



L U K U

**Building
Through
Motions**



Designing indoor play artefacts based
on children's full-body movements
and their interaction with objects

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Abstract

LIKU: Building Through Motions project explores the method of designing that is born through children's performative body movements. It is an attempt to combine child culture design with elements of bodily movements found in the performance art field.

This project addresses the lack of movement-based play done by children in indoor environments. The widely-known perception today is that children commonly engage in quiet, sedentary play while staying indoors such as playing with building blocks and drawing, whereas they play more actively in an outdoor environment. (Sandseter, Storli, Sando 2022).

In some countries where outdoor play is more restricted because of the lack of space and/or safety reasons, playing indoors becomes the main option for children. The existence of indoor playgrounds allows children to have physical play while being indoors. However, the play situation presented by these indoor playgrounds is a predetermined play, where play structures are made to accommodate certain play activities. As a result, even though the body movements aspects are fulfilled, children lack the ability to nurture their own play culture.

Facing this problem, the project aims to provide affordances for children to do full-body movements play in an indoor context with the use of designed objects, which is framed with the research question:

How can indoor objects encourage full-body movements and free play interaction?

This project starts by investigating the myriad of possibilities a child's body can both influence and be influenced by objects within an indoor spatial context. It is then connected to the exploration of the design of objects that accommodates such movements and in return, allow children to said movements.

A designed object will be the outcome of this project that creates the full-bodied action capacity of children's play while also promoting free play that let children decide how they want to play, giving children the agency to decide what kind of active play they can do with it.

Keywords: Indoor environments, full-body movements, free play

Chapter I

Between Spaces, Movements, and Free Play



This chapter covers the literature reviews that explain the background and context of this project, where three keywords thrive: indoor spaces, full-body movements, and free play. At the end of this chapter, a research question comes into shape.

The Tendency of Indoor Play

For children, play is something ubiquitous. It can happen everywhere, be it inside a house or outside in a park. But considering the two contexts to be contrasting environments, what differentiates between indoor and outdoor play? Outdoor play is often associated with active, physical play (Lee et al. 2015), while indoor play is associated more with sedentary play (Sandseter, Storli, Sando 2022). Being indoors, children generally face more spatial restrictions compared to outdoors, which also shapes the perception of how children are expected to move less in an indoor environment.

A study done by Sandseter, Storli, & Sando (2022) investigates the kind of play children do in ECEC (Early Childhood Education Center) indoor spaces in Norway, in which they categorise the play into three types: physically active play such as running and jumping or “functional play”, “constructive play” which defines as building play activity with various material such as drawing and painting, and “symbolic play” which also mean imaginative play. The result of the study shows that children in ECEC engage more in constructive play, with tables and chairs being the main space that bears this particular type of play.

On the other hand, physically active play (functional play) in indoor environments took the lowest percentage compared to the other two types. Of course, other factors influence the study's result such as how a pedagogical space is usually a confined space with limited size and is furnished by play tools that leads to also a limited kind of play activities. Nevertheless, the study manages to show that children engage less in physical, full-body play and more in seated play while being indoors.

Bringing Full-Body Play Indoor

In recent times, children's outdoor playtime is declining and they spend more time indoors (Sandseter, Kleppe, & Sando 2021; Kemple et al 2016). Since outdoor play is tightly connected to the time when children are physically active (Lee et al. 2015), it could be said that children's opportunity to conduct full-body play is decreasing. I use the term “full-body play” to define the physically active play that involves the whole body (refer to “functional play” based on the study mentioned in the previous point).

It is not something new and several approaches have been done to tackle this issue. I would like to name a couple of measures that have been done to bring full-body play into indoor environments:

1. Indoor Playgrounds

Coming from Jakarta, the capital city of Indonesia, which is regarded as a densely populated metropolitan city, I am used to seeing children do their whole play activity, from the sedentary to the full-body play, in indoor environments. There are only a few occasions where children in Indonesia's big cities have a chance to play outdoors, for example during their playtime in preschool where tight adults' supervision exists. The lack of outdoor play in big cities is caused by urban risks (Pimenta 2010). In Indonesia, some of the reasons are the absence of open space within cities' urban planning and the increasing traffic of motor vehicles.

Subsequently, playgrounds, which originated as outdoor play spaces, are brought indoors and surge in popularity. In Jakarta, shopping malls, play area with gigantic slides and climbing surfaces to a variety of post-and-platform playgrounds is a natural sight; fast-food chain stores usually have indoor playground structures built beside their eating area; upper-class families sometimes have their own playground structure inside the house. During my past working experience as a playground designer, receiving clients who wanted an indoor playground built were common.

This way, despite the lack of outdoor playtime, children are expected to play actively using their whole body.



Figure 1 & 2: Indoor playgrounds in Jakarta, Indonesia

2. Indoor Gym

The second case I'm mentioning is the indoor gym play spaces, where children attend organized physical activity in a designated place. These kinds of places have grown in numbers, responding to the trend of declining physical activity among children. One of the early examples would be Tumble Tots, an institution established in 1979 by a former gymnast coach from the UK (Tumble Tots, 2018) that aims to foster children with various bodily skills.

In a way, Tumble Tots is similar to a pedagogical institution where children are divided into different classes based on age and skill. Children do their full-body play in an indoor space filled with soft play equipment and varied gym equipment made for children while following certain objectives together with adult mentors.



Figure 3



Figure 4

The two aforementioned cases have a similar characteristic I would like to point out. Indoor playgrounds, which often bear similarities with traditional outdoor playgrounds, possess the apparent aspect of prescribed play activities (Cohen et al 2023). They also have slides, climbing surfaces, or swings. Each play structure's name explicitly tells the activity that the children are expected to do: sliding, climbing, or swinging.

The prescribed play activity also exists in indoor gyms, since they have a structured program the children should follow. For example, one of the classes required the attending children to follow an obstacle course and practising their gross-motor skills such as jumps, forward rolls, and tuck hang on a monkey bar—a full-body play activity in an indoor environment.

Free Play

To sum up, I have been addressing how children lack the stimulation of full-body play within indoor spaces. On the other side, the existing stimuli tend to deliver structured and prescribed play situations.

If we compare these findings to Johnson's (2015) characteristic of play, there is a discrepancy worth mentioning. Johnson defines play to be self-directed and self-selected, open-ended, flexible, and voluntary (Aras 2016). The cases earlier lack the quality of being self-selected and open-ended, considering the predetermined play activities they pose.

There are chances where a play becomes self-directed, for example during free play. It is a term that refers to an unstructured time (Veitch et al. 2006) where children can choose the type of play they want and with whom they interact (Sandseter, Kleppe, & Sando 2021). Furthermore, free play is most often defined very broadly as the play that is dictated, initiated, and controlled by the children themselves (Sandseter, Storli, & Sando 2022; Hewes 2014; Zigler and Bishop-Josef 2006).

In early childhood education settings, ownership is left for the children to play with (Ivrendi 2020; Gronlund 2010). Adults are present as spectators, facilitators, and supporters. They will only step in as play leaders that give suggestions when children have difficulties getting the play started (Ivrendi 2020).

The study about play allows me to form an essential aspect of this project, in which I will use the term "free play". This project wants to focus on a play where children have the agency to decide how they play. Those are indeed important if we link them to Mouritsen's (2002) statement that children should be able to play naturally, which then ultimately self-produce their own play culture.

3. AnjiPlay

Playing naturally initiated by the children is found in AnjiPlay, a pedagogical approach created by Cheng Xueqin in Anji County, China. This approach embraces True Play, a play that comes from the child themselves (Coffino & Bailey 2019).

Coming from a preschool teacher's background and then moving to educational research field, Cheng wanted to change the play that was previously teacher-designed to play where children have more control. To do so, she developed large, open-ended elements such as ladders, barrels, and mats, that the children could assemble, combine, and interact with however they wish.

This principle is in line with the definition of open-ended play brought by de Valk, Bekker, & Eggen (2013), in which they define it as a play where children can interpret play objects in different ways and create their own play with it. Through AnjiPlay, the children are free to decide how they want to play with the available elements, with the teachers being silent spectators.



Figure 5

The different aspects that I have mentioned ultimately framed the research question that underlines this project:

How can indoor objects encourage full-body movements and free-play interaction?

Chapter II **Between Bodies and Objects**



This chapter adds another layer to the project by exploring approaches prior to threading into the design process.

The theories presented in this chapter is influenced by my experience as a dancer and performer. I am taking in an approach found in the performance art field, which is the relationship between bodies and objects to further shape this project.

Body-Object Relation

An object can influence how a subject behaves (Enjalbert, 2014, Costa & Rossini, 2022), for instance, a chair implies the unspoken command for somebody to sit on it. If we refer back to the topic of playground equipment, we could see that slides and swings also have a similar ability to direct how a child plays on them.

However, an object could also be made so that it doesn't submit to predetermined behaviour. In this case, the subjects break the invisible boundary and instil their own interaction with the object thus deciding how the object is treated. The objects invite the subjects to "the establishment of a bodily investigation" (Costa & Rossini, 2022), In one way or another, the object becomes ambiguous.

Several fields of performance arts, especially the ones that involve an object, apply the two-way relationship between subjects and objects to create body movements and poses that could only be done through the collaboration of both parties (subject and object). In a branch of Puppet Theatre stated by Vargas (2010) (Costa & Rossini, 2022), the performers use ready-made objects and manipulate the objects as if puppets, delivering a series of body movements in relation to the objects.

Affordances in Ambiguity

The notion of manipulating objects into different objects brought me to the ambiguity theory mentioned by Gaver (2003) and Van Leeuwen & Gielen (2016). Gaver stated ambiguity as a property of the interpretative relationship between actors and objects/ environments. He mentioned three types of ambiguity: ambiguity of information, ambiguity of context, and ambiguity of relationship.

