sketch model, I discovered the ribs on corrugated cardboard provided excellent, non-intrusive grip.



There was still the issue of horizontal sliding and material choice, not to mention the greatly reduced volume inherent to the idea.



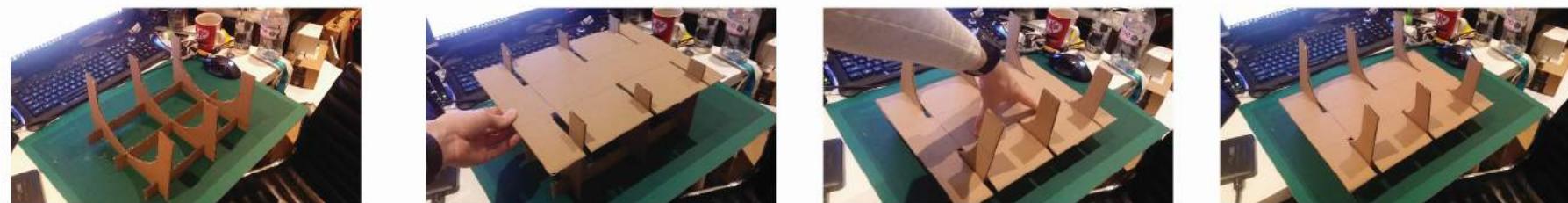
Chosen Design Direction

This sheet develops the idea to a new responsive basin design.



Noting the issue of volume being wasted, I wondered if it might be possible to make a 'responsive basin', that is, a basin that varies how much grip and volume are available based on user input.

I created a proof of concept sketch model to show how extrusions could be revealed in response to increased pressure from the user.



I was inspired by the 'Growth' plant pot by Begum and Bike Ayaskan and how it responded to the changed volume of a plant by expanding.

I worked with similar geometric forms in my 6th year Art and Design work and wondered if some of my old research could be repurposed.



Begum and Bike Ayaskan's Growth plant pot



Jackson, P. Folding Techniques for Product Designers.



A sample of relevant research from Advanced Higher Art and Design (high school)

I dug out some relevant research and focused in on this collapsing polygonal pattern.

