



Free & challenging play
modular play facilities in public spaces

HDK-Valand Academy of Art and Design,
University of Gothenburg

June, 2022

Qiushi Wang

Child Culture Design
DEMCD 5 Master Degree Project

Abstract

Risky elements in play are of great importance to healthy child development. They are naturally attractive to children especially at the age when their athletic performance is developing at a rapid pace. While in many traditional children's areas, because of safety concern from adults, play facilities that are restricted by strict construction rules tend to homogenize. This project is located in the area between experienced challenging feelings and the actual risk of injury, in order to discover more design possibilities for children playing in public spaces.

The goal of this project is to create a group of play facilities that provide children with more choices in free and challenging play. This project has four phases: research-initiated design, concept generation, design evaluation & development and design articulating & simulating. Specific methods applied in the stages are staging design activity, on-site observations, brainstorm, testing with scale models, interaction prototyping with children, qualitative analysis, 3D modeling and rendering. The outcome of this project is Domio. By reconsidering the way children play interactively, Domio begins an exciting method to play with balancing. It encourages open-ended play where children can create their own rules with other players. Besides, to suit a wider range of environmental requirements, Domio has been designed with the needs of space planners in mind and is therefore modular. This project brings knowledge in how the theory of protective frames can be applied in design to create a relative safe area for children to explore risky play with different levels of experienced challenge feelings.

Keywords: Playground design, Play facility design, open-ended play, Child culture design, Product design

02	ABSTRACT
04	INTRODUCTION
06	LITERARY REVIEW
12	RESEARCH QUESTIONS
14	METHOD DESCRIPTION
22	PROCESS DOCUMENTATION
48	PROJECT OUTCOME
58	CONCLUSION
61	BIBLIOGRAPHY
64	ACKNOWLEDGEMENTS



Introduction

There is an increasing debate on how to balance children's play safety versus having them play in physically and emotionally challenging environment (Sandseter and Beate, 2007); there is growing evidence that free play is vital to children's well-being. From an evolutionary perspective, Hart and Tannock (2013) argued that mammals can practice essential skills for survival by engaging in rough and tumble play (R&T), such as catching prey, avoiding predators and social acceptance. For example, individuals within the same social group on which they rely for survival, are facing the challenge of resources competing and accessing mates in a less conflicting way.

Similarly in modern world, according to Jambor (1998), risky elements in play motivate children to test their physical limits, be adjustable to dangerous activities and environment. Animal research with rats shows that adequate free play opportunities help to promote maturation of the frontal lobe where houses regulatory skills and help control impulsive behaviors and develop self-reflection, empathy and creativity (Panksepp, J, 2017). A study in U.S. provides convincing evidence that free play is of great importance to healthy child development, the deprivation of free play in preschool year may potentially lead to lifelong repercussions (Weikart, D.P. 1998).

However, adults often consider challenging play to be inappropriate because of the inadequate understanding of children's play nature and the misconception that all challenging play are potentially harmful (Kuschner, D, 2019). These safety concerns have led to an increasing restriction in challenging play opportunities of different fields including physical education and design for children (Lavrysen et al., 2017).

The risk related to objective safety is of great difference from the experienced challenge by individuals. According to Sandseter's (2007) observations, risky play can be categorized in six types: play with high speed, play with great height, play with harmful tools, play near dangerous elements, rough-and-tumble play and play where children can 'disappear'/get lost. These play activities may lead to physical safety concerns and the risky elements involved are objective and practical. However, the feeling of challenge (experienced challenge) is tended to be more subjective and emotional. People are different individually in the level of challenge and thrill they like and feel confidence (Hughes and Erika, 2017). This means that there is no necessary connection between activities that make people feel challenging and those that cause substantial harm.

Moreover, According to Apter (2007a, 2007b), one person is widely different when experiencing the same situation, which means that the attitude to one activity can change dramatically according to the motivational state and circumstances (Leeuwen, Lieselotte van et al., 2012). This indicates that the experienced challenge may change among different people and it is also in an always-changing dynamic for one person. As a result, it will offer more play possibilities to involve different challenging types and levels in one activity, in order to empower children to control the way how they experience challenging play. By doing this, children will be given the space to explore activities they feel challenging within their safety zone and feel confident to try higher level of challenge when they are ready. Meanwhile, the activity that contains lower level of physical harm will also reduce the concern from adults.

Literary Review

The project will mainly focus on children from ages 7-10, according to Piaget (1954a), children in this age period are no longer egocentric and can think logically. Besides, their athletic performance has been improved significantly compared with their early ages. It is an important period for them to acquire the knowledge about what they experience as challenging and how to deal with it.

As a designer, there are two main design requirements in this project:

1. High level of experienced challenge can be involved but the level of body-harm risk should be lower.
2. Children need to be provided with adequate options to choose the way how they experience the risk.

Furthermore, children spend great amount of time observing others interacting with objects (Kuschner, D., 2019), which means social interaction that may also influence the motivational state of individuals should also be considered as an important value in design.

Adding challenging elements to familiar rides

In order to acquire a better understanding of parents' experience about challenging play, an on-line questionnaire was made to collect feedbacks of 14 parents from different countries (Sweden, Mongolia, Italy, Japan and China). One reply from a mom of a 5-year-old boy to the question 'do you have any disagreement with your children, how do you deal with it?' suggests a strong connection to my topic. She said "Not yet, by now the challenging play facilities and areas are limited in my city, and most play tools are at high safety level."

In the further interview, she also points out that most of the public playgrounds where she often takes her son to play in are almost identical to each other, which are standardized with a slider, several swings, seesaws and climbing ropes. "There are some activity centers for children with professional trainers who are able to provide targeted solutions." She said, "it's more like a class but not a daily playground to go to after class with friends and have fun."

Generally speaking, 85% of parents in the questionnaire shows a relatively positive attitude to challenging play. Although still being cautious about security risks in the play area, they are also willing to let children try challenging activities and obtain the ability to control risky situations. When parents are requested to rank the 6 categories of risky play (Hansen Sandseter and Ellen Beate, 2007), all of them voted "playing with dangerous tools" is the riskiest, because "the action is hard to notice and can happen anytime". As predicted, "rough and tumble play" was selected by 80% of parents to be the least dangerous type of play. "It normally happens when my daughter is with her friends or classmates, this makes me feel safer since I think she has better control over the situation because of the familiarity" said by a mom of a 7-year-old girl, "Being around with my child and seeing her play can also release my anxiety".

Based on the valuable answers from questionnaire, one possible way to balance parent's anxiety and meet children's needs of challenging play is to add challenging elements to children's familiar rides, such as swings, seesaws or slides. Children who have played in normal playground will have a clear understanding of how these facilities work and the techniques to avoid getting hurt from their previous experience. Comparing with a new activity with the facility that they never seen or tried before, adding challenging elements to familiar equipment may help to reduce children's fear from the first impression as well as the concern from parents. In addition, controlling the challenging level can also let children feel safe.

Theory: Protective frames and challenging play

According to protective frames described by Apter in Figure 1, safety and protection that experienced by individuals are changing dynamically in relation to the felt level of danger. Being in a protective frame helps to decrease the fear of challenging to a large extent (Leeuwen, Lieselotte van et al., 2012). Simultaneously, the different levels of protection experience also create more possibilities for challenging play within design settings. Using the eye-mask game (Figure 2) workshop as an experiment, it explores what different frames mean in a specific design project in related to the different levels of challenge.

The game consists of two items and a mission. Figure 3 shows the arc protection tools and the eye-masks. The mission is to collect all the stickers in the room wearing the eye-mask. There are 5 types of masks, as it shows in Figure 4, see-through effects of 5 different eye-masks create 5 levels of challenge. There are also other criteria in the scenario that can affect the experienced challenge, such as the stairs, obstacles on the floor, the locations of stickers...

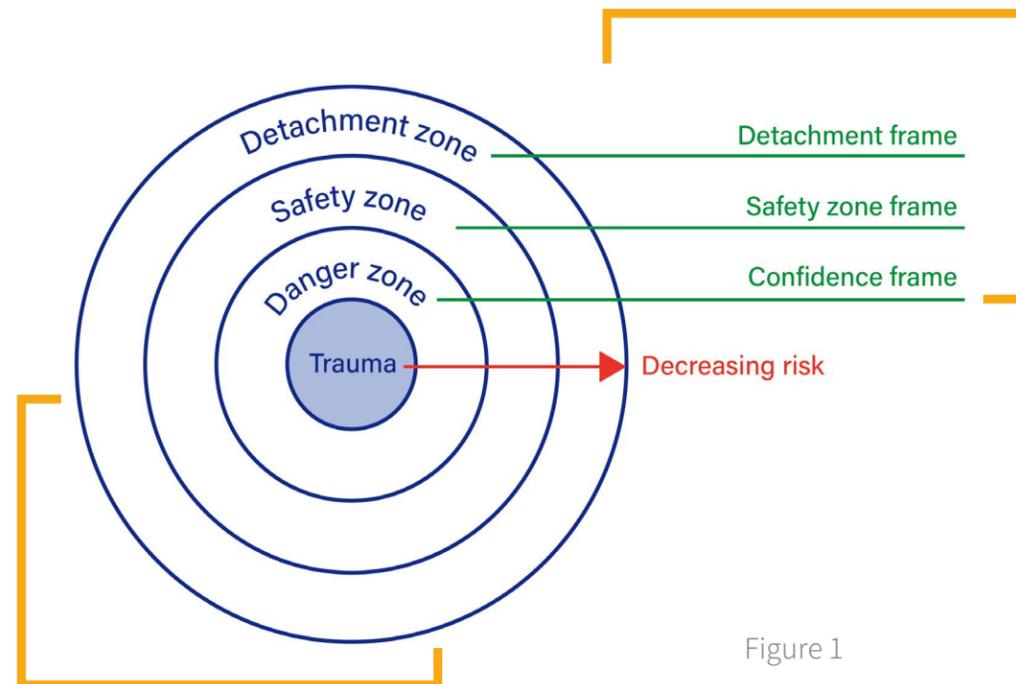


Figure 1

The detachment frame:

It is an observing area where individuals experience risk merely by empathizing with the people who are closer to the challenging elements and physically playing in the activity (Leeuwen, Lieselotte van et al., 2012). Children who are new to the activity or the environment may start with observing others. This is also a free space for parents and caretakers to see children's movement.