In this project, I decided to focus on one of his ambiguity types, which is the ambiguity of relationship. It "refers to the stance of the individual interpreting and evaluating objects and spaces depending on their action capacities, intention, experience, mood, and memories". (Van Leeuwen & Gielen 2016; Gaver 2003).

Here are some references that can be linked to and reviewed with the ambiguity theory as the base:

1. T4BLE

A contemporary dance piece called T4BLE (2021) that was performed as a part of a dance competition held in Singapore. Four dancers performed choreography using a disassembled table that consisted of a tabletop and four legs (RPProds, 2022).

The dance started with a completely disassembled table. Along the way, the dancers weaved the action of slowly assembling the table with various choreography moves. They hid behind the table, interacting with one of the legs, sliding down to the diagonally placed tabletop, and other artistic movements involving the table's parts.

This performance shows that one simple table allows many different physical movements out of the 'proper' function. The dancers managed to recreate new affordances of an object (table), rather than adhere to the predetermined one.

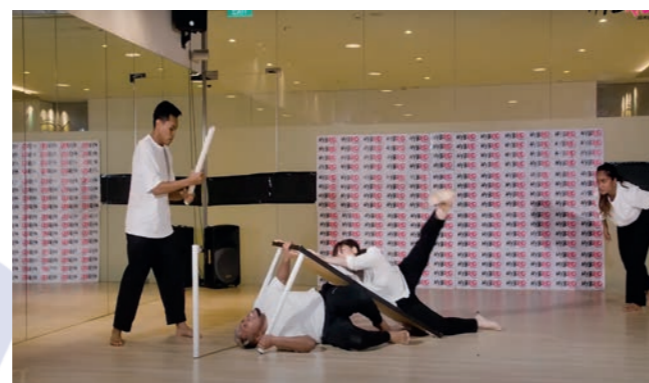


Figure 6

2. KURIOS Circus Show

KURIOS – Cabinet of Curiosities, "O" and LUZIA (2014) is a circus show created and performed by Cirque du Soleil in Canada. Circus is known to have various props that the crews use during their show. In one of its early acts, the crews started by bringing tables and chairs on stage. The circus choreography was done by incorporating these pieces of furniture as part of the movements. A table was turned into a percussion instrument and chairs were transformed into moving platforms that carried a lady across the stage.

Again, in this case, we can see how chairs are not utilised for sedentary activity, as most people are familiar with. The circus' choreography added playful elements and imaginations so they can see the hidden affordances a furniture poses.



Figure 7

3. Parkour

There is another field that requires its practitioners to see alternatives in objects and their in-between spaces. Parkour is an example of how people interact with objects in a playful way (Aggerholm & Højbjerg 2017). This sport could be seen as a creative free play, where urban spaces are regarded as open-ended toys (Bondi & Bondi 2022).

Parkour practitioners (traceurs) utilise urban elements such as buildings, public facilities, and alleys to perform acrobatic movements, using urban spaces out of the 'norm'. It opens the possibilities upon objects that were once considered to have fixed functions. Angel (2014) views parkour as "an imaginative reworking of the existing spatial configuration". When doing parkour, traceurs allow themselves to see the potential of kinaesthetic movements (e.g. climb, crawl, vault) in their surrounding environments.

The way traceurs traverse different spaces in the city is similar to children (Leone 2010; Bondi & Bondi 2021). They see objects and spaces in a different light, like when children see the stairs' railing as a sliding track. Similarly, this project adds a layer that encourages children to reimagine their affordances of everyday objects and work towards new ways of interacting with them. In this project's case, the ideal scenario is how children could find play affordances in familiar objects they see every day, for example, a chair.



Aside from the examples given above, multiple affordances over a single object could also be found during child's play, especially pretend play (Van Leeuwen & Gielen 2016). It is not uncommon to see a child pretends that their bed was a full-rigged ship in a raging sea, or a stack of blankets at the corner of the bedroom that is regarded as their secret hideout.

Bodystorming

I came across a method that is often used in the interaction design process called bodystorming. It is a type of brainstorming and prototyping that is done “through dynamic physical experience and role play” (Hannington & Martin 2022).

Bodystorming is commonly used in the interaction design field that relies heavily upon movements and body engagements, such as games and interactive arts (Segura, Vidal, & Rostami 2022). It uses body movements to help simulate, articulate, evaluate, and also develop ideas beyond verbal explanation. Bodystorming uses the physical and spatial context as a design resource and uses movements and play as the method. (Segura, Vidal, & Rostami 2022).

A bodystorming session creates simulated contexts with simple props and participants’ bodies to mimic a scenario the designers want to investigate. During the run of the scenario, participants should be able to spontaneously act and have improvised reactions toward the situation. Designers will pay attention to “decisions, interactive experiences, and emotional responses” (Hannington & Martin 2022) of the users in that situation. These impromptu actions can inspire spontaneous creations of design. In *The Pocket Universal Method of Design* (2022), the method of bodystorming is closely connected to role-playing, where these two methods often have scripted scenarios as a starting point to get people moving and have the participants enacting a role in the process.

An example of bodystorming session is one done for the purpose to come up with a game idea that uses hanging mechanics as the concept and involves physical activities in the game-play (Segura, Vidal, & Rostami 2022). In that session, designers and researchers used various objects that were provided in an indoor area and tried to come up with and also demonstrate with their bodies, the game mechanic’s idea they had. TRX fitness equipment is provided in the space, hanging from the ceiling, as a linkage to the game’s concept of hanging mechanics.

Dynamic Affordances

An analysis from the previous case said that the moving TRX equipment gave play possibilities and bodily experiences that are linked to balance and stability (Segura, Vidal, & Rostami 2022), new aspects that emerged due to dynamically moving objects. This relates to the theory of dynamic affordances, an act of “moving oneself in relation to other moving objects” (Plumert & Kearney 2014). As opposed to static objects, interacting with a moving object have to consider the shifting spaces in-between the body and the object. Affordances change along with moving objects. One form of interaction may not be valid once an object move and people need to adapt to the changes and act accordingly.

There are many cases where people are faced with dynamic affordances. Plumert and Kearney (2014) studied how children perceive dynamic affordances with the task of crossing the road with a simulator program. Children had to make judgments and coordinate their movements in relation to the timing of moving vehicles. They have to find gaps between the vehicles and commencing the act of crossing the road.

I believe that understanding dynamic affordances is essential to this project since a part of the project is about investigating the dynamic relationship between objects and children. Finding play affordances in static objects is one way, but moving objects open up different play affordances that the children could discover as they move and interact with them.

Following the research question stated on the previous chapter and combined with another layer of literature reviews presented in this chapter, I come up with two follow-up design questions that further frame my project:

What kind of design (objects) allow children to take agency in playing while performing various bodily movements?

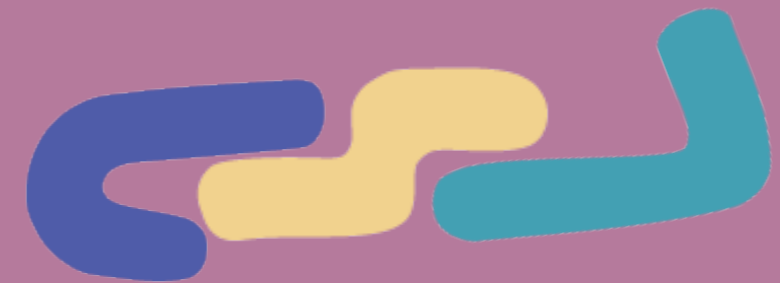
How to design an object as a response to children’s dynamic body movements?



Figure 8: Decorating the room

Chapter III

Welcome to Motion Cirkus



This chapter retells the experience of a workshop done as means to interact with children. Motion Cirkus is a workshop that

The Thinking Behind

Tightly knitted to the project's research question, the workshop intended to explore ways of answering my research question. Motion Cirkus is a manifestation and iteration of the bodystorming method that in the previous chapter.

I created a simulated context with elements that reflect my research question: an indoor space for children to move their whole bodies while interacting with different objects. With the context as the cue, I focused my attention on the reaction and interaction the children did within. Similar to bodystorming method that is triggered by a given scenario (Hannington & Martin 2022), the workshop ran with prompt after prompt.

The workshop is packaged in a circus theme, where the participating children were identified as new recruits of a circus crew named "Motion Cirkus". This concept affects how I designed the activities of the workshop. Circus is identical to experimental choreography and body movements, and I aimed to give an appropriate space for children to be exploratory in their play and in their body movements. Just like in a circus, children could test the boundary of how a body can move.

This workshop was a medium for me to directly witness and understand how children see and discover play possibilities that involve various objects. It includes play objects that might have different play approaches or objects that are not initially designed as play objects.

The objects chosen for this particular workshop were simple everyday furniture, adhering to how bodystorming usually utilises simple objects to form ideas. In this case, these furniture objects are props with limitless possibilities of replacement in the case of different workshop settings.

With full-body play in mind, I wanted to see the variety of children's body movements that were engaged when they were playing. Along the way, the connection between the movements that the children produce and the qualities of the objects that entice the children to do certain movements was also investigated.

Figure 9: The Mask of Motion Cirkus



Warm-up Interactions

Prior to holding the Motion Cirkus workshop, there were two spontaneous interactions that happened between me, the workshop equipment, and the children that were worth mentioning.

1. Self-made Obstacle Course

This interaction happened while I was testing out different materials for Motion Cirkus' equipment in HDK's classroom. The materials I had at that time were: slackline, yoga mats, and hula hoops. I experimented with the arrangement of the equipment I brought combined with the tables and chairs in the room. I put the table upside down, the chair on its side, and I tied slackline around the furniture, creating a spiderweb-like appearance.