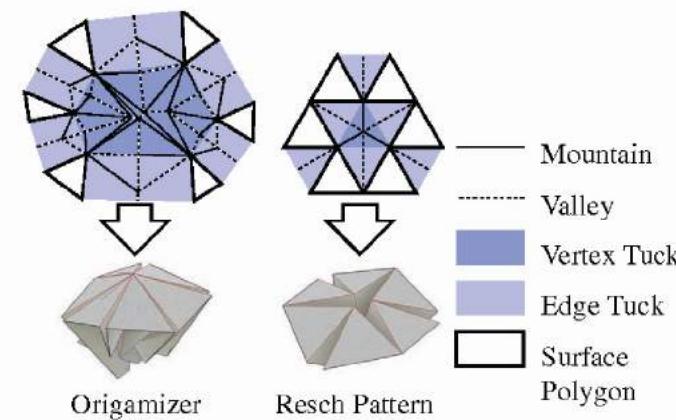
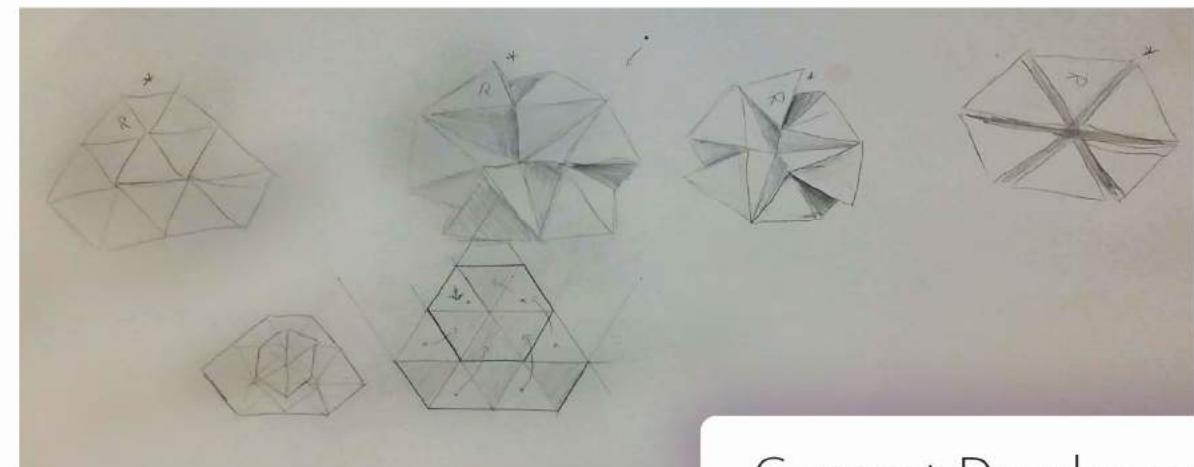
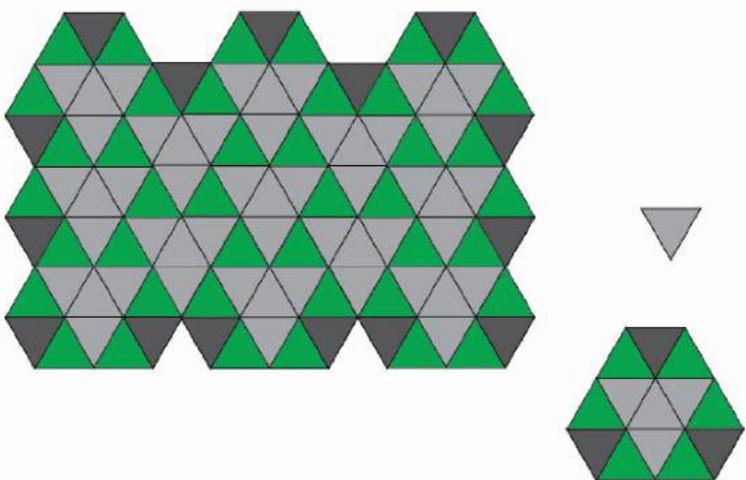
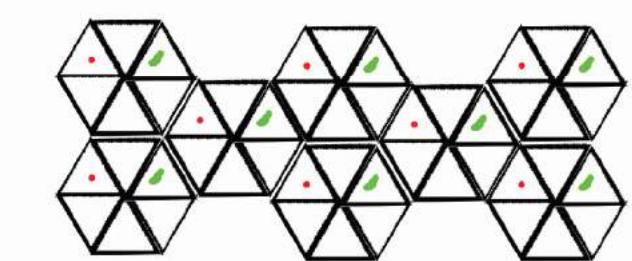
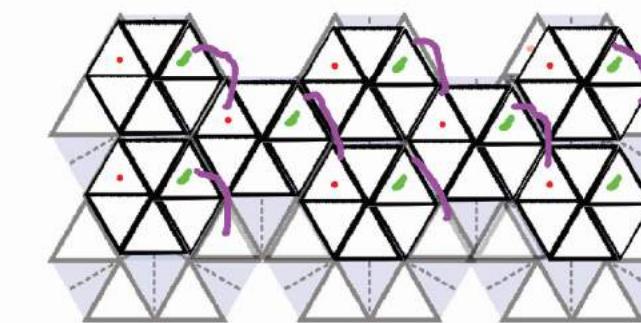
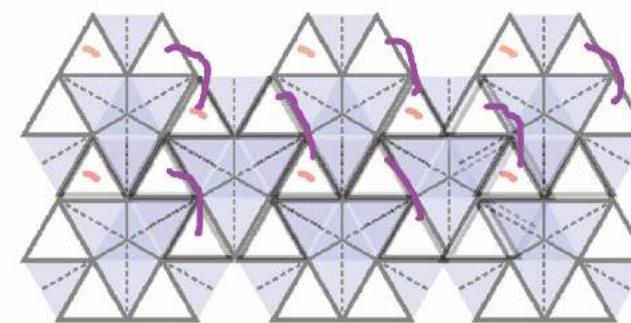