The safety zone frame:

This is an actual play area where players feel safe enough to enjoy playing and learning skills and acquiring courage to go further. This area can be relatively bigger, in the eye-mask game, most of the areas can be regarded as in this frame. It contains lower levels of challenge where players can enjoy the game and interact with each other freely.

The confidence frame:

It is the challenging part of the activity where children will have a higher excitement level. The central risk can also be merged within this area as an "exciting challenge zone". Children feel confident enough to willingly test the limits of safety by e.g., interacting with others, trying a new challenge of being naughty...For example in this game, children can choose to go upstairs and explore the area where there are larger obstacles.



Figure 2

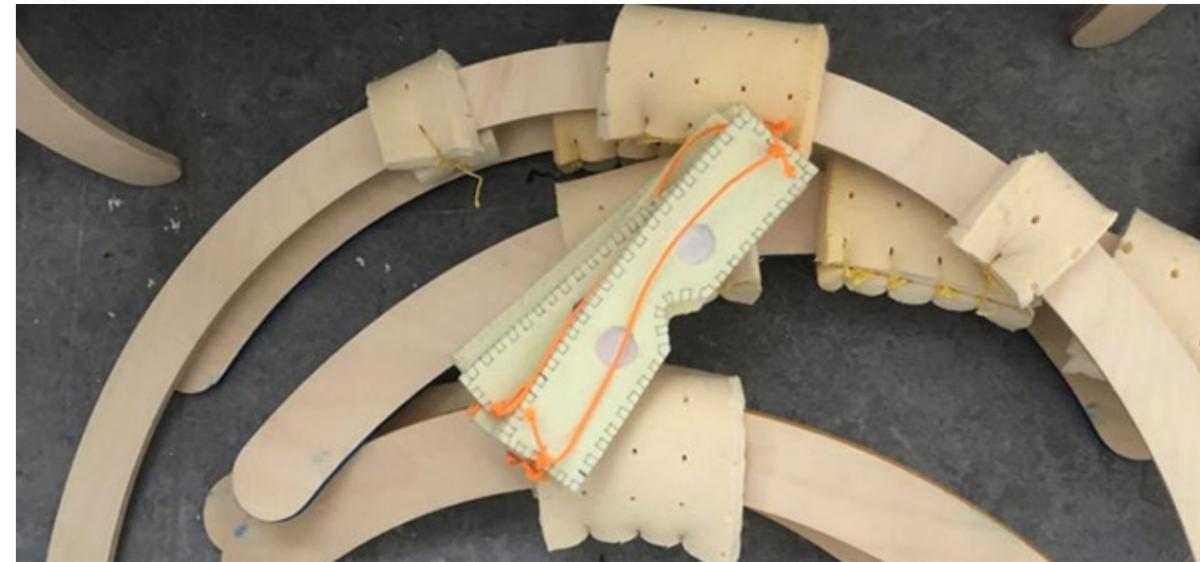


Figure 3

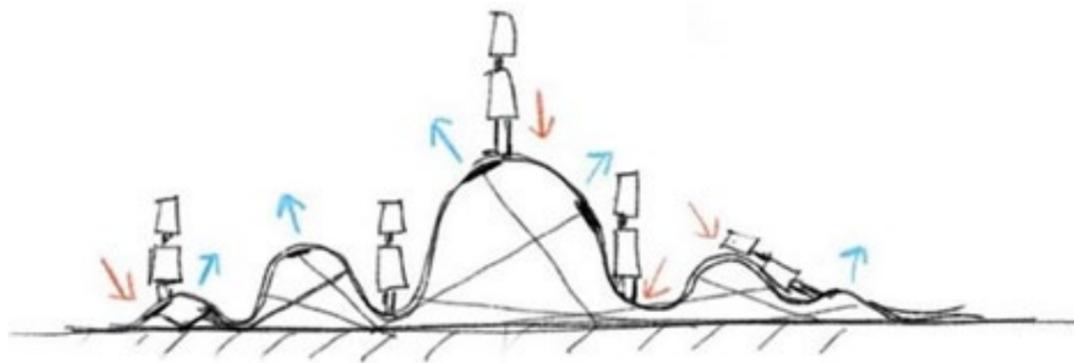


Figure 4

There will not be a clear line between the safety zone frame and the confidence frame, it is about how children feel in a specific situation. Moreover, it is also possible that the “line” will be changing among different groups of children.

DOMIO:
Children experience challenging – individually and socially

The main concept of this project is to create a welcoming area for children in the public space where they can explore different levels of challenging play freely. One possible idea is to build a circular area that are full of small hills from the lowest at the edge to the highest in the middle. Furthermore, the hill’s surfaces are connected to each other underneath, and every movement on the surface can be sensed by individuals within the whole system (Figure 3).

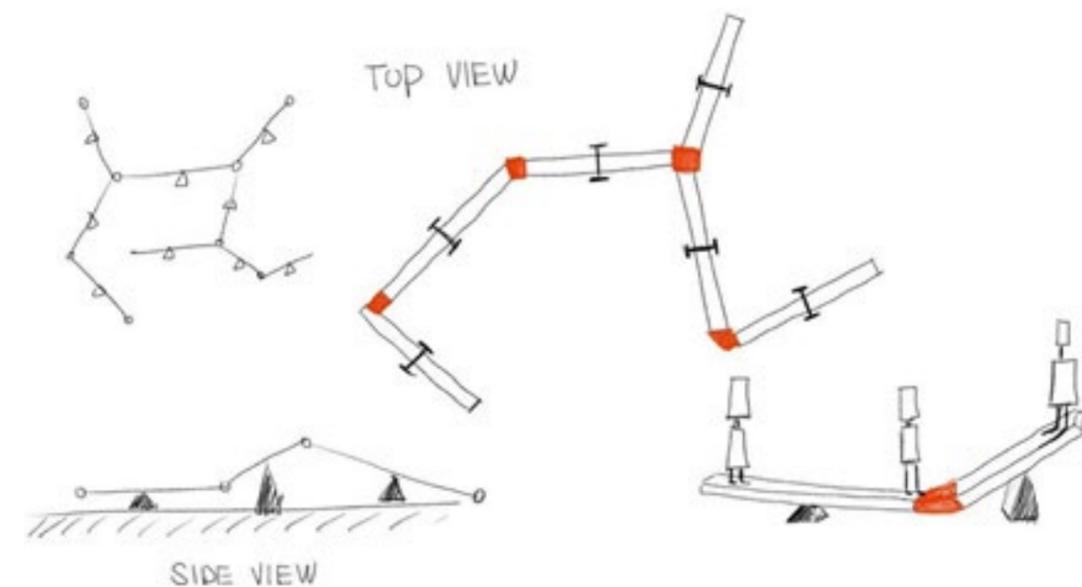


This linkage system can be simplified to a familiar ride that can be found in most of the playground – seesaw. One and the only change is connecting every end of seesaws together, in order to create an always-changing dynamic. Children have the experience to play with normal seesaw to some extent, but they still need to try out this new version to obtain the ability to control.

Although this activity does not include great height or high-speed elements which are common in risky play, there are still safety issues that need to be considered. Since the movement of all parts are connected to each other, children may lose balance and fall when paying no attention to others. This may be the most frequent “risk” in this activity. In addition to this, there may be some unpredictable risks associated with children’s different modes of interaction.

The different levels of challenge can be implemented in several ways, such as the height of beams, the surface, the shape and width of seesaw... Combinations and the arrangement of these elements can create distinct challenging levels for players.

Interaction and communication are evenly important in this activity. Children can never play along without observing others. The locations of players, directions they are going to move, are they running or walking...all these details can make a great difference to individuals’ experience. Children always need to consider others as part of the game, and react to their behaviors.



Research questions

1. How to encourage children to develop and explore their control over challenging situations through challenging facilities and environment?
2. How challenge feeling changes for children when they interact with each other in the public space?

Method Description

My design method will be based on the standard product design process, Using the book "DELFT DESIGN GUIDE" as a reference, I selected, merged and simplified some of methods in this book to achieve my design goal.

At the end of this chapter is an illustrated project timeline that shows the different design methods utilized at each phases.

● Phase 1 Research-initiated design process

Staging design activity

In order to come up with suitable approach that fits my design goal, this method is necessary for planning and preparing before entering into specific design requirements. It can also help to rethink the process and decisions during my project and offer the flexibility to adapt to new circumstances.

Questions need to be asked when staging:

What is the design goal? What resources are available in terms of time, budget, expertise, infrastructure? Who are the stakeholders that directly influence the project process in terms of resources, support, decision making? What stakeholders are supposed to benefit from the outcome of the project? What are their desires and wishes?

On-site observations

This approach is to get an overview of the scenario where children are gathered and play in the public space. I took pictures of small open play area around the community, public playground park for children, indoor play corners in museums and libraries...

● Phase 2 Concept generation process

Brainstorm

After defining design questions and reasoning, brainstorm can help to generate a large number of ideas in a relatively 'open' formulation. These ideas can be the initial material for different usage in the future, such as: further selection and development, quantity of resources for reviewing...

Inspirations - Reasoning in design model

This model helps to define my design from different levels. Description of this model should include:

1. Form: geometrical and material form of design
2. Using conditions and mode: the specific using scenario of design, both the form and the use affect the manner in which design will actually function.
3. Functions: express the purpose of design, functions also depend on the intensions, preferences, objectives and goals of users.
4. Needs and values: By fulfilling functions, what extra value can this design bring to users or stakeholders?

Design drawing

This method is a powerful tool for design exploring and communication. It helps to explore concepts in both general and detailed way. It can contribute to exploring the perimeters of the design problem. Drawing is also a convenient starting point for new concepts. By using different techniques, sketches can contain different information, such as materials, colors and construction details...

● Phase 3 Design evaluation & development

Interaction prototyping & evaluation

This method helps to simulate and test how user will experience future interactions with my design. It helps to evaluate concepts at an early stage of development, acquiring quick feedback, facilitating quick learning cycles during concept development. It includes:

1. Some scaled prototype to test the local functionality of the model, dimensions related to ergonomic aspects...
2. An interaction prototype that is a rough and simple version of the design aspects I wish to explore.
3. A workshop with users or actors using the prototype and act out the interactions as if using the final design. (pictures/video recorded)
4. Evaluation of the experienced interaction qualities when the prototype was used.