Anu (7 years old) was initially interested in the hula hoop as a play object she was familiar with, playing it as how it was intended. However, seeing the action that I did, she started to get interested in the spiderweb slackline construction.

In the end, Anu made her own obstacle course using the objects in the room. She tied the slackline to the table, similar to what I did. She arranged the yoga mats on the floor and put hula hoops in a scattered manner. The obstacle course play started with going through the spiderweb slackline and jumping onto each of the hula hoop circles. The play was also joined by Frida (5 years old), in which Anu demonstrated her how to complete the obstacle course.



Figure 10: The Left Out Obstacle Course



Figure 11: Anu and Frida playing

2. Make-shift Dresses

The interaction happened with bundles of yoga mats in HDK's classroom, which was the equipment for Motion Cirkus workshop. Anu (7 years old) decided that she wanted to wear the yoga mat as clothing and asked me to wrap her around the yoga mat and put masking tape to seal it in place. Her sister, Oyu (5 years old), followed suit.

They were having difficulty walking around with the yoga mat "dress", falling several times while laughing. At the same time, the yoga mat acted as a cushion when the children fell, so they did not hesitate to fall onto the otherwise hard floor. The children also enjoy rolling around the floor while being wrapped in the yoga mat.

The play soon turned into a chasing game, where I was asked to be a monster and they had to avoid getting caught. The challenge was that they were running away while still wearing the make-shift dress, restricting their mobility yet adding a heightened difficulty compared to the usual chasing game.



Figure 12: Anu and Oyu in their make-shift dresses

Reflection

The two interactions happened without any plan nor being organised. The play that grew from the interactions was spontaneous. The difference was that during the first interaction, the child mimicked what I did and developed her own play from there. In the second interaction, the children had more control over the whole play by initiating the play themselves.

A note was taken during the first interaction. Anu was really into hula hoops, knowing exactly what it was. However, by knowing a "proper" play possibility, it was harder to invent new affordances. At the beginning, Anu played with the hula hoop quite a lot and did not really pay attention to the other objects. This reflection changed how I chose the equipment used in the Motion Cirkus workshop—by minimising the use of obvious play objects that children might already know.

Despite having really different play forms, these interactions managed to show children's capacity to find play affordances in various objects and direct the play by themselves, nurturing their own play culture.

Motion Cirkus

◆ Participants

Eight children aged 5-6 years old from Lennart Torstenssonsgatan 11 preschool participated in the workshop along with two adult teachers from the preschool. I was also present during the workshop and acted as the workshop leader.

◆ Equipment

Each participant received a blank masquerade mask and a sheet of stickers with different patterns and colours to decorate their own mask. There were also decoration props made from coloured cardboard that children could stick on whatever surface within the room. Tables, chairs, a sofa, yoga mats, rope, different kinds of fabric sheets, foam noodles, and hula hoops. They were deliberately arranged in a scattered manner inside the room. I also placed them unusually: the tables are laid on its side and the chairs are upside down. This was done as a trigger to make children see another perspective of the otherwise non-play objects.

◆ Location

The workshop is done in a classroom in HDK-Valand building (Room 310)



Figure 13: Mask decorating time



Figure 14: My dance performance as opening

Welcoming New Circus Recruits

Building up from the circus concept, I performed a short dance performance where I danced and interacted with the furniture in the room. Some of the interactions were posing on top of a chair, tiptoeing atop a table, sliding down to a half-folded table, and mimicking a liquid on the sofa where I “melted down” to the floor. It is known that children learn to imitate actions and gestures from a model (McGuigan 2013). The performance served as an example for the children, showing the possibilities of interaction and play they could do with the objects inside the room which otherwise were not meant for play objects.

I gave each of the children a blank masquerade mask, inspired by a common prop often found in circus costumes, that they could decorate themselves with ready-made stickers. I also prepared cut-out cardboard in different shapes and colours that they can stick around the room to decorate with the purpose of making the children take control over the space and getting them used to the otherwise unfamiliar space.

An introduction session where each of us introduced each other using movements that included a chair was done to bring about a playful mindset and got them to think differently about what a chair can afford, which is more than a piece of furniture to sit on. It is also done to physically prepare the children to engage in a bodily play process.

Figure 16: Introduction with chair



Figure 15: The decorated table





Figure 17: Hunter game





Figure 18: Playing on the sofa



Figure 19: Now you are a rock

Now, you are...

The main part of this workshop is when children play while utilising the objects available in the room. In order to trigger that, I gave them the prompt of "being an animal in a jungle, and right now, the floor is on fire", which was really effective to get them moving and as they were not allowed to step on the floor, they used the objects in various way to avoid having their feet on the ground. The whole session had upbeat instrumental music playing in the background.

An additional layer was also introduced as I involved myself in the play as a "hunter" who would catch whoever was moving. The children were free to move when I was not looking but had to freeze when I turned my body towards them.

As we moved to another session, another prompt was given where children should imagine themselves as wind, tree, and rock, in which they had to show their current 'identity' using their whole body.

Casual Interview

At the end of the workshop, I did a casual interview with the children regarding the workshop. I deliberately did not write anything down since I want to keep the atmosphere to be fun. The informal interview was done by me in English, with the teachers being the English and Swedish translators for both sides. Below are the questions and answers we did:

- What is the most interesting thing in this workshop?**
(Most answers) The forest play. I can become a crocodile, a shark, a bird (differs from each child).
- Is there something you wanted to do in this workshop but were not able to do?**
(Answer from one child) I haven't tried to swim underwater
(From the other child) I haven't tried dancing.
- What is it in this room is your favourite?**
(Most answers) The sliding table.

Reflection

Relating the result of the workshop to the research question, this workshop was a success in terms of getting the children to move physically despite being in an indoor situation. The objects inside the room also gave affordances for children to do full-body play by not conforming to their intended function.

The objects that were available in the room played a big role in deciding how children move and play. Most of the objects in the room were those that the children could move easily. Most children did the action of aligning the chairs and stepping on them to create a bridge. They also used the yoga mats in a similar manner as a stepping stone. With the rope and foam noodles, they carried them around and use them as a rescue tool to get a hold of their peers.

On the other side, the children did not attempt to move either the sofa or the table, despite the possibility of doing so with the help of their peers. They hung their body on the table and hid behind the sofa, playing while making use of the objects' big and sturdy attributes. Albeit different treatments, the children interact with

both the moveable and the unmoveable objects in a balanced portion.

The workshop also showed that children were well-versed in perceiving dynamic affordances while playing. In the "hunter" game, the situation could be read as the hunter took the role as a moving factor that conducted play interaction with the moving children. The children moved in relation to my hunter movements. They moved with careful calculations while monitoring my gestures, freezing immediately as I turned around. At one point, some of the children took the risk and hovered right behind the hunter while still managing to stay still as I turned to face them.

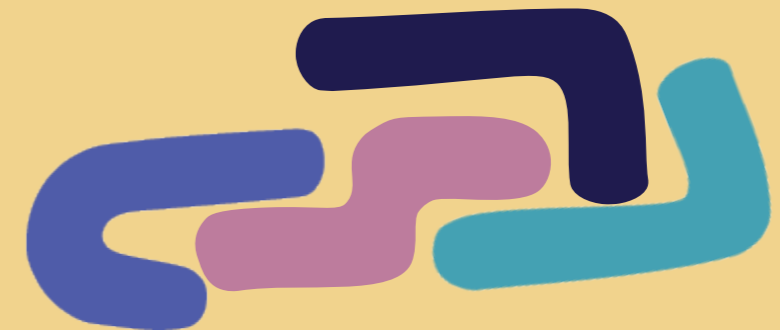
However, this workshop did not yet able to explore the notion of free play in relation to the research question. Due to the time limit, the play did not have enough time to naturally transform the prompted play into a play where there was no command or objective, where the children could discover by themselves any play affordances the objects in the room could have.

Figure 20: After the workshop





Chapter IV Design Journey



This chapter presents the design process that happened after the workshop in Chapter III. Provided by materials and input obtained during the workshop, the project continued to find its form. This chapter explains the design methods I used and each of its implementation throughout this project's design process.

This chapter is divided into three phases:

1. Exploration and Development
2. Production

Exploration and Development

This phase was fuelled by the findings from the workshop, where the product of this project, an indoor object, slowly took its final shape. I will explain the process through the design methods I used:

1. Constructing The Negative

This design method is inspired by a US-based designer, Cas Holman. In a documentary titled *The Art of Design* (2019), Cas Holman shared about her design process, which involved extensive sketches that started from sketches of children playing. Her sketches showed various drawings of children playing, with only their bodies without any surroundings. She would build up a design based on the body positions (Holman 2019). It could be said as a reverse method compared to the conventional design process of a playground where designers often start by designing the form of the structure, be it sculptural or a typical post-and-platform play structure.

Holman (2019) further explained that for example, instead of designing different kinds of slides, she took the principle embedded in a slide: quick, uncontrolled movements that raised adrenaline, and design something that also serves the same principle, without being restricted to the form of a slide structure.

I adapted the method to suit this project's context. The Motion Cirkus workshop was documented through photographs and the photos managed to capture various movements the children did while interacting with the objects. From the photos, I eliminated the surrounding elements, leaving it with just a child as if posing in a void.

From that wide range of poses, I sketched different possibilities of an object that would make the child pose the same way. For example, in one of the poses where the child is staying low on all four, different scenarios could be generated. The initial situation that happened during the workshop was that the child hiding underneath a table. However, with the absence of this context, I, as a designer, could imagine that the child might have been crawling through a long, low tunnel, or they could be hiding in a cave at a cliff. Any kind of surface could also be laid on top of them, which resulted in the crouching pose.