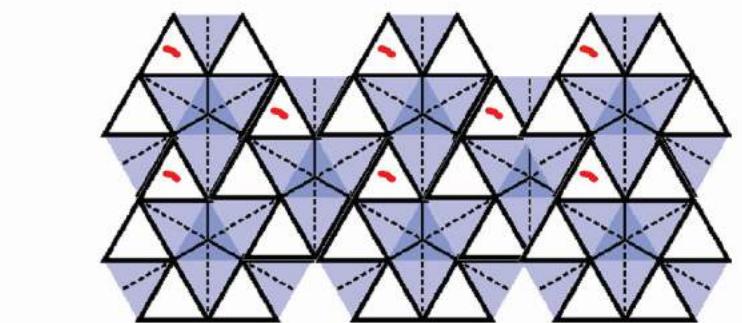
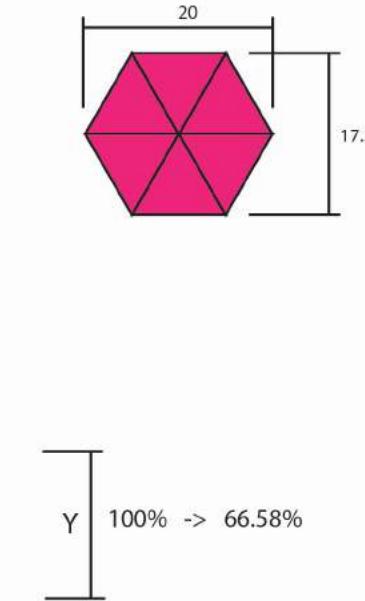
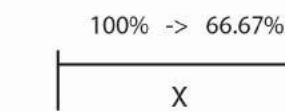
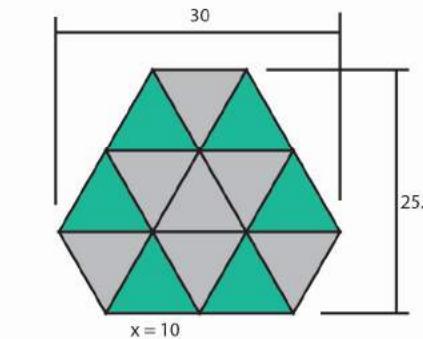
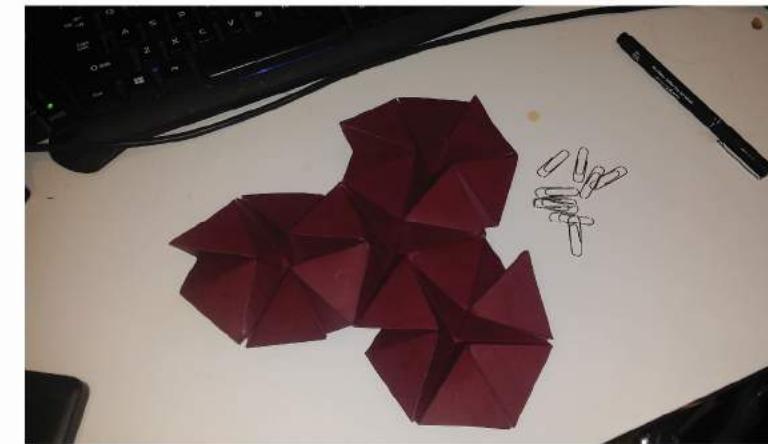
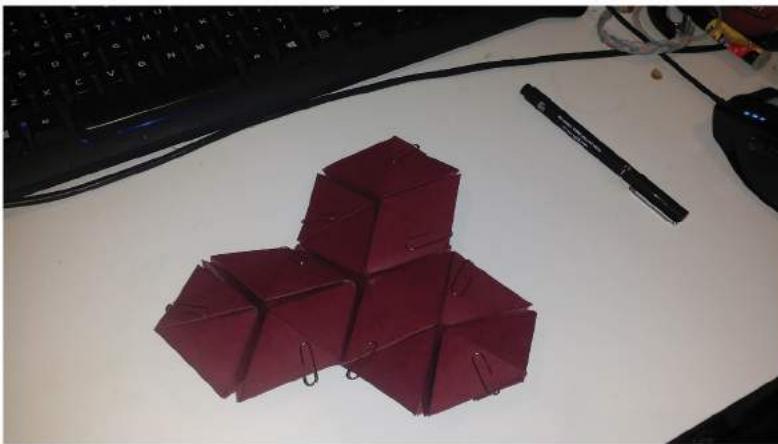