● Phase 4 Design articulating & simulating

Technical documentation

This method is the unambiguous recording of designs, Technical drawings can be used to simulate and control manufacturing processes and the assembly of products or components.

Three-dimensional models

A three-dimensional model is the digital model built in 3D software. It can indicate the basic structure of product and assembly details. It is also convenient for the communication between factories and designers.



Project Timeline

18

19

Theme project Timeline - 2022

Child Culture Design
Chelsea Wang

JAN

FEB

W3

W4

W5

W6

W7

Design research: case study, design references...

Thesis writing: academic research (playground, safety rules, physical play...

Concept development: concept sketch, sketch models, digital models and scale models...

materialization

INTRO 17
PJ, LvL, JF 608 Mon

Lecture: Anna Hyden 20
PJ 301 Thu

UPLOAD: 21
Final Essay Fri

Concept research & sketch ●
Stakeholder research ●

Concept development ●

digital models & renderings ●

scale models making & testing ●

Proposal preparation (Design Concepts, sketches models and renderings) ●

Seminar: Thesis Structure 31
LvL 338 Mon

Tutoring 03
PJ, JF 610b Thu

UPLOAD: 04
Project description Fri

send proposals to stakeholders & make connection ●

REVIEW 07-08
527 Mon-Tue

Individual material exploration 09-11
527 Wen-Fri

1:1 model making ●

TEST 1: peer test ●

Seminar: Co-design 16
LvL 206b Wen

1:1 model making ●

players/users research ●

MAR

W8

W9

W10

W11

W12

Concept development: concept sketch, sketch models, digital models and scale models...

workshop feedback evaluation & design modification

workshop feedback evaluation & design modification

materialization

materialization

1:1 model making ●

Player Test WS preparation ●

Player Test WS room booking ●

Workshop: Co-design 30
PJ 4029 Wen

TEST 2: player test ●

workshop feedback evaluation ●

Concept development & modification ●

1:1 model making ●

Tutoring 30
PJ, JF 610b Thu

Concept development & modification ●

1:1 model making ●

TEST 3: player test ●

Playground tour 23
PJ, CS Wen

workshop feedback evaluation ●

Concept development & modification ●

Project Timeline

Theme project Timeline - 2022

Child Culture Design
Chelsea Wang

APR

MAY

W13

W14

W15

W16

W17

workshop feedback evaluation & design modification

Thesis writing: material organisation

materialization

REVIEW 31-01
310 Thu-Fri

Individual material exploration 505

Tutoring AV 301 14 Thu

Concept development & modification

Individual material exploration 505 25-26 Mon-Tue

Final model making

TEST 6: player test

Final model making

Tutoring PJ,JF 301 28 Thu

TEST 5: player test

Thesis writing

FINAL TEST : player test

JUN

W18

W19

W20

W21

W22

Thesis writing: material organisation

Thesis writing

FINAL REVIEW 12-13
305 Thu-Fri

Thesis writing

DDL: 27 Fri
Complied Thesis

Design material organization

Design material organization

Thesis writing

Design material organization

Assessment: 30-31 Mon-Tue
Compiled thesis

Process Documentation

This section expands on and complements the method description above and aims to show all the key design processes and methods associated with this project.

Staging design activity

Before entering into specific design requirements, several questions can be asked to clarify my design area for further planning:

1. What is the design goal?

The goal of this project is to create a welcoming space with different challenging levels for children to explore free and risky play. Children will be given the freedom to choose which level they want to try. Communication among players is also an important part in this project. This project should help to promote dialogue between players, on the basis of which children can create more ways to play.

2. What resources are available in terms of time, budget, expertise, infrastructure?

In the research and concept generation phases, on-line questionnaire and interviews are possible and efficient. Concept models both in digital and physical are also available. In prototype phase, wood and metal workshop are available for both scale models and 1:1 models. My budget for this project in prototyping is 2500 kr. Technicians in HDK are available to help with the construction of physical models. Tutors in CCD are also available to provide feedback with a broader vision.

3. Who are the stakeholders that directly influence the project process in terms of resources, support, decision making?

There are two types of stakeholders in this project. One main group is children in different ages who often play in public areas. Their needs and expects will be considered throughout the design process as role of players and users. The other is playground planners who will influence the constructing part of my design.

4. What stakeholders are supposed to benefit from the outcome of the project? What are their desires and wishes?

This project will offer children a new game to try in the area of free and risky play. Children can create their own games with this open-ended project. They will have more possibilities to communicate with other players in this process.

Playground planners will be provided with a flexible design solutions to fit different environment conditions. This project is modular that can become a standard product in play area design catalogue.

On-site observations

In order to get an overview of the playground environment and how children play in the area, I visited 4 outdoor play areas in Gothenburg. By observing their infrastructures, facility layout, ground conditions etc., concepts can be narrowed down into greater detail.



Benches are always around the playground.

Environment condition: there are mainly three types of ground: sand, grass and EPDM ground...



Playing facilities are scattered and there is free space between them for children to run or play their own games.



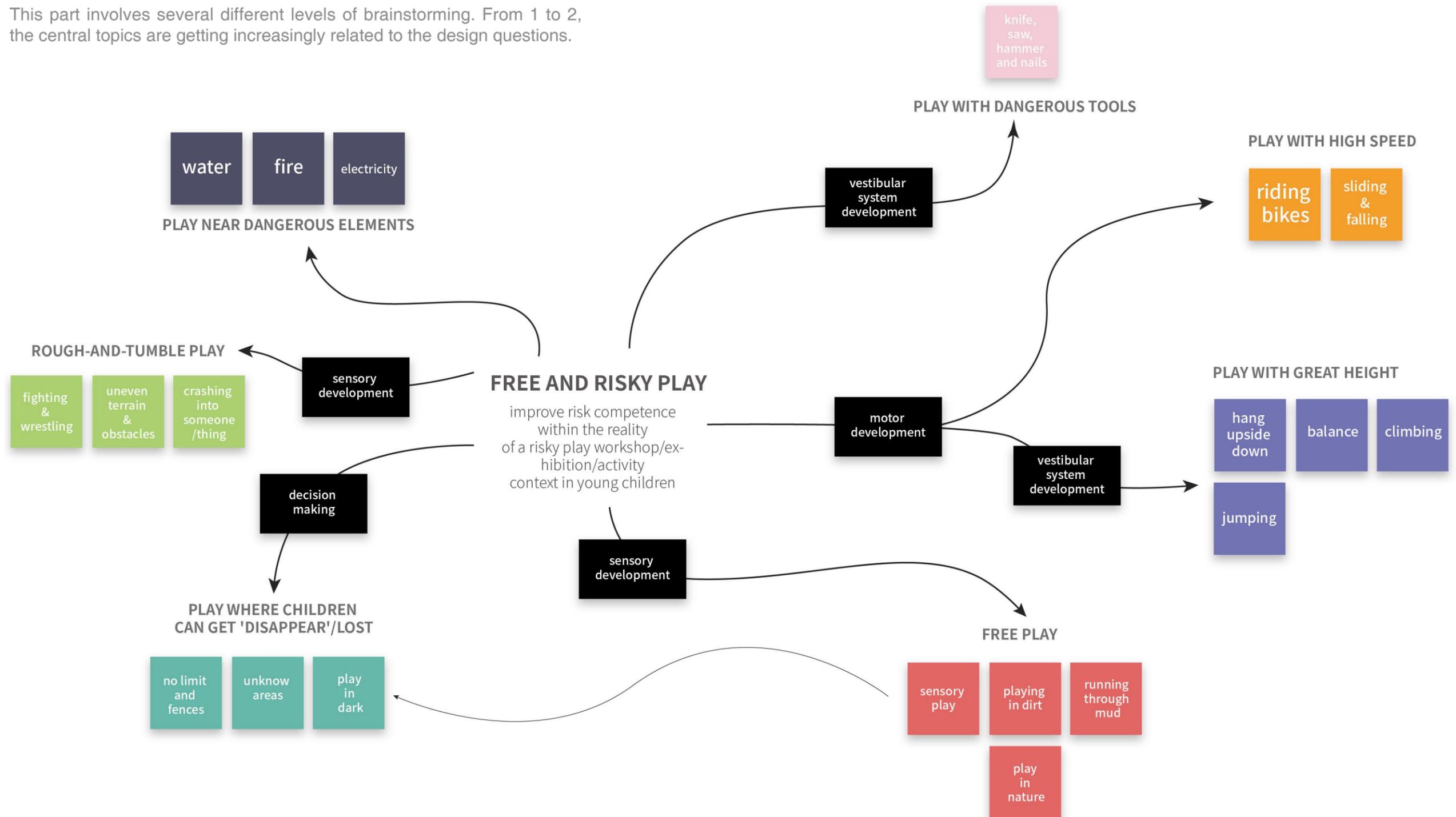
There will also be a storage room in mostly larger outdoor playground where children can borrow toys or tools that can be played here. It normally contains cars or tools for sand playing, children's bikes, ski equipment for children and some spare space on the shelf.

When talking about the movement of children and parents, younger children around or under 5 are always close to their parents, they need help to climb high, keep balance or play with sand and water... elder children often play with peers, their parents are normally sitting on bench or chat with other parents, some of them even came by themselves. Elder children always play swings, climbing ropes and create their own rules to play. For example, they stand on both sides of swings to make it higher...