Other poses done by the children include squatting, lying down, tiptoeing, stepping with a large stride, and climbing up. Each of the pose was given the same treatment, which is sketching through different scenarios this pose could be generated.

Through this method, the attributes of the design outcome would be targeted to the body and movements of 5 to 6 years old, which were the participants in my workshop. This influenced the dimensions and the possible shapes that came out of my sketches.



2. Identifying Patterns

With so many different poses the children had made during the workshop, there was a wide range of variety in terms of scenarios and the sketches I produced. For example, the scenario I could think of with the activity of climbing up is completely different from the scenario I could generate with the tiptoeing figure.

However, upon further observation, I identified some repeating shapes that afford several different poses. This fact shows that that particular shape is open for multiple affordances and play interpretation, which can lead to the shape having the potential of being an open-ended play object, an important design requirement to achieve the condition of free-play interaction (refer to Chapter I).

In my sketches, the squatting pose, the walk as if holding an imaginative railing, the crouching pose, and the lying down pose have a similar shape that serves as the scenario that entices these poses. They could all start from a simple, long, and narrow mass that has the ability to be bent. I then decided to focus on this one shape, since it is really intriguing to develop a single shape and to see how many play possibilities this one shape could hold.



Figure 21

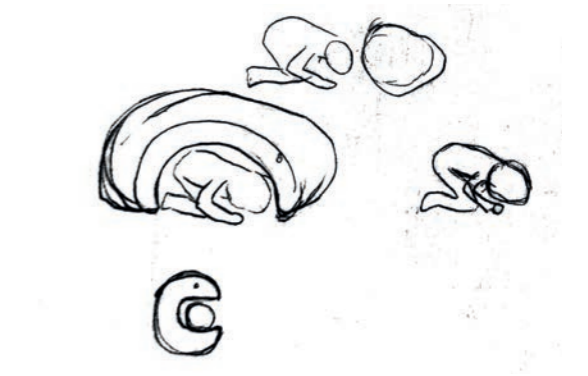
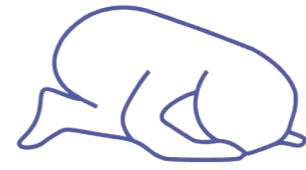


Figure 22

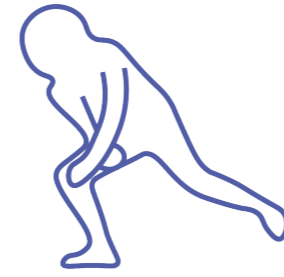


Figure 23

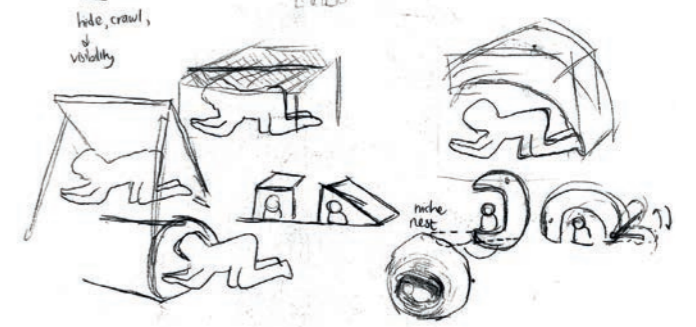
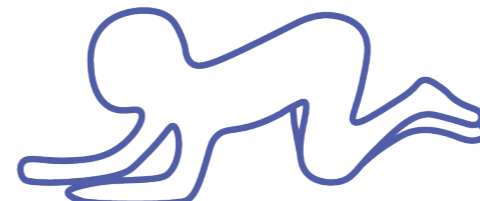
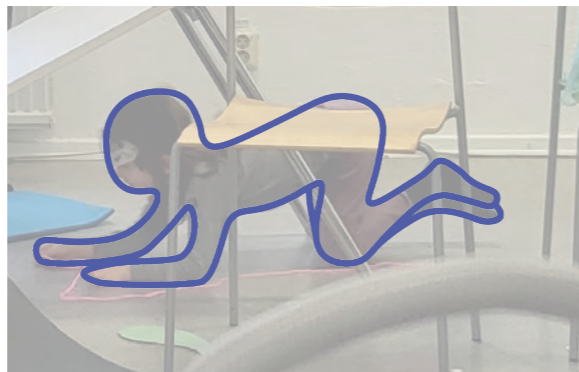


Figure 24

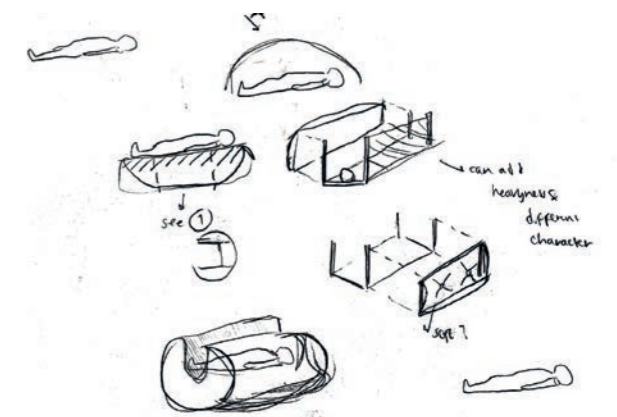
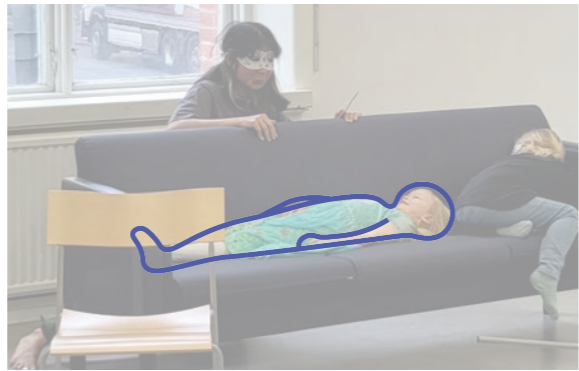
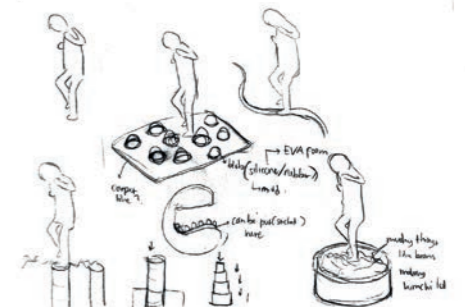
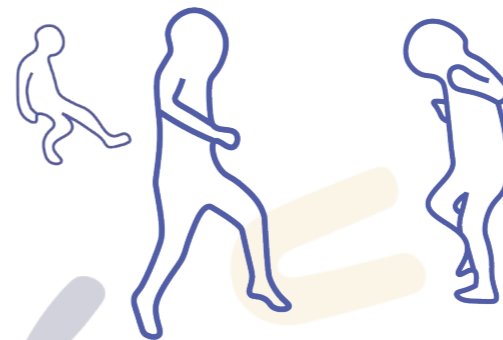
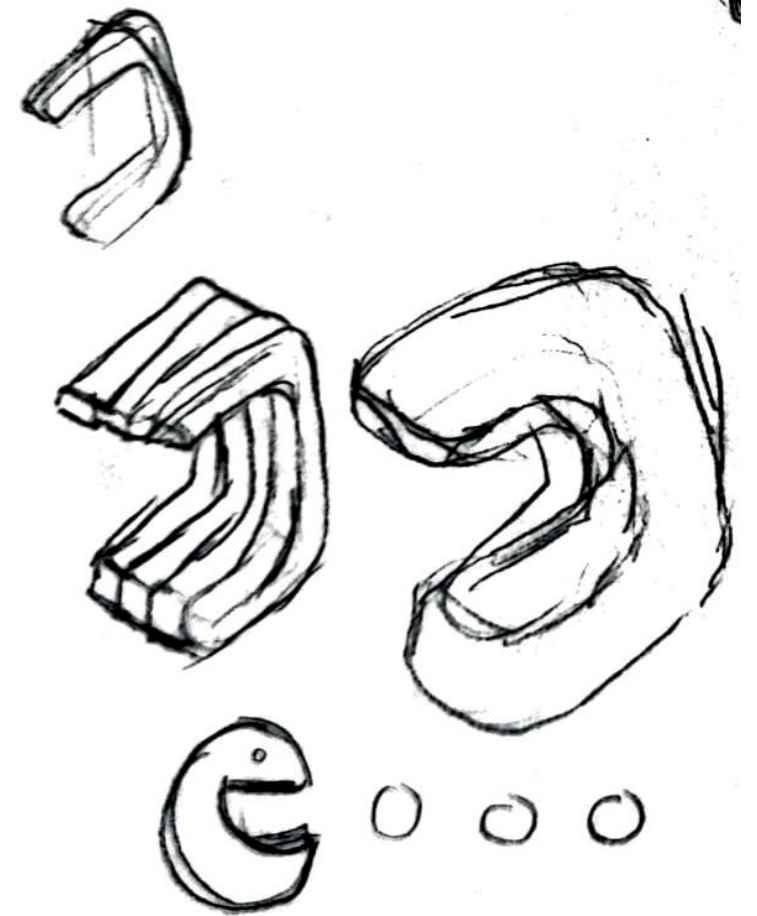
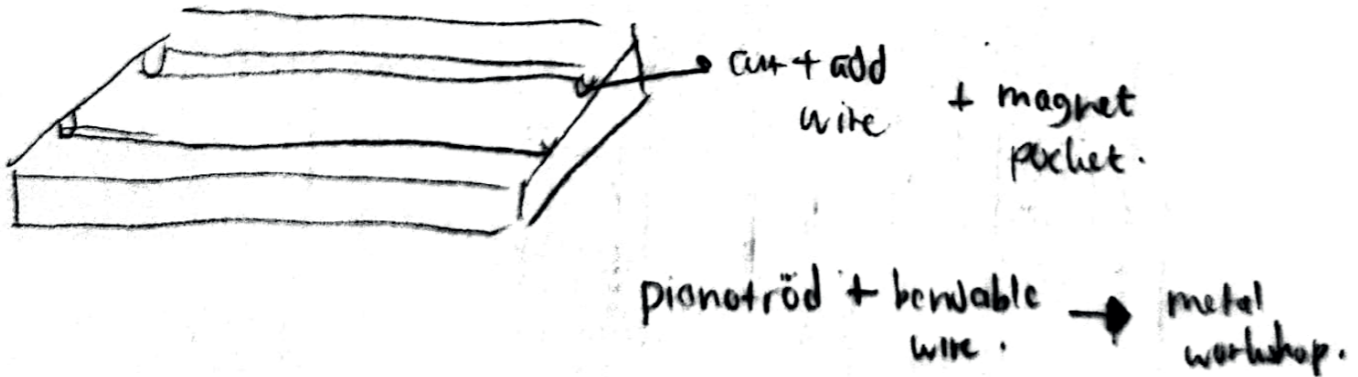
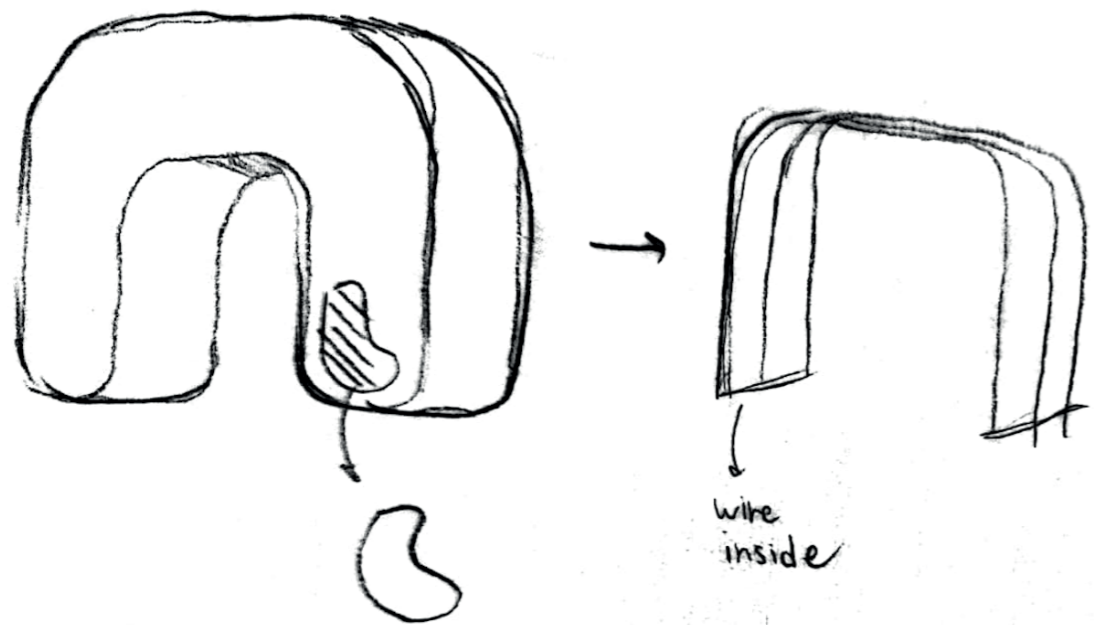