Image Source: www.semanticscholar.org

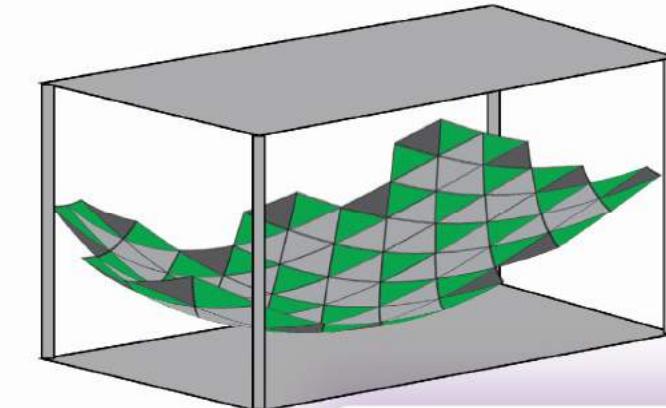
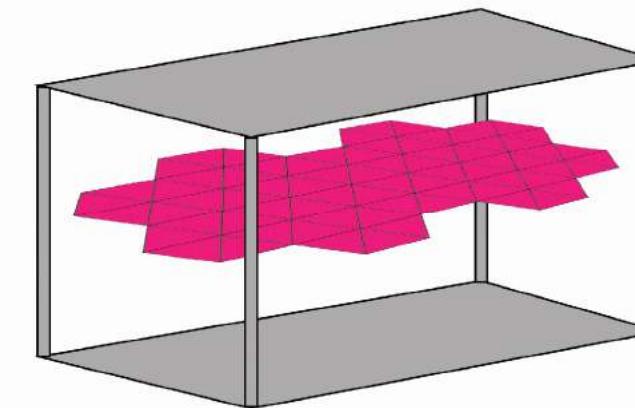


Concept Development

This sheet details exploring the folded shape found previously

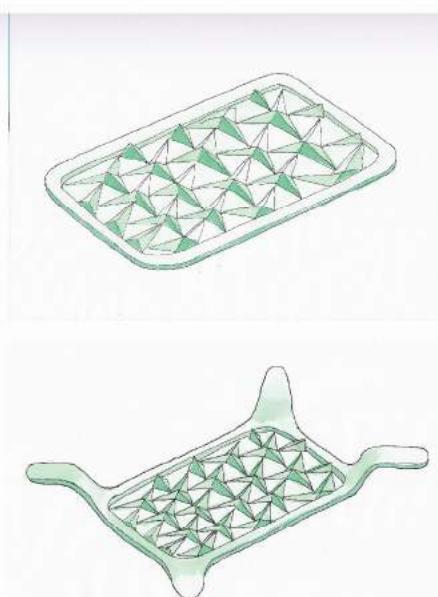


A rough idea was digitised to decide a way to create a sketch model to test with.

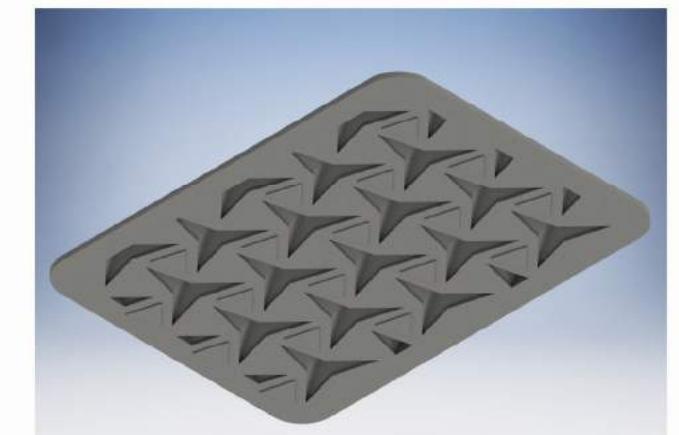
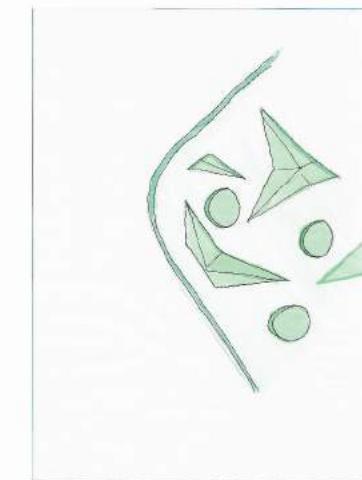


Responsive Design One

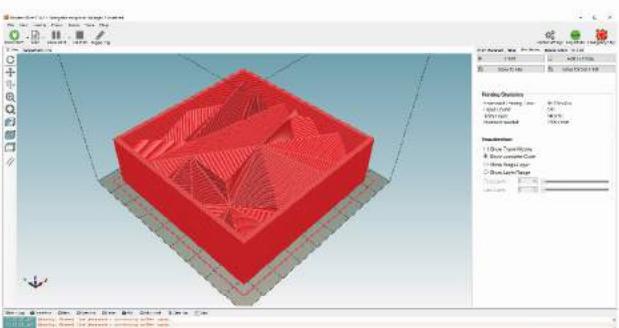
Changing the folding shape and testing.