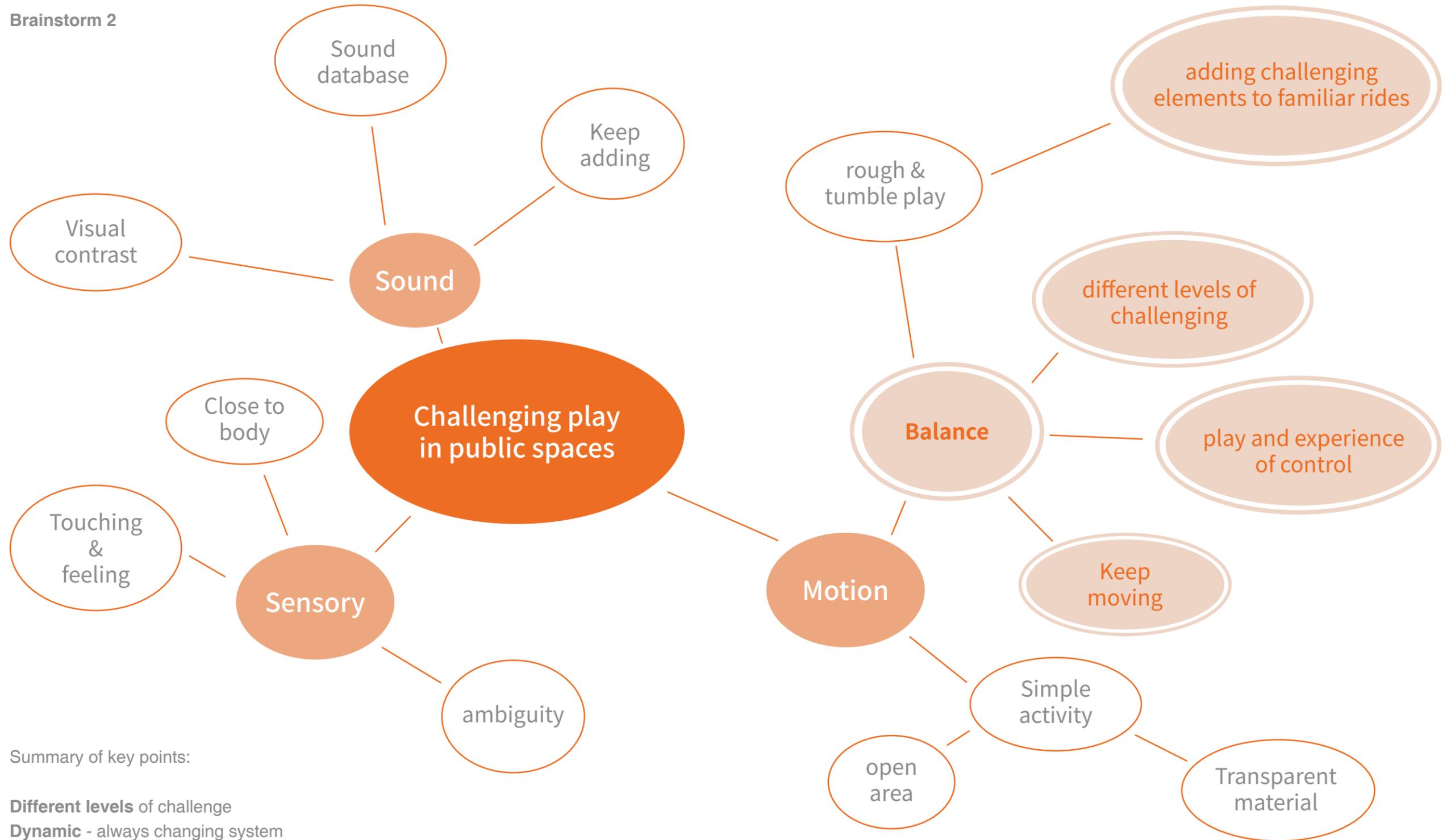
Brainstorm

This part involves several different levels of brainstorming. From 1 to 2, the central topics are getting increasingly related to the design questions.

Brainstorm 1



Brainstorm 2



Summary of key points:

- Different levels** of challenge
- Dynamic** - always changing system
- Modular** for playground planners

Inspirations - Reasoning in design model

This model will illustrate inspirations related to the following aspects: Form, Using conditions, Functions, Needs and Values. The pictures will contain projects done by other designers or artists, random shapes and material pieces that relate to the topic, relevant scenarios or using conditions... This model helps to inspire my design on a more detailed level.

1. Form: geometrical and material form of design

Materials that contact to body: irregular shapes and textures help to create different touching and visual feelings



Workshop with soft materials: create protecting tools by themselves to protect them in order to explore "risky" elements in the room.

Materials that can be used to communicate with each other, and also attached to body.



Simple geometric shapes can create a constant dynamic effect.

2. Using conditions and mode

Outdoor play areas for children:

This project can take place in a residential area or in an open space around a school, where children and even passers-by can go to play. There is no specific age limit for this area, so children, teenagers and even adults can find joy in it.

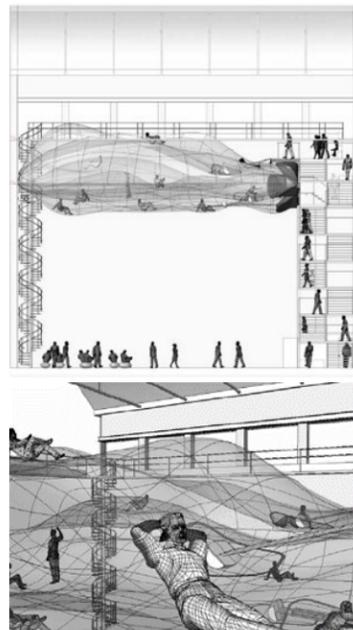


Indoor play area: This project can also be used in indoor children's rest areas, such as libraries, exhibition halls, children's physical training centres, etc.



Outdoor playground: This project can be found in tightly planned outdoor playgrounds. It can reach children of all ages and provide them with a fun and physically challenging experience.

3. Functions: express the purpose of design



This project inspires me in a lot of aspects: Firstly, it is very simple and easy to understand. The participants can start the activity on their own without any instructions. Secondly, it contains many possibilities for interaction, both between people and the environment and between people and people. They can find their own role in it and have the freedom to change it at will.

This activity is similar to the first one, but is more complicate in appearances. One can see some clear interaction in its exterior design, but by and large it is designed to be very open-ended.

This project has more explicit restrictions on location and interaction methods, but still leaves room for functionality. Sometimes these restrictions are what inspire participants to explore new ways of playing.

4. Needs and values What kind of play this project can support?



Free and risky Play:
Keep balance in different challenging levels.



Physical play:
Walk, run, sit and more...

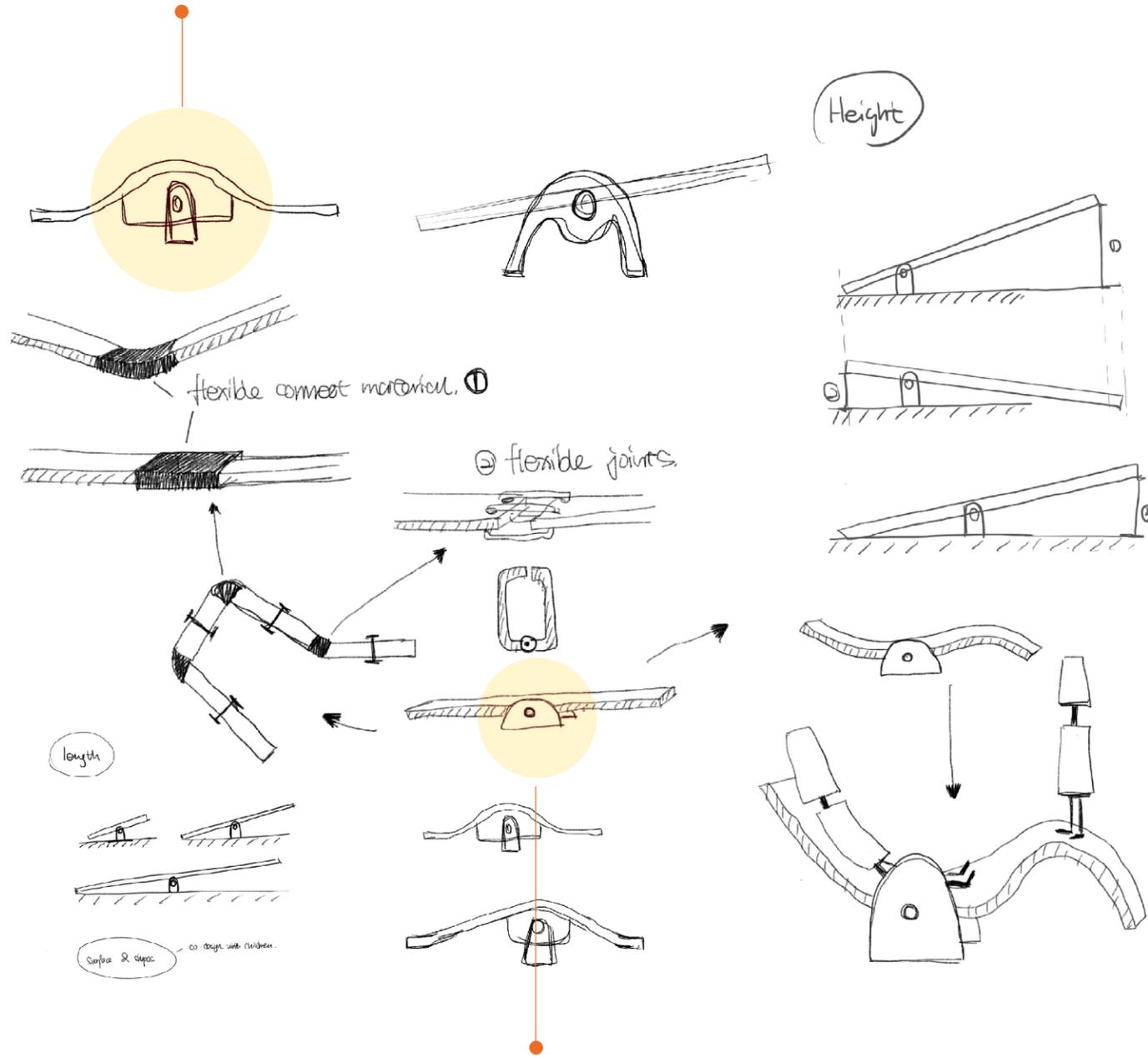


Cooperative Play:
Communicate and react to each other.