Figure 25





3. 3D Model Exploration

Sketching on paper has its limitation in perceiving a three-dimensional form, hence I combined both physical model-making and 3D software model-making to develop the design form.

Polymer clay is a great material to create physical models as it's easy to shape and does not dry through contact with air. Depending on the complexity of the design, modelling with polymer clay generally does not require much time so it is excellent for the exploration phase where designers need the capacity to try out several different design alternatives. In my project, the idea is to have an organic shape that is malleable, thus the use of polymer clay is a convenient modelling material to use.

Aside from using polymer clay for physical model exploration, the modeling software also works to polish the form of the design. I used SketchUp and Blender interchangeably to finalise the shape I was aiming for.

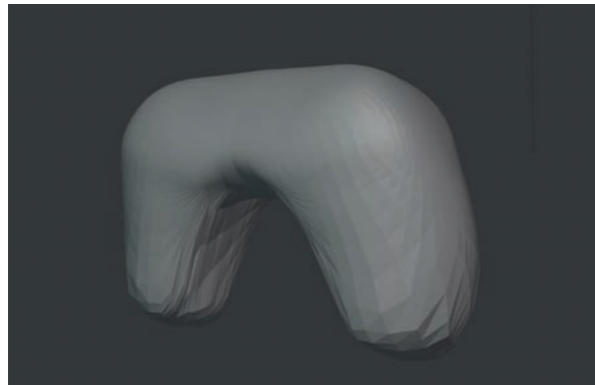


Figure 26: Early model made through Blender

I discover that using two different media in design modelling could have complementary symbiosis. Limitations possessed by the physical media could be overcome by the digital media, and vice versa.

4. Material Exploration

When it comes to material exploration, technical aspects related to design requirements ought to be thought of for designers to find the appropriate materials among millions of different material characteristics. For this project, my design requirement is to have malleable quality, derived from the pattern I discover using the previous (2) method. The dimensions should be thin yet long to allow the affordances I am aiming for. Furthermore, the material should be relatively easy to carve to achieve the organic shape.

With these design requirements, steel wire material, which comes as a long piece and has malleable quality, was chosen. Meanwhile, the convenience of carving is answered by using upholstery foam, which furniture makers often carve and shape to create the shape of a sofa or armchair.

Another design requirement of my project came from the thought of having multiple units of the same shape and form. Since the idea is to explore play affordances in one single object, adding the possibility to try different combinations could further widen the fun aspect. To do so, the design should have a temporary adhesive mechanic to attach the units. Thus, the possible materials of either hook-and-loop fastener (Velcro) or magnet to execute the requirement are put into consideration.

Production

At this point, I have come up with the materials that I might use to materialise my design physically, albeit in theory. Therefore, to test whether the materialisation would have the imagined result as the 3D model that also fulfils the project's design requirements, the next phase is production. This phase is marked by my role as a designer who went hands-on and crafted my design into a tangible form.

1. Design Mock-up

A. Test Mock-up

The crucial thing to test was whether metal wire could convey the desired malleable quality while wrapped in the upholstery foam. To do that, I created a small-scale mock-up of the design. A piece of metal wire of 2mm diameter is used as the inner structure along the length of the foam, sandwiched between 2 layers of foam. I also test to carve the foam.

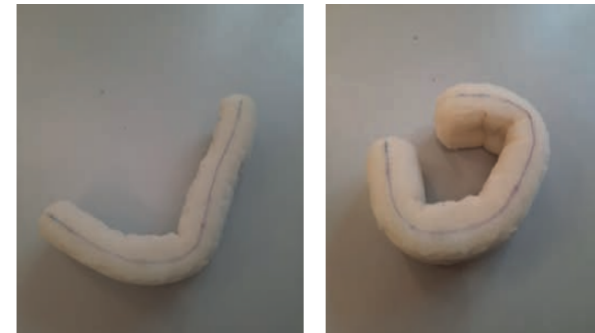


Figure 27 & 28: Test Mock-up

Making a mock-up allows designers to detect technical features that sketching and digital modelling cannot do. For example, I found out that the first mock-up I made could not only be bent but also twisted. It was an unexpected ability that could bring more complex design, beyond the intended design requirement. To restrict the twisting movement, I went back to the 3D modelling software and devised a ladder-shaped structure for the metal wire. This way, the wire could still be bent but it would be difficult to twist.

B. Scaled Mock-up

This mock-up conveys a closer appearance to the intended design. It was also made after the dimensions of the end product has been decided, thus allowing a downsize with a proper scale. The aim for this scaled mock-up is to simulate multiple numbers of the end-product, testing the possibility of play affordances with more than one body (from this point on, I will call the body of a singular end-product as "unit").

The making process of the scaled mock-up was similar to the making of the test mock-up, with the main difference being the 1:100 scale dimensions. During the process, the amorphic shape that was made during the 3D modelling exploration was revised since the shape was lacking stability if it was put on the ground. Moreover, the end-product will consist of several units that are made to interact with each and achieve a free-standing position, it is necessary to have flat surfaces, unlike the previous organic form, so the unit could stand and have more unity between each other when they're attached.

Nine scaled mock-ups were made of the same dimensions. This phase was where I tested the use of Velcro (hook-and-loop) as a means of connection between each unit. White cotton fabric, which was only a temporary fabric to use, was made into the unit's cover and patches of Velcro were attached to it at different sides.

On the body of every unit were the loops surfaces, while the hook surfaces were made as standalone components. This way, the mock-ups could be attached to each other from every side without needing to find the pair of hook-and-loop.

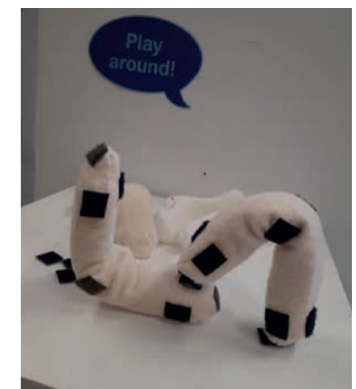


Figure 29: Scaled Mock-up



B. Scaled Mock-up 2.0

The previous scaled mock-ups had some design aspects that needed to be revised, which was done by this scaled mock-up's version. The biggest change was the connection between units. Velcro produced a ripping sound every time its connection was pulled apart. Moreover, they have distinct textures that cannot be compromised. With these considerations, it was replaced with magnets that could eliminate the concerns.