Upon testing, the shape was deemed to intricate to be properly functional with a sheet material, instead it was partly flattened and changed from an entire basin blow to a mat insert.

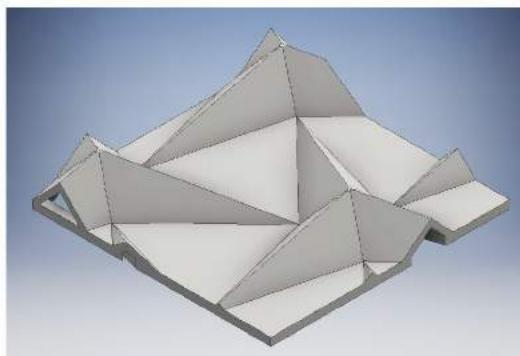


Underside Sketch + Render

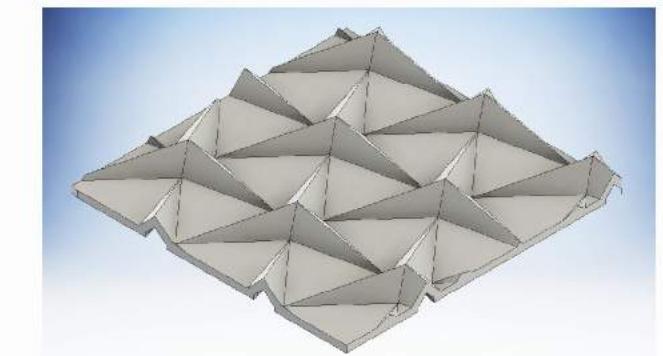


To test this shape in its new, partly static form, I created two samples at different scales via 3D printing and casting RTV silicone rubber (T28).