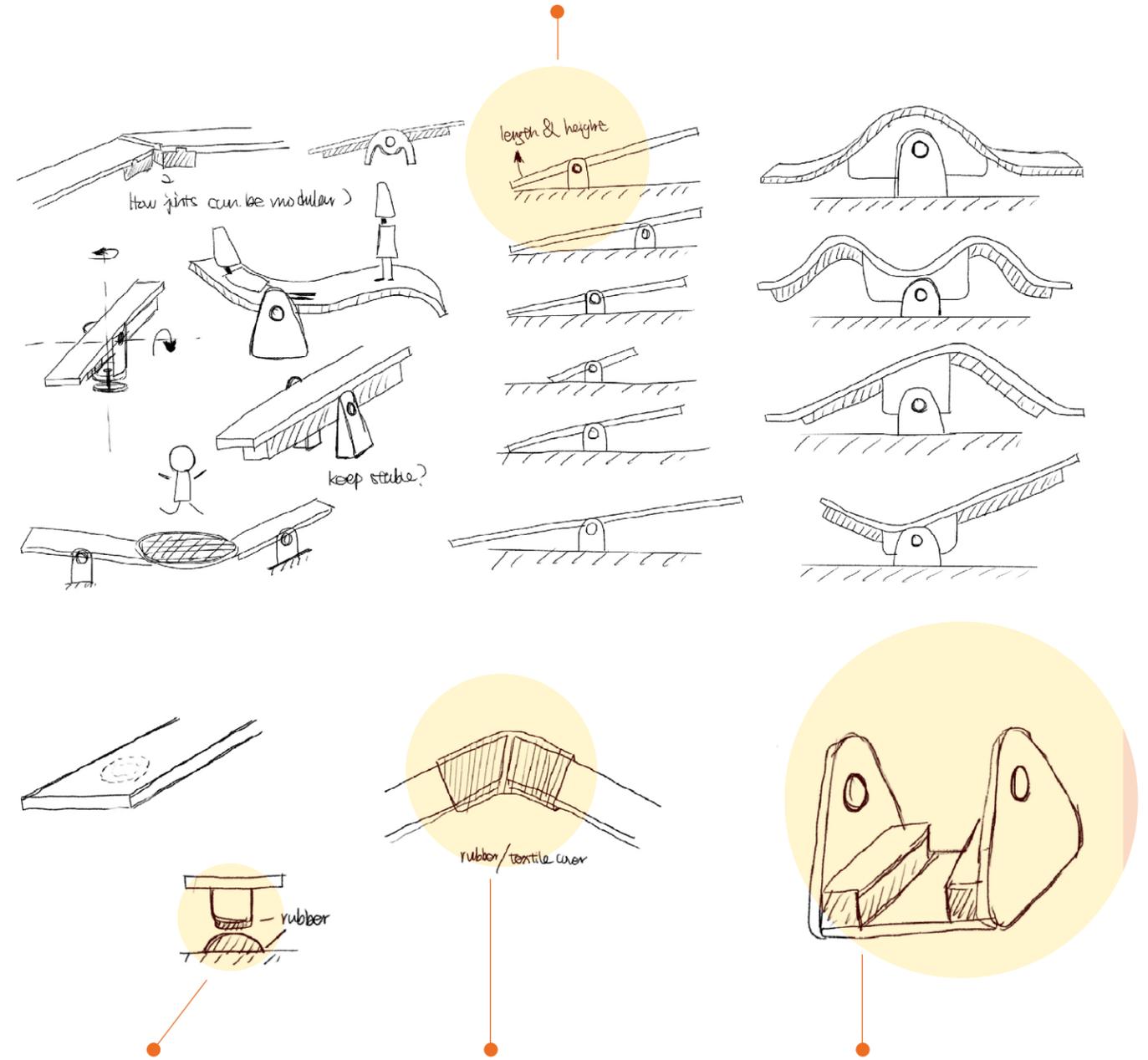
Creative play:
Create new ways to play through increased familiarity with the game.

The main part can be curved or in other shapes, in order to add challenging level from another perspective.



Greater contact area with the ground for greater stability

Different challenging levels: by changing the length of beams and the location of pivot.

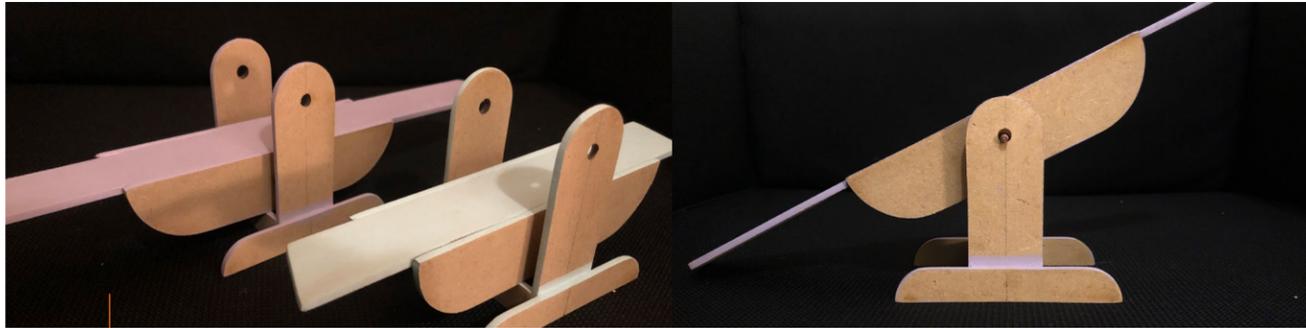


Buffer Point: Protects players from being caught in the board while cushioning the impact

Joints: both durable and flexible

Foundation: extra inner support for stability

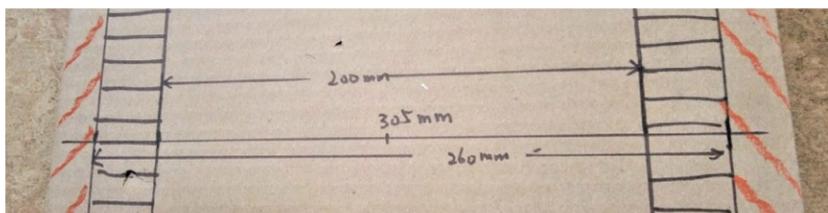
Interaction prototyping & evaluation



I started to explore the structure with laser-cut models. By building it piece by piece, it helps me to think how can I assemble different parts in the real scale.



Joints for the 1:1 prototype are connected by elastic ropes. Although the final product should be linked by rubber sheets and screws to ensure long-lasting use. However, as the prototype needs to be disassembled and reassembled frequently, this temporary connection would be more convenient.



Before setting the base dimensions for the prototype, I made a simple long board out of paper shells to find a suitable width and length. The board was marked with three lengths on which I walked evenly, walked fast, ran and jumped as well as turned. The right width should fully accommodate all of these movements. In the end I decided to use 200mm as the width and 3m as the length.

I made two sets of 1:1 prototypes. They were divided into two challenge levels. They both have the same base height, the difference is in the length of the planks. The first level consists of two 3m long planks with fixed bases and no changing of the position of the shafts.

The second level consists of two 2m and one 1.5m planks. Compared to the first stage, they have a steeper slope. And as they are made up of three planks joined together, it is also necessary for the players to pay more attention to the movements of the others to judge how to keep their balance.



Workshop Plan

Free and challenging play

Scan to watch the testing videos with different groups



Workshop 1 - Let's do balancing!

Estimated time: 30mins for each activity

Material: Domio prototypes

Activity: Maximum number of children who can stand on it.

All students will be divided into 2-3 groups with 4-6 children in each group. Let students find a way to stand/sit/whatever on Domio to see how many students can be on the Domio prototype as a maximum number.

Activity 2: Keep flatly balance

Keep the same group, the purpose is to keep Domio as flat as possible.

Children can discuss and decide how to management to achieve that. (in terms of different weight, height, ability...)

	age range	number of children	how familiar with risky/ free play
Group A	3-4	14	Basic level
Group B	5-6	16	Higher level than average

* All children in pictures and videos have signed the informed consent

Using the two sets of prototypes above as a basis, I invited two groups of children of different ages to do two workshops, one per week. As my design was intended for an outdoor children's place, a minimum playable age needed to be defined. The whole workshop was divided into two parts, the first part was a free exploration where the children and the teacher could play as they wished according to their understanding.

They can use this to get familiar with the prototype and the environment, and some new ways of playing can be discovered without even thinking about it. The second part was a small activity where the children were asked to get on the prototype one by one and then go down one by one. Through this process, I wanted to systematically observe how children of different ages maintain balance in such situations and how they interact with each other.

Both groups of children are 3-4 years old, but there are still subtle differences in physical performance. When doing the same task, the first group needed two teachers behind them for support, but the next group only needed one teacher to be around for a little help.



The boy was very keen on lying on the prototype or crawling on it with his limbs. When another girl joined in the game, the girl was upset with his movements because it interfered with the balance she wanted to maintain.



After a while, when they are tired of playing. Some children began to sit around prototype, using branches as tools and boards as tables to play role-play.



Group A observations

1. Play with more caution, need more help from adults
2. It is difficult for them to make a judgment on the next move
3. Less concentration and less control over their bodies

4. Follow rules rather than create ones
5. They learned from the first workshop, and they are more willing to try and explore in the second workshop.



Group B observations

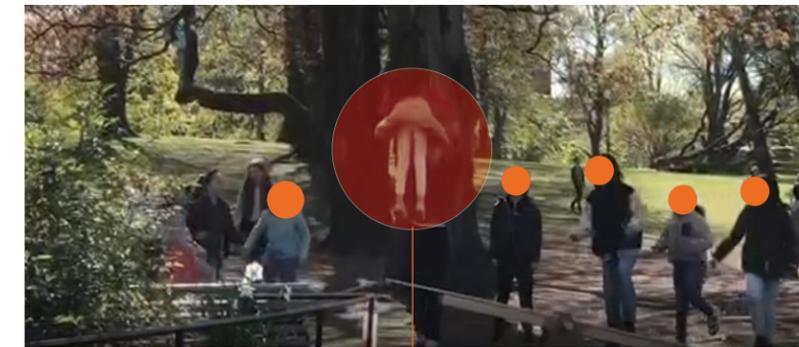
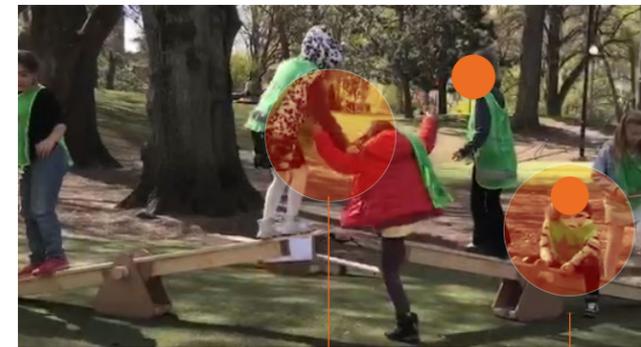
1. Play with less fear, more willing to challenge
2. More capable to anticipate the actions of others
3. More patient and willing to think before moving
4. Repeat the successful movement and get sense of satisfaction
5. Less communication with peers, more willing to play along

Overall summary

1. Three years old can be taken as the lower age limit of this game.
2. Children can learn the skill of controlling it through repeated play.
3. For children from 3-6, there is no significant risk of serious injury in this game, but they may be scared by the rapid movement and unbalancing while playing.
4. For children from 3-6, They are more concerned with their own movement than observing others.