This phase was also when I decided on the right upholstery fabric to use for the design's cover, with consideration of its texture, durability, and colour options. I will explain further about the fabric in Chapter V.



Figure 30, 31, 32, 33, 34, 35: Scaled Mock-up 2.0



2. Design Prototype

With the decisions I have made during the making of the small-scale mock-up, the next step was the design prototype. I am referring to a physical model that has the real dimension in mind. I made the prototype to match parts of the design requirements, which in the end, would still not be perfect. However, I take notes that any other requirements that could not be fulfilled with the said prototype should then be identified and modified for future improvements (Rosenman & Gero, 1993).

The prototype's main objective was to see the design's real dimensions and to test whether all the technical aspects in the small-scale mock-up would work the same in the upscale version. I divided the design prototype phase into two parts:

A. First Prototype

By the time I made the first mock-up, which was in parallel with the production of small-scale mock-ups 2.0, I have not decided on the fabric to use as the cover. Therefore, this first prototype still used the sample fabric as the cover. The focus of this prototype was mainly to see the dimensions and the bending ability. The magnet connector was also omitted in this prototype.



Figure 37, 38, 39: First prototype



Figure 36

During this first prototype process, I had chance to do a test play with two children. However, the children, being 3 and 4 years old, were younger than the intended age group. Since their body is smaller, the play they did was a recurring action of falling intentionally towards the object, which resulted in bending the artifact. From my observation, the play they did have not yet revealed another play potentials that the project could do.

B. High-fidelity Prototype

This was the last phase of the design prototype I made for the project. In the product and industrial design world, a high-fidelity prototype usually looks like the finished design, showing the aesthetic the design proposes (Curedale 2012). This prototype used the intended upholstery fabric, the application of magnet connectors, and the quantity of two units, which brought the design even closer to its intended outcome.

This high-fidelity prototype also served as the final designed object I have for the entirety of this thesis, even though there are still feedback and iterations for the future. Thus, I have this prototype served as the design outcome, which I will disclose in detail in Chapter V.

During this phase, I did an informal play session with Anu (7 years old) with two units of LIKU in HDK's classroom. Anu could not figure out what LIKU could do, so I demonstrated bending the unit. Soon, started shaping the two units as she built her own ship, which she sat on it and asked me to push the ship "across the ocean". The role-play of her sailing with the ship grew from there. She also combined LIKU with a rope that was available in the room to give modification to her ship.

This play session had Anu, LIKU, and me as an adult in the play situation. Anu led the play and had me as her "crew". There are several reflections I have done from this session. Because of the LIKU's size, the children will find it more convenient to play not individually. Moreover, on another occasion, I would like to see a free-play situation where the adults are silent observers who will just enter the play situation if the children need help.

Figure 40, 41, 42: Play session with Anu



Chapter V Design Outcome



This chapter discloses the outcome of this project, which from now on will be called LIKU. It is a combination of a product with its brand identity, designed through literary reviews, interactions with children, and design methods that I have conveyed in the previous chapters.

What is

LIKU?

LIKU is a brand that I propose to name the outcome of this project, which I have developed into a designed product. I collected some keywords that reflect this project's nature, such as "foam", "soft", "bend", "body", and "movement". From this group of words, I did mind mapping that grew bigger as I found synonyms and translations into different languages.

The word LIKU came from an Indonesia word, *liku* (pronounced /li.ku/). It is an adjective, which can be translated into meander, twisted (road, among other things). In the Indonesian language, *liku* is a versatile word that conveys the idea of twistiness, both in a literal and metaphorical sense. It portrays the ability of the product that is bendable, forming a kind of meandering entity.

I will address this project's outcome as "LIKU" from now on.

Brand Identity

Aside from the name, I also designed LIKU's visual identity to breathe more personality and existence into the project. The visual identity consists of colour palette and a logo.

One of LIKU's values is being ambiguous, thus it should be able to blend well with whatever indoor environment LIKU is placed at. Therefore, I chose colours with warm bases and muted features that could also convey a moderate amount of playful quality.

The name LIKU can be formed by using the product itself, bending them to achieve the form of the letters: L, I, K, and U. From that approach, the logo was formed and combined with the colour palette.



R32
G27
B29

201B4F

R86
G85
B158

56559E

R81
G163
B184

51A3B8

R189
G125
B157

BD7D9D

R244
G214
B146

F4D692



Figure 43

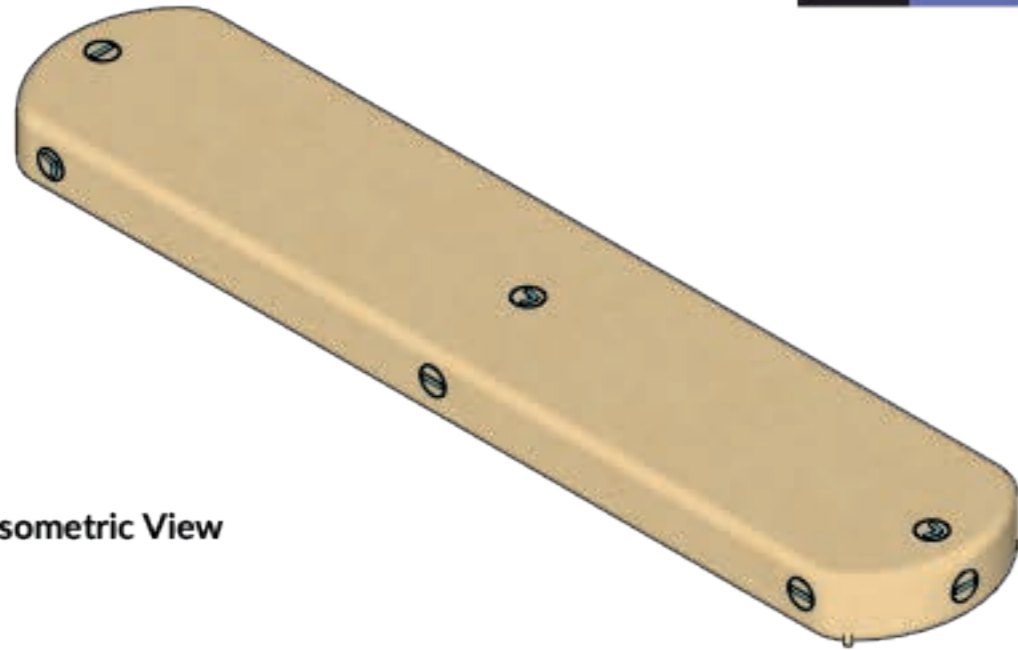


Technical Drawings

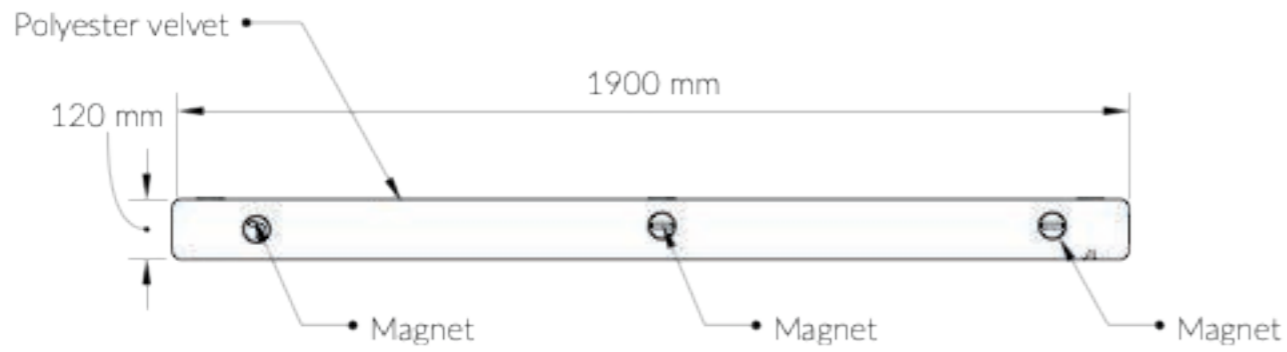
Scaled drawings that communicate the overall dimensions of LIKU as well as the materials. It was made as a guide for production.