Scale 1 : 1

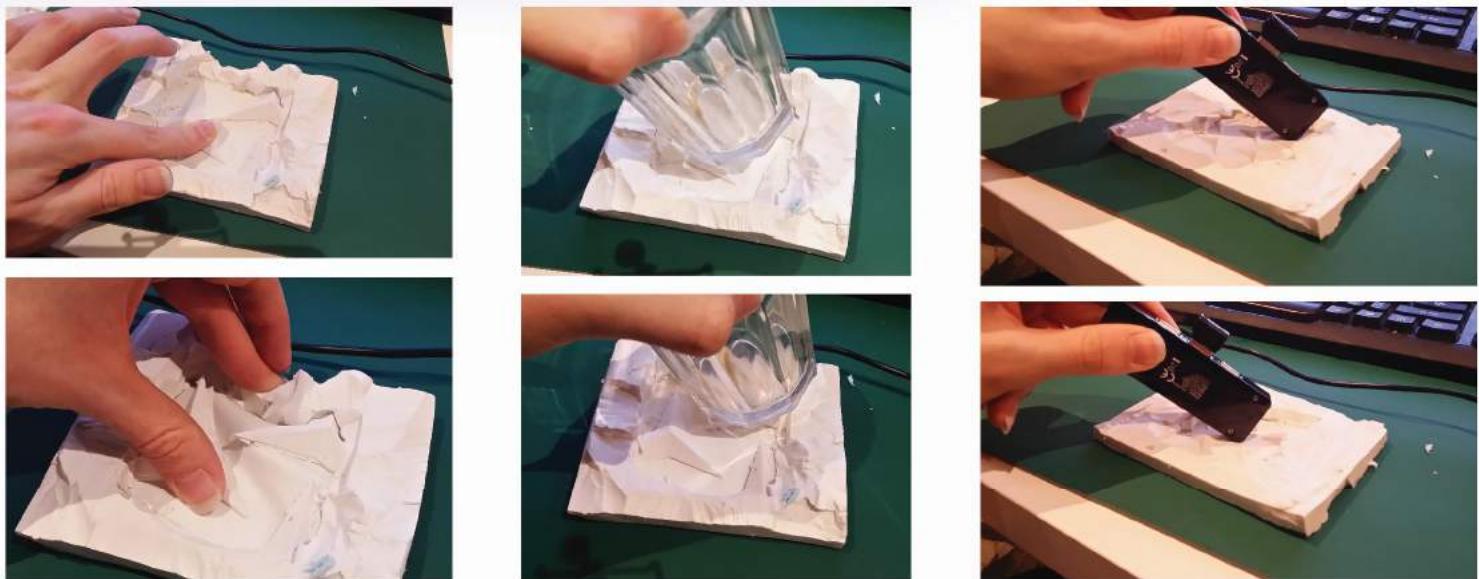


Scale 1 : 1.75



Responsive Design One

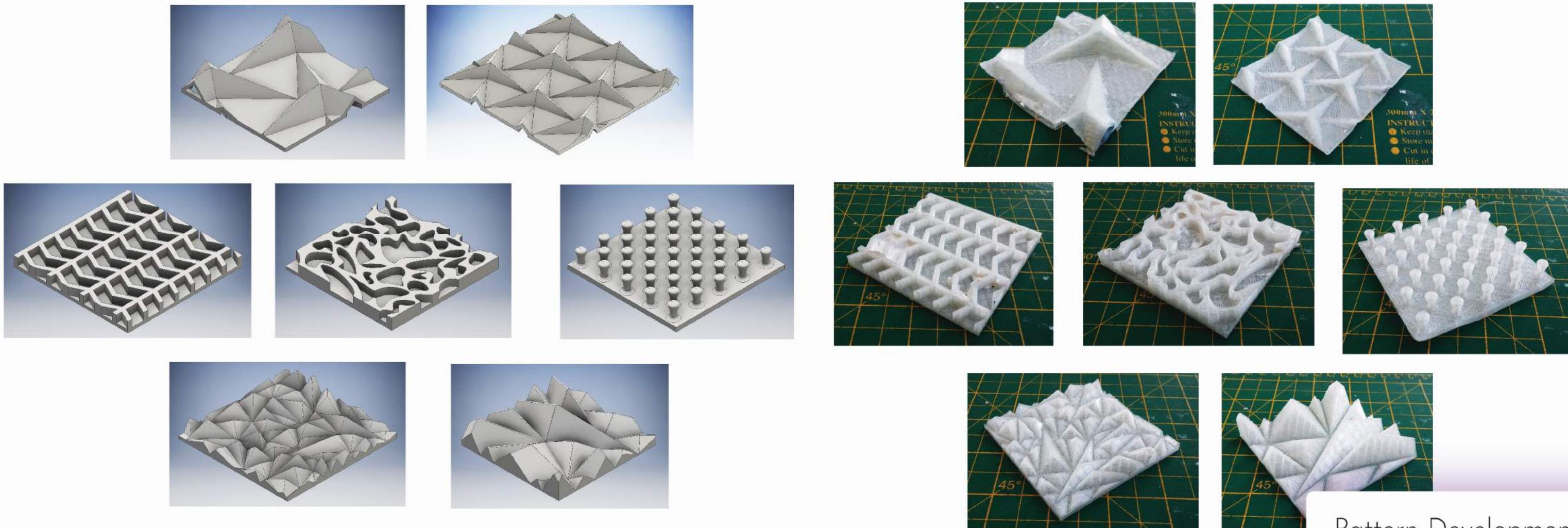
Further refinement of the pattern and new samples



Upon testing the silicone samples I realised the shape provided too little surface area, not enough height and not enough variation to provide sufficient friction.

Upon applying pressure objects would either slide over the top or the shape would buckle and fold into itself.

I developed a new batch of samples including refinements made to the original shape.
These were similarly rendered, printed and casted.