Random observations in the park

This group of children are more than 6 years old, they know each other quite well, and are willing to communicate. This boy is not one of their group, he randomly came and tried to push the end down, in order to change the balancing situations.



These children came every day. They have gradually gone from playing in a constrained ways of playing.

This girl sit there and asked others to keep balance. She really enjoyed sitting there and observing.

This group of players, of all ages, developed a new way to play after a few days of trying: launching the center into the air. The people on either side would count: 3, 2, 1... Then in tandem, they would step down hard on both ends. They liked this way of playing so much that they could keep playing for about an hour.

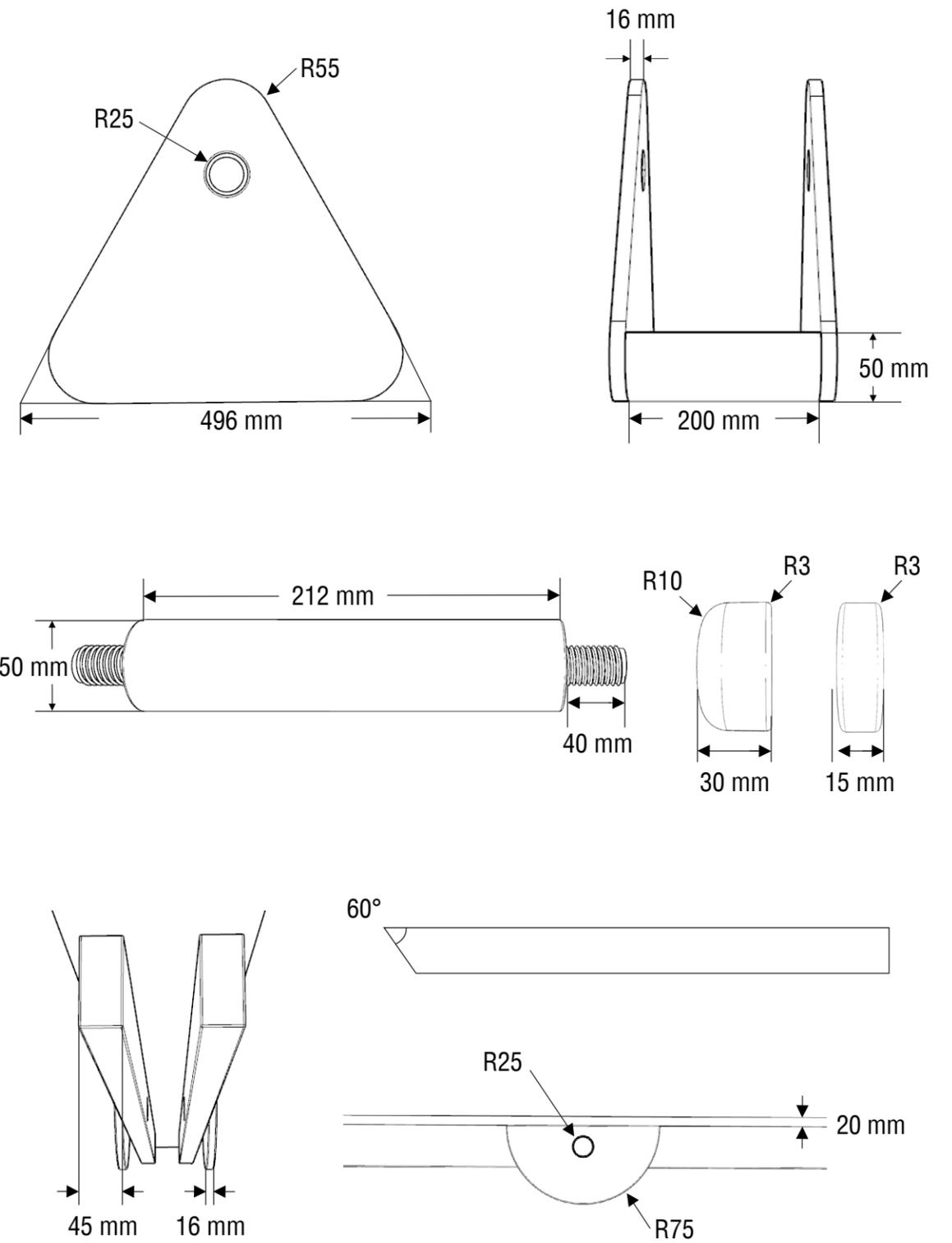
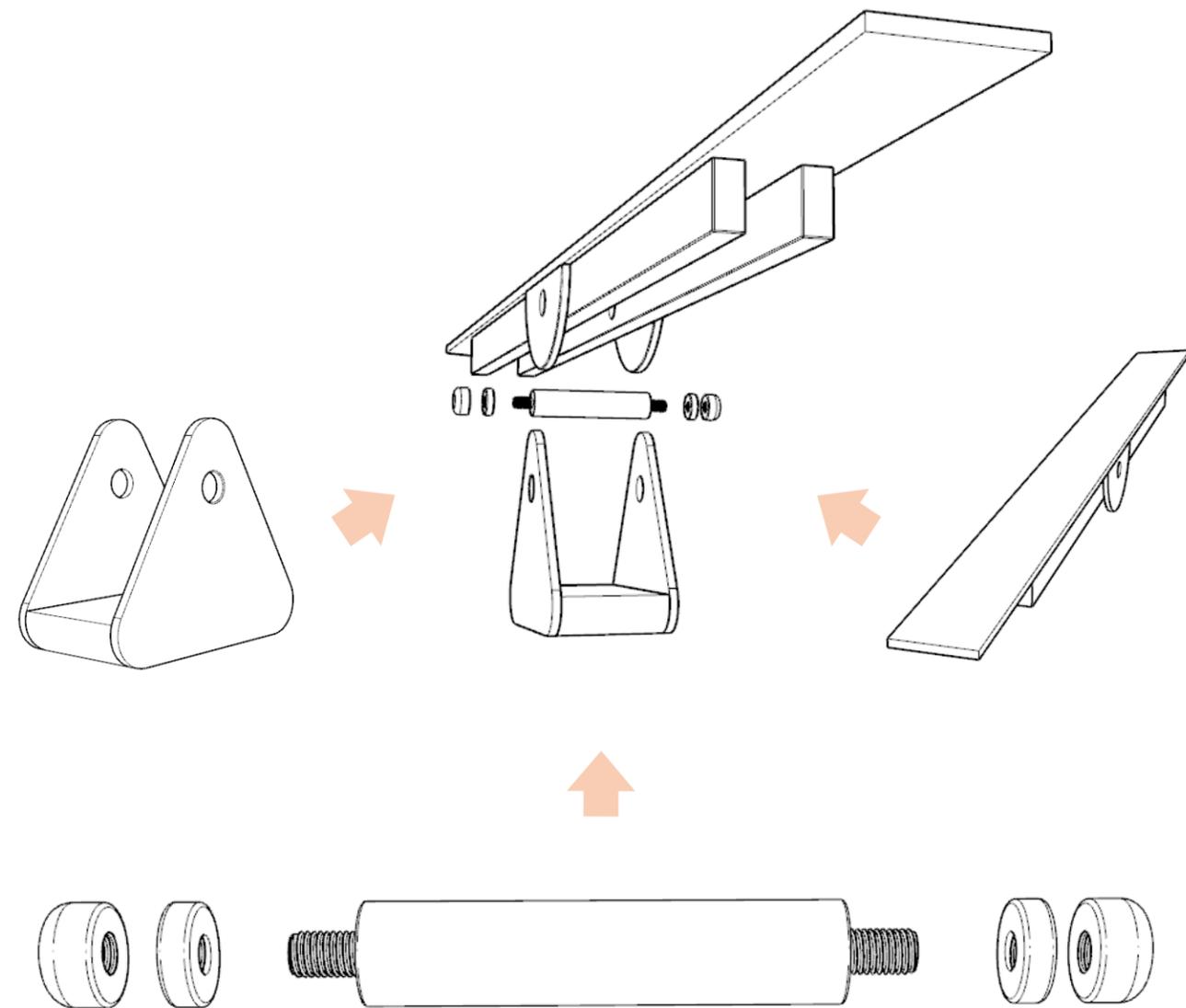
Older children and even teenagers are more enthusiastic about the game. They go beyond the challenge of the facility itself to add new challenges through different ways of playing.

What is the feedback from Ulrika (Physical therapist, Founder of Learntomove), regarding the design and the testing with children?

The discussion was based on the observation of the children's play in the video. Ulrika made several interesting observations: Children are perfectly capable of handling their current level of challenge and adults should be less involved in their exploration. Furthermore, Falls and temporary inability to maintain balance are not bad things for children, they are how they learn new skills and create new ways of coping. This project can cover a wide age range of children who can acquire different play experiences through it. It will be more interesting for children when adding more modules in the system.

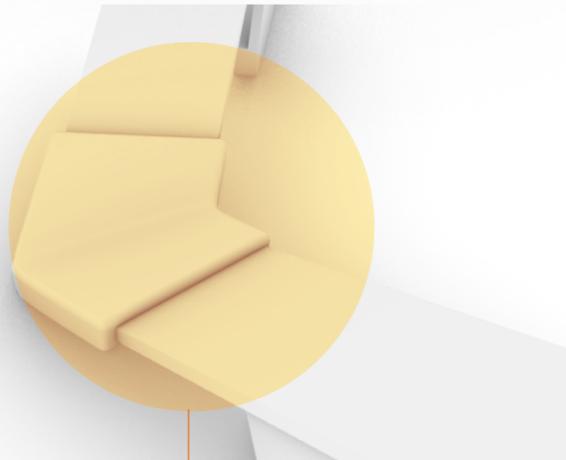
Technical documentation

The prototype consists of three main parts, the foundation, plank, and axis. Dimensions are documented for further improvement and test.