Polyester velvet

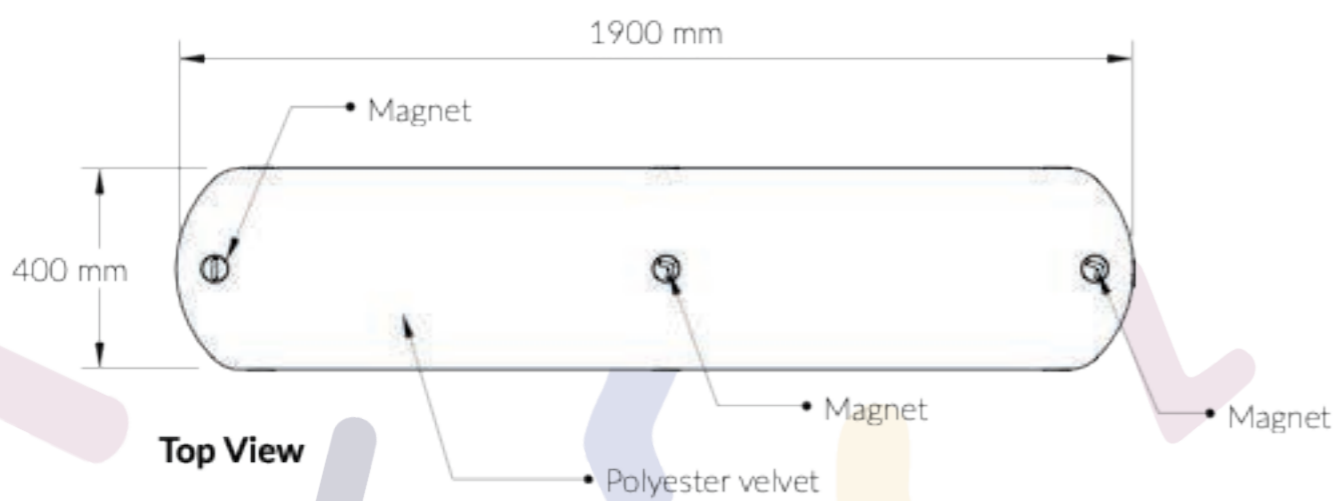
Fabric colours:



Isometric View



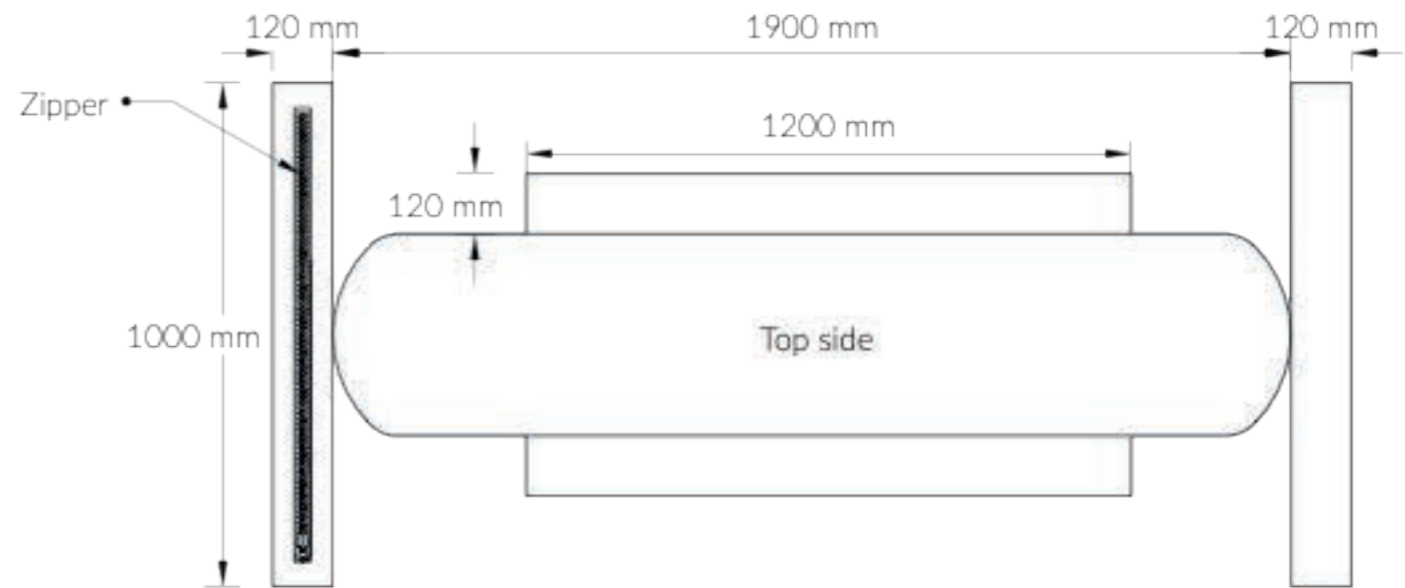
Side View



Top View



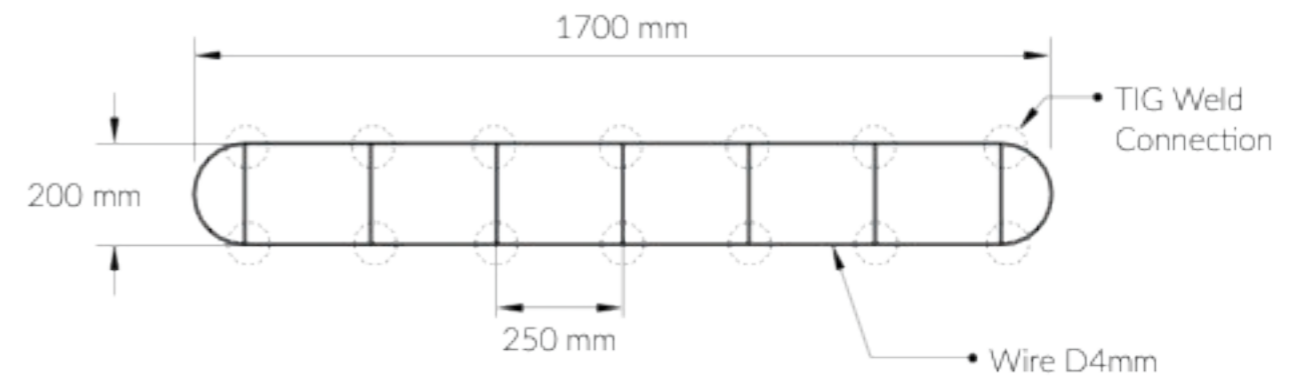
Bottom side



Top side

Outer Fabric Cover - Pattern

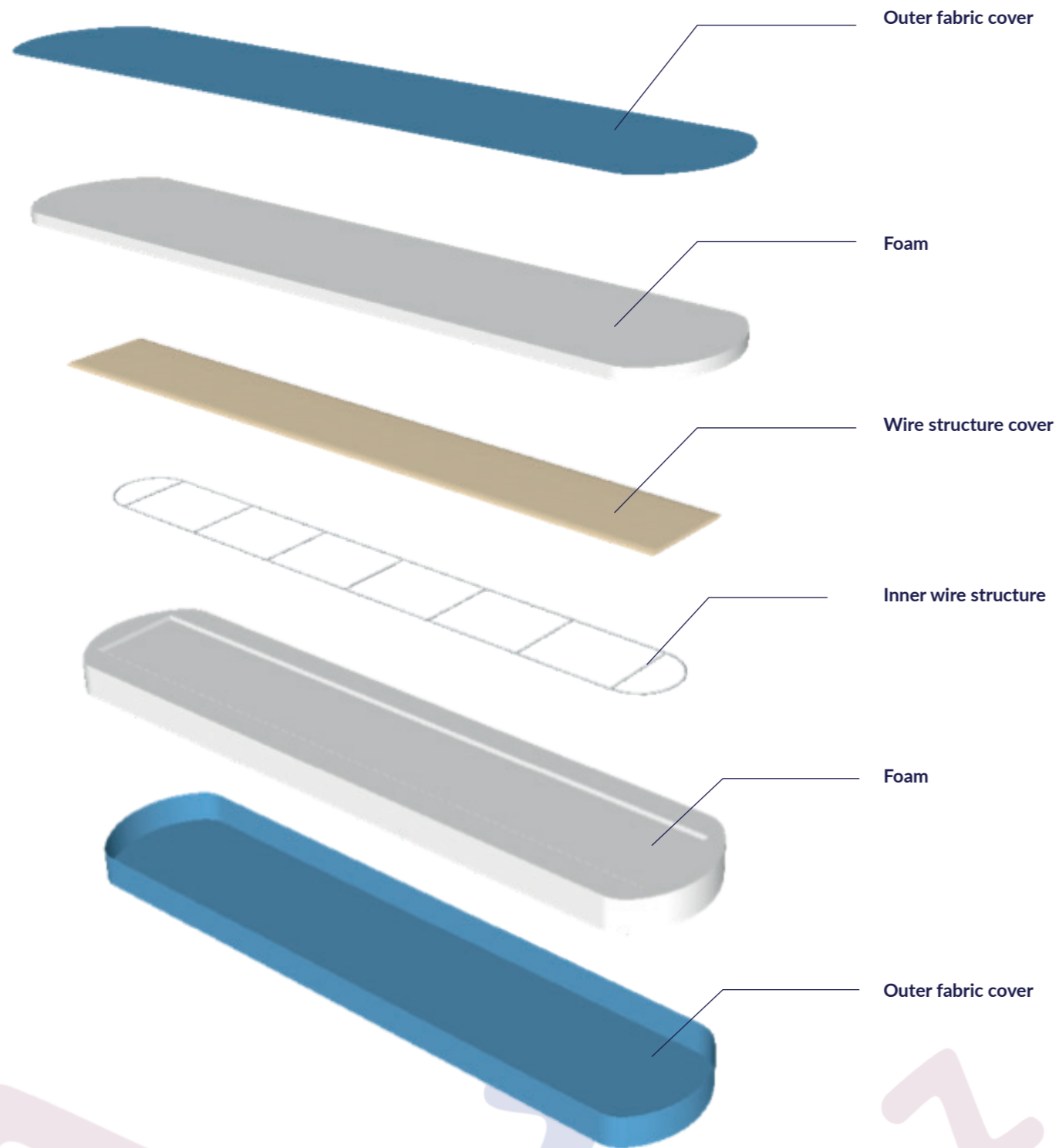
Note: length is not yet included 1cm overlap on all sides



Inner Wire Structure

Design Body Breakdown

Each unit of LIKU is designed as a long piece of foam with rounded edges and is covered in fabric. Each unit of LIKU consists of several layers with different materials on each layer:



1. Inner wire structure

This functioned as a backbone for each LIKU unit. I used a 4mm diameter metal wire. Several parts of metal wire were formed into a ladder shape using TIG (Tungsten Inert Gas) welding technique. The structure's welding points were covered in duct tape for safety purposes in case the welding broke.