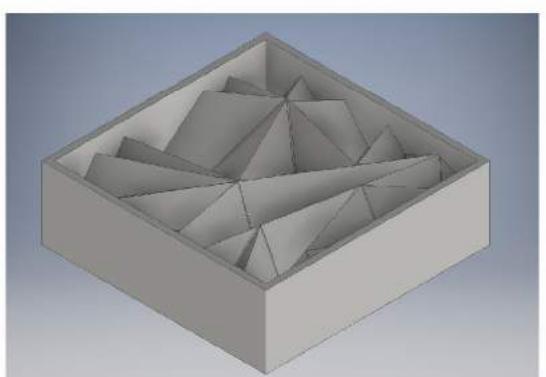
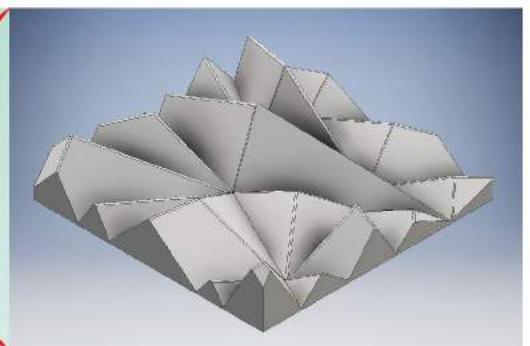
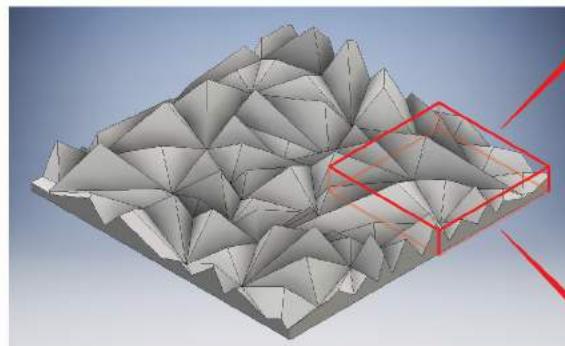


Pattern Development

Testing the samples and finalising a chosen form



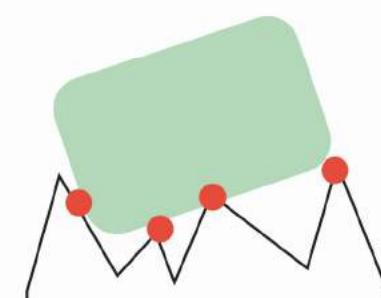
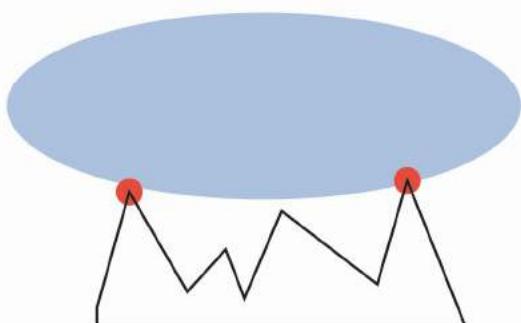
Upon analysis the shapes showed an interesting array of qualities but many suffered from being too flexible and others from not providing enough height variation.



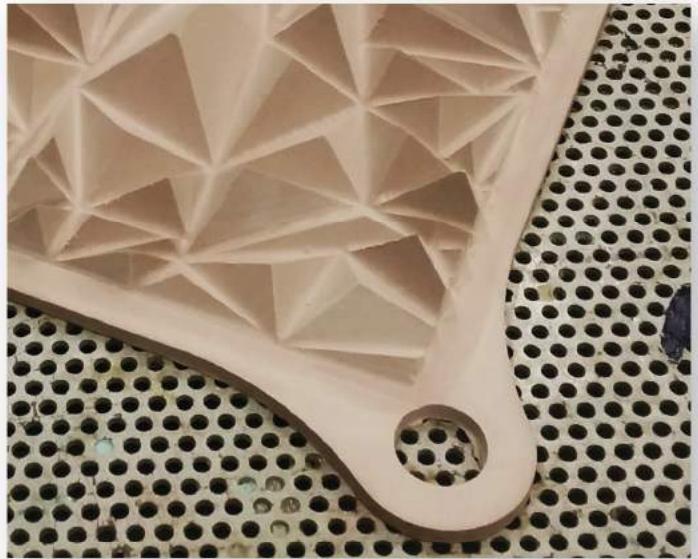
This pattern employed a semi-irregular mountain like structure to provide a wide range of angles, heights and volume with negligible 'flat space' in between.

In addition the pyramidal slopes provide variable resistance depending on input force as desired.

The material was tested in 1 and 0.5 scale and proved more than suitable for the task.



Lastly some additions and final refinements were made to the design.



I realised that there were still height concerns and so I added considered a way to suspend the mat in the air optionally.

Small loops were added to each corner to attach accessories. This was done in conjunction with creating a frame mount to suspend the item in the middle of the sink.

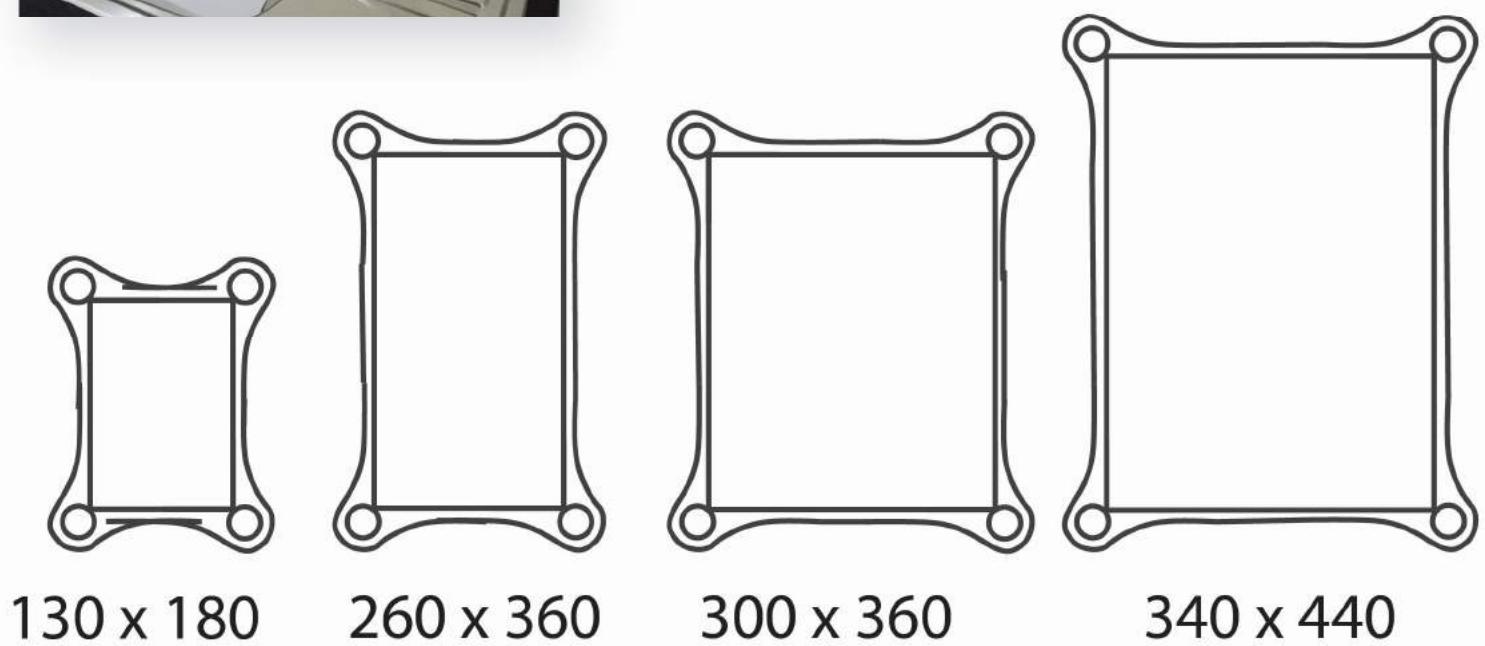
The loops could be utilised for other accessories or home-made modifications as the end user sees fit.



I designed the mat around an average size domestic UK sink but had to modify it to accommodate not only different sized sinks and worktops as well as use cases.

Some users may prefer to use the device curved around the basin while others may prefer a smaller, more contained mat.

I decided on four sizes, shown at 16% scale here, based on secondary research and sketch modelling.



The product is comprised entirely of NSF 51 compliant silicone rubber created via compression moulding to achieve even material density.

Silicone Rubber is produced from by products from petrol-chemical manufacture making it damaging to produce but was deemed the only currently viable option to achieve the properties necessary and is biodegradable.



Sample products in target material,
marshbellofram.com



The design uses a semi-irregular triangular pattern to provide grip to a range of items while the hexagonal underside pattern stops it sliding while in use.

A range of colours and sizes are possible to manufacture, sizes include:

340 x 440
300 x 360
260 x 360
130 x 180