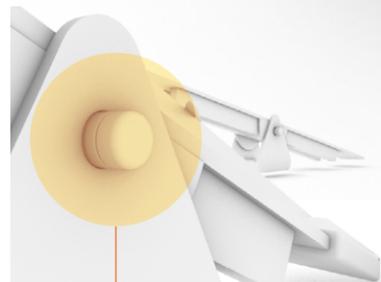


Three-dimensional models

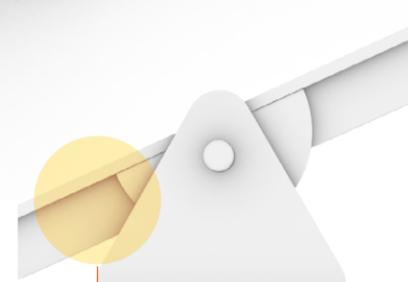
White mold rendering helps to remove the distractions of materials and light, focusing attention on the structural relationships and internal and external details of the product's own components. It can more accurately convey the design intent and product functionality.



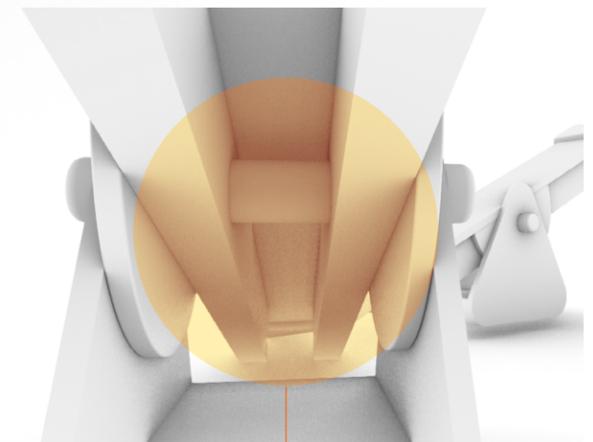
The joint need to be both flexible and durable. It needs to be able to handle multiple up and down movements while maintaining functional stability.



The fixing part consists of a nut and a threaded spacer. Since the base is constantly in motion, the two parts, which are tightened to each other, increase the stability of the base.



The main part consists of three plate structures joined together. The two lower support plates help to distribute the forces from above, which allows the product to carry more players.



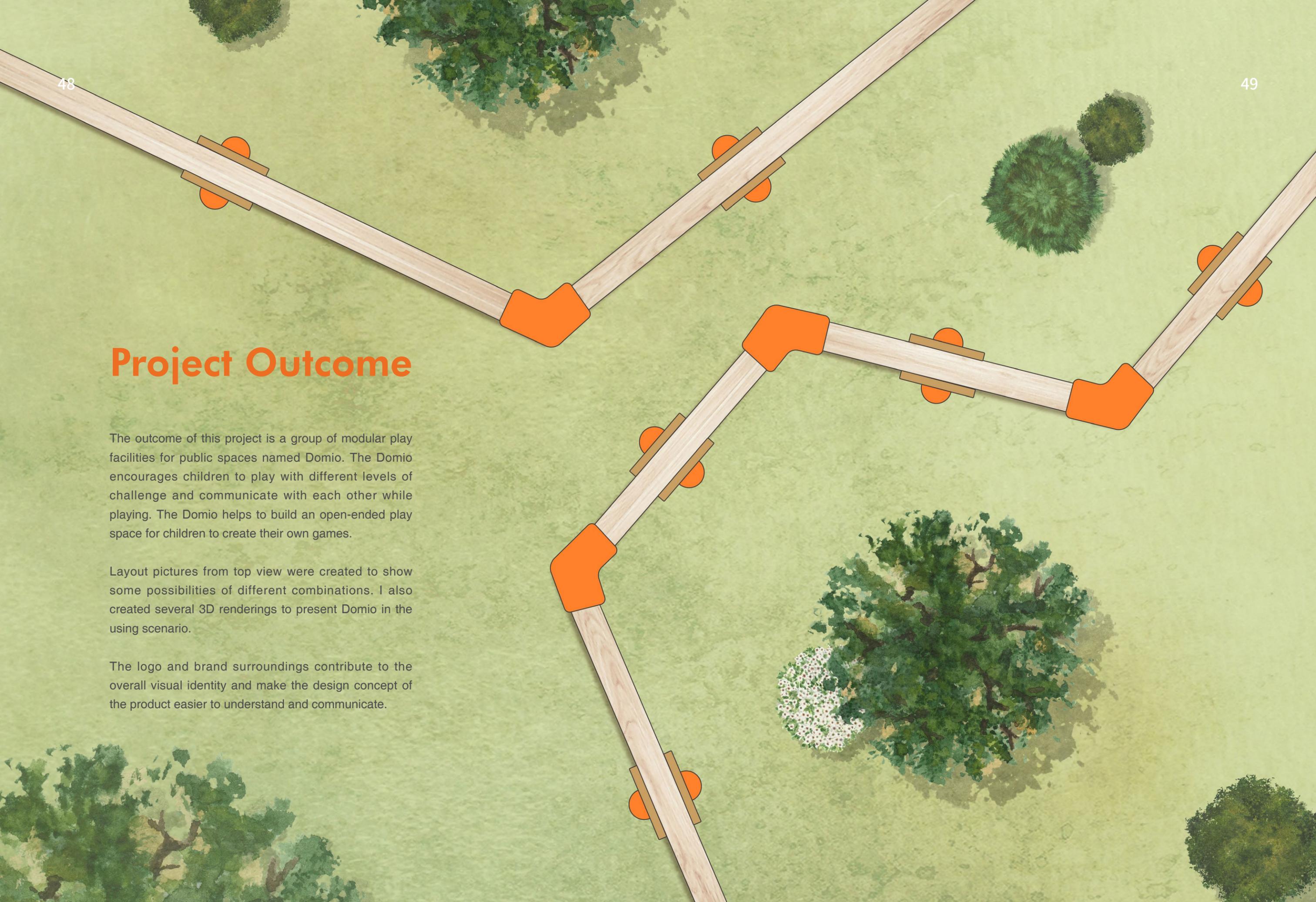
The connecting shaft not only carries the downward force, but is also in constant rotation and wear. This part needs to be strong as well as flexible for rotation.

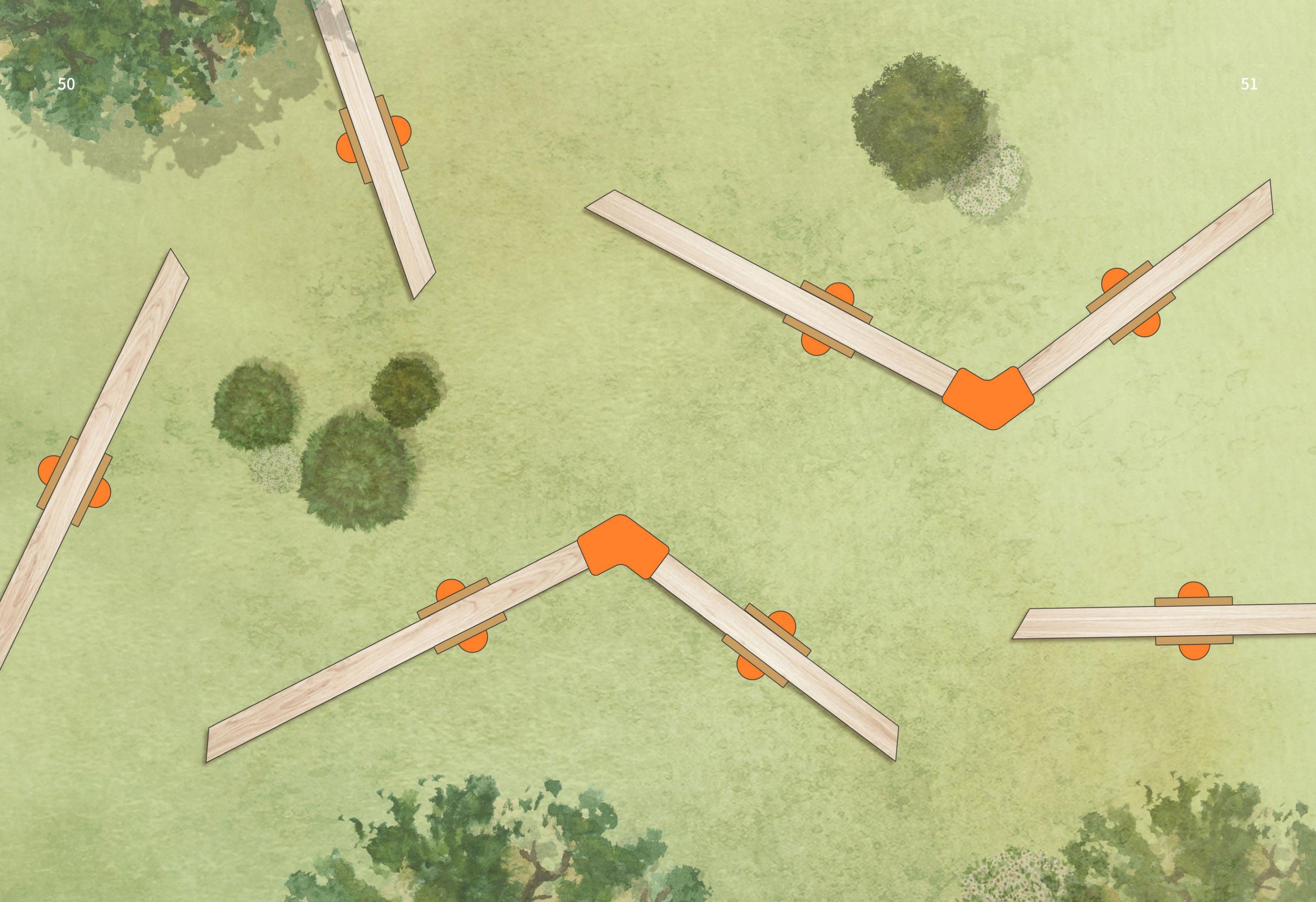
Project Outcome

The outcome of this project is a group of modular play facilities for public spaces named Domio. The Domio encourages children to play with different levels of challenge and communicate with each other while playing. The Domio helps to build an open-ended play space for children to create their own games.

Layout pictures from top view were created to show some possibilities of different combinations. I also created several 3D renderings to present Domio in the using scenario.

The logo and brand surroundings contribute to the overall visual identity and make the design concept of the product easier to understand and communicate.









User's choices

The basic set of Domio has three levels of choices. Each level has 2-3 kinds of plank. In total, there are 8 types of planks that can be chosen. By selecting different length and different shapes of Domio, users can design their own playground with different challenge levels.

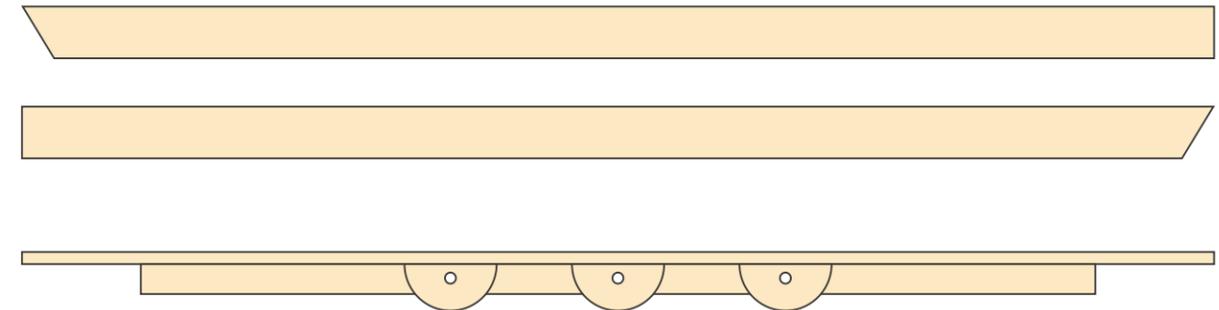
Different pivot locations

For the Domio modules in level 1 and 2, the plank is longer and there are 2-3 pivot locations that can be selected. This adds another dimension for the user to control the challenge level. Besides, when setting Domio individually, both the user and the player are free to move the position of the axes to add new game-play experiences.

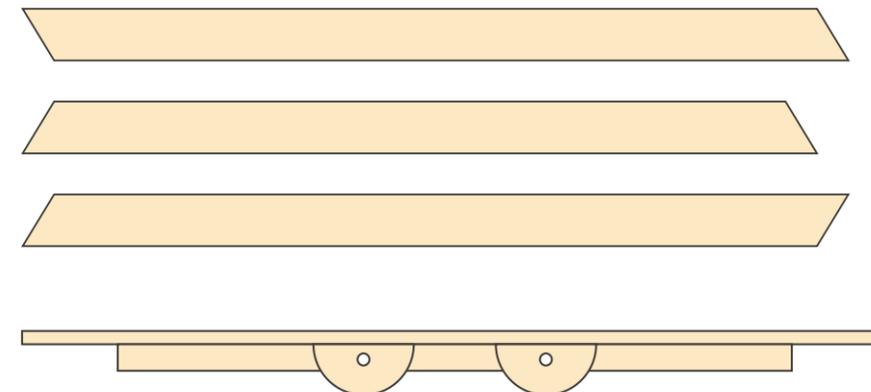
Modules with different angles

Different angles at the ends of modules help to manage the direction of where the "path" goes. According to all kinds of environment conditions, users can manage the area more freely by combining modules with different angles.

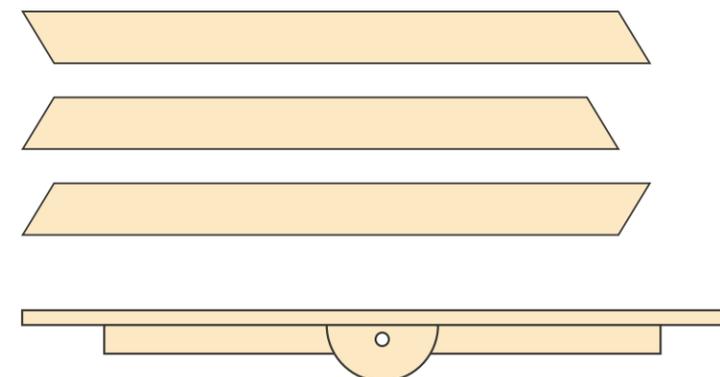
Level 1
length: 3m



Level 2
length: 2m



Level 3
length: 1.5m





Stickers Set

For workshops, tests or trainings, play activities that based on the facilities of Domio.



RGB: 205 60 40
CMYK: 18 89 90 0

RGB: 230 195 184
CMYK: 10 28 24 0

RGB: 6 0 1
CMYK: 91 87 88 79

RGB: 211 15 42
CMYK: 17 65 89 0

RGB: 89 39 122
CMYK: 78 97 18 0



Logo and branding series

The word Domio is derived from Domino, meaning chain reaction. It symbolizes that the program creates an environment of constant change for children, designed to encourage them to observe and communicate with each other as they play, and to respond to the movement of their peers.

Conclusion

Free and challenging play is important to children's well-being. It offers them opportunities to develop social-emotional skills, to read other's facial expressions and to infer player's intent (Kuschner, D, 2019). However, due to the negative perceptions of challenging play, safety concerns from adults lead to restrictions in physical education and design possibilities. For children, individuals are different separately in how they feel several challenging levels. Furthermore, due to the fluctuation of motivational state, individuals will also have distinct experience in the same situation (Leeuwen, Lieselotte van et al., 2019) In order to provide children with opportunities to choose the way how they like to experience challenge play, different levels of challenge are provided in the project.

Design settings and space arrangement of this project can be generally described in a public children's area. Domio is one of the possible concepts to encourage children to develop and explore their control over challenging situations and have fun. It provides children with freedom to choose the challenging level they are willing to try and a space to observe other players as well as react to their movement. Adult are also welcomed in this game. They can help to add another layer of challenging.

The "challenging elements" in this activity do not include an obvious intent to be in physical danger. Instead, it opens up an in-between area to discuss how children behave in different levels of challenging items; how they interact with each other in this situation; and what influences them to make a decision when facing a challenging task...These questions are not only important to children themselves, but also crucial to adults who are involved in the activity, especially parents and caretakers to acquire a better understanding of challenging play from children's perspective.

In terms of product functionality and structure, Domio is designed to be modular, offering a diverse portfolio of options for playground planners or individual users. The planners are free to combine the modular facilities according to their own plans and the actual environmental conditions.

Mechanically, the Domio is indeed very similar to a normal seesaw, in that they both create a constant, non-stop movement by supporting the two ends of a long board. However, in terms of function and play experience, they differ in many ways:

First of all, the seesaw has only one board and one pivot point, and two seats have been fitted at each end. The design communicates very clearly how it is to be played: i.e. the player is supposed to sit at both ends and change balance through the difference in weight. While Domio consists of a number of boards of varying lengths, the ends of which are linked together to form a community of movement. Beyond this, the appearance of Domio does not point to a specific way of playing. Players can stand, sit, climb or even run and jump on it. Secondly, Domio creates a more open environment for players to communicate and create than a normal seesaw. Domio welcomes more people to join the game, which adds more playability to the game. At the same time, the project encourages players to try out different levels of challenges with their peers. They need to observe each other during the game, communicate and collaborate with each other, and they can also create their own rules for the game.

The project can be used not only in playgrounds, parks and schools, but also in indoor children's areas such as exhibition halls, museums and child corner in libraries. In addition to play purposes, the project can also be used as an aid for educational purposes such as physical and attention training for children.

Seeing children play and create with Domio in Vasaplatsen for 2 weeks encourages me to push the project further into reality. I plan to pitch this project to relevant government programs and companies, trying to get some support and possibilities to cooperate. Also, It is crucial to do more test with children by using different combinations of Domio modules in further development.



Bibliography

- [1] Brussoni, Mariana, Lise L Olsen, Ian Pike, and David A Sleet. "Risky Play and Children's Safety: Balancing Priorities for Optimal Child Development." *International Journal of Environmental Research and Public Health* 9.9 (2012): 3134-148. Web.
- [2] Kushner, D. (2019). The Cambridge handbook of play. *International Journal of Play*, 8(3), 327–329. <https://doi.org/10.1080/21594937.2019.1677544>
- [3] Lavrysen, Ann, Els Bertrands, Leene Leyssen, Lieve Smets, Anja Vanderspikken, and Peter De Graef. "Risky-play at School. Facilitating Risk Perception and Competence in Young Children." *European Early Childhood Education Research Journal* 25.1 (2017): 89-105. Web.
- [4] Sandseter, Ellen Beate Hansen. "Restrictive Safety or Unsafe Freedom? Norwegian ECEC Practitioners' Perceptions and Practices Concerning Children's Risky Play." *Child Care in Practice: Northern Ireland Journal of Multi-disciplinary Child Care Practice* 18.1 (2012): 83-101. Web.
- [5] Hughes, Erika. "Dramaturgies of Risky Play: Two (risky) Case Studies." *Youth Theatre Journal* 31.1 (2017): 35-47. Web.
- [6] Leeuwen, Lieselotte van et al. "Controlling experience or experiencing control? Reversal theory & design for play." (2012).
- [7] Piaget, J. (1954). *The development of object concept* (M. Cook, Trans.)
- [8] Hansen Sandseter, Ellen Beate. "Categorising Risky Play-how Can We Identify Risk-taking in Children's Play?" *European Early Childhood Education Research Journal* 15.2 (2007): 237-52. Web.
- [9] Jambor, T. *Challenge and Risk-Taking in Play*. In *Play from Birth to Twelve and Beyond: Contexts, Perspectives, and Meanings*; Fromberg, D.P., Bergen, D., Eds.; Routledge: New York, NY, USA, 1998.
- [10] Weikart, D.P. *Changing early childhood development through educational intervention*. *Prev. Med.* 1998, 27, 233–237.
- [11] Panksepp, J. *Can play diminish ADHD and facilitate the construction of the social brain?* *J. Can. Acad. Child Adolesc. Psychiatry* 2007, 16, 57–66.

Acknowledgements

I sincerely appreciate the support from the two preschools: abc all about children and gothenburg preschool, all the students who gave me lots of hugs and smiles. I am externally grateful to meet all kinds of children and teenagers in Vasaplatsen who offered me the passion to continue improving my design. None of this would have been possible without their help.

I want to thank my tutors and fellow students who gave me feedback, helped me with testing and prototype making, and most importantly the courage throughout the whole design process. I also want to thank Ulrika who kept providing me with an outside perspective to look at my project.






Domio

HDK-Valand Academy of Art and Design,
University of Gothenburg