2. Wire structure cover

The cover was made to envelop the wire structure. It was made for two reasons: to add more cushioning that separates the wire and the body (user) and for safety reasons in the worst case that the wire broke.

3. Foam

Foam took the biggest part in LIKU. It decided how the product looks as well as the size of its final form. It consists of two parts that sandwiched the wire structure. In this final production, I used polyester foam in F30 density carved in the intended shape.

4. Outer fabric cover

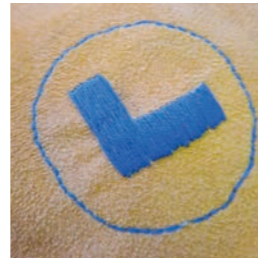
I used polyester velvet fabric which is categorised as a textile for furniture. The fabric has a velvety texture and is durable considering the rough play interaction that might happen between the product and bodies (users). The fabric cover is made with zipper openings to allow an easier process of inserting and taking out the foam.

I couldn't show it in the final prototype, but the colour of each LIKU's unit is supposed to correspond with the colour palette mentioned in the previous section.

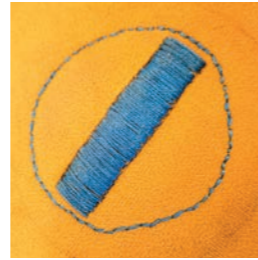
Connectors

The connectors are the feature to attach each unit together and to form stability while the units are in different forms of combination. To do so, I used strong magnets that could withstand the weight of one unit.

The magnet was located on different sides of each unit. I created inner pockets that were attached to the outer cover to put the magnets and hold them in place. A symbol was embroidered on the cover to show where the connectors are which also show which side of the magnet it was (north or south).



(+) Magnet Pattern



(-) Magnet Pattern



Play Possibilities

The play possibilities for LIKU are presented through a combination of visual communication in photos and 3D renderings. They are differentiated by the number of units involved in the play: one unit, two units, three units, and are still open for even more numbers of unit.

1. One Unit



Figure 44



Figure 45



Figure 46

2. Two Units

Figure 47



Figure 48



Figure 50



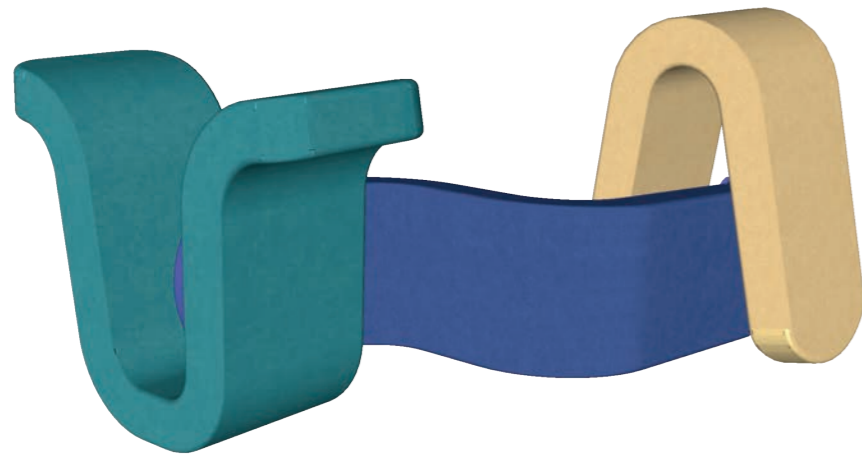
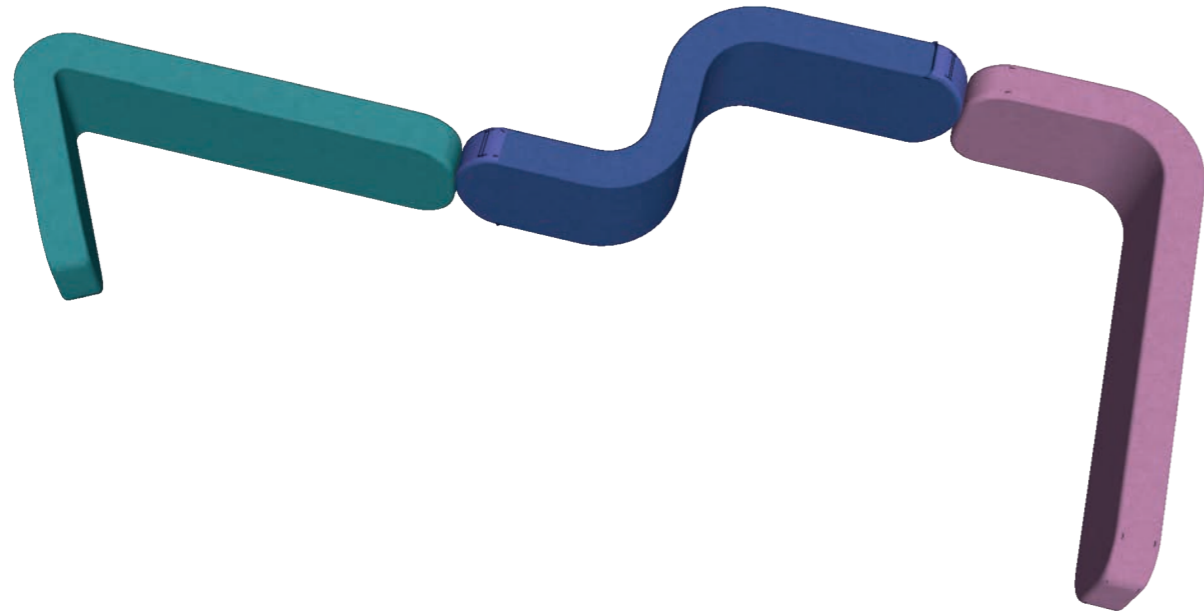
Figure 49



Figure 51



3. Three Units



How about

Four units?

Five units?



Chapter VII

Conclusion And Future Plan



Conclusion

This project intended to design an indoor object that could encourage full-body movements and free play interaction in children. It was sparked by seeing the lack of stimulation children have for active play in indoor environments. Active play is identical to outdoor environments, while indoor environments lean more towards sedentary play. However, the time children spent indoors has increased in recent times, which resulted in less active moving. To put matters forth, the paper mentioned cases when active indoor play is often prescribed. From the child culture point of view, this issue stripped children of their agency in playing.

To begin solving the issue, I brought in a topic from the performance art field about body-object relation and focused on how a body can decide an object's affordances. The decision is influenced by my practice as, aside from a designer, also a dance performer. There were several examples where performers, such as dancers, circus performers, and parkour practitioners, exhibited a form of full-body play using objects that were not meant for play. It showed that objects have an embedded quality to be ambiguous and open-ended.

I reflected on and connected them to the issue I brought up and to the children themselves. Can children find play affordances in everyday indoor objects? To find out, I devised a creative workshop called Motion Cirkus where children could play with

furniture and other objects in a semi-public indoor space that were not made for playing. The workshop allowed me to see active play possibilities that could happen within indoor environments with the help of objects.

The varied movements and play done by the children fuelled my design process where I designed alternative play situations based on the movements they did. I wanted to find out whether a single form could accommodate multiple play situations and decided to focus on it. The ambiguous and open-ended factor was brought into the design to let children interpret an object and decide their own play. Thus, the product LIKU was formed.

LIKU serves as a catalyst for children to have full-body play despite being an indoor object. At the same time, it also wishes to have free-play interaction, where children have the control to decide how they want to play with it. This outcome wants children to cultivate their own way of playing with LIKU. I do not determine any 'right' way to play with it and leave room for children to decide on how they interact with it. The play possibilities are endless and not for me, the designer, to dictate. Rather, the children are free to explore their own way of playing. LIKU was made from children's movements, and children have the agency to create their own play culture with LIKU.

Future Plan

It is worth mentioning that this project has not yet reached the finish line. I want to further iterate the design with the help of the children, to seek more interactions between children and LIKU, and to receive feedback and insights from them. Children's involvement is highly needed in this project's product development as it will be a back-and-forth process between testing and iteration. Play sessions with children are necessary for the next step.

LIKU is an object that may have an unfamiliar form and features as a play object. To make the play culture bloom, it is important to either give children time to familiarise themselves or to show what the object can do. Therefore, in the near future, I plan to locate LIKU in an indoor public space for a period of time where children are given enough time to figure out how to interact with LIKU and to witness the play possibilities they can find.

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List of Figures

Figure 3

Tumble Tots at Charlton King. <https://www.cheltenhamrocks.co.uk/listings/tumble-tots-at-charlton-kings> (accessed 21 May 2023)

Figure 4

Tumble Tots at Chelmsford. <https://www.groupon.co.uk/deals/tumble-tots-chelmsford> (accessed in 21 May 2023)

Figure 5

Anji Play. *Children in AnjiPlay have access to large, minimally-structured and open-ended environments and materials, and extensive and uninterrupted time to work together and solve problems.* <http://www.anjiplay.com/guide> (accessed in 21 May 2023)

Figure 6

T4BLE (1st Place) | Hybrid Series 2021: Storytelling Showcase | RPProds [Video]. T4BLE, 2021.

Figure 7

60-MINUTE SPECIAL #1 | Cirque du Soleil | KURIOS - Cabinet of Curiosities, "O" and LUZIA. Cirque du Soleil, 2020.

Figure 13, 14, 15, 16, 17, 18, 19

Ramirez, P.L.T. (2023). Documentation taken during Motion Cirkus Workshop,

Figure 13, 14, 15, 16, 17, 18, 19

Ramirez, P.L.T. (2023). Documentation taken during Motion Cirkus Workshop,

Figure 36

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Figure 44, 46, 48, 50, 51

